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Principles of Finance

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Contents

Chapter 1 Introduction

1.1 What is Finance?

Finance is an imprecise generalization that may encompass several branches of economics, law and general know-how on managing valuable assets. From simple currency and property to bonds and other more complex financial instruments. More specifically, one can state that through financial analysis and decisions, planed actions can be taken regarding the collection and use of those assets as to optimize financial resources toward the objectives of an organization (states, companies and businesses) or individual.

Types of finance:

1. Overdraft
2. Bank term loans
3. Asset-based finance
4. Receivables Finance
5. Invoice discounting
6. Angel funding
7. Venture capital
8. Personal resources

1.2 History

1.2.1 Introduction to Finance

Finance is a field of study of the relationship of three things; time, risk and money.

The Time Value of Money is one of three fundamental ideas that shape finance.

The Time Value of Money explains why, "A dollar today is worth more than a dollar tomorrow". This is primarily due to the market for loanable funds and inflation. If someone has a dollar today then they also have the opportunity to loan/invest that dollar at some interest rate. Therefore, a dollar today in time t, would be worth $1.00 plus some interest rate, i. That is more than a dollar by itself in the future. An example for inflation would be, let's say you have $1 and you can buy 10 candies today. For the same 10 candies tomorrow you have to pay $1.20. So, due to inflation for the same 10 candies today you pay less than you would pay tomorrow

Inflation refers to the decrease in the purchasing power. Deflation refers to the increase in the purchasing power. In layman terms, inflation causes not the value of money to decrease but the amount of consumables/items that you can now purchase to decline in

quantity. Look at the example above. $1 is still $1 but after inflation the individual can probably buy only 8 candies for the same $1 amount.

There are two values of money. One is the Present Value of Money and the other is the Future Value of Money.

Second is the concept of "opportunity cost"; i.e. if a person deploys his money on one item or investment then he has given up the opportunity to do something else with it.

Third is the concept of risk. Let us say, I have earmarked $10,000 towards investments and I decide that I will invest in Microsoft. I put all my money in Microsoft(MSFT) all $10,000 of it. As on 5th Oct., 2006 each share of Microsoft trades at $27.94. So, I would be able to purchase 357.91 shares of MSFT. My returns are completely dependent on how MSFT stock performs in the market and this means that if a Microsoft product(i.e. Vista), fails in the marketplace, MSFT stock goes tumbling down and reduces my investment in MSFT.

Thus, Risk can be defined as the probability of my investment eroding its own self.

In equity, the risk factor is higher than in debt financing and hence as an investor I look for equity to give me higher returns as I have taken higher risk. If I buy US Treasury notes for that value, the investment is almost risk free as the US Govt. stands to guarantee it and hence the return (typically, expressed as the rate of interest) is low. The difference between the returns from equity and from debt(US Treasury, etc) is the Risk Premium.

Risk Premium is the reward given to an investor to take more risk.

1.2.1.1 Return on Investments

The concept of a return on investment is designed to balance all three perils. In finance there are actually two returns: the **return of investment** and the **return on investment**. If the investment loses money, you may be able to recover a portion of what you risked. A return on investment (hereafter "**ROI**", or "**return**") is the return that finance is primarily concerned with although the other cannot be overlooked. It implies first and foremost a 100% return of investment. In order to do so, the return must therefore

1. replace the buying power lost to inflation,
2. make up for and exceed the losses from other financing activities, and
3. make the investment more attractive to someone than any other option, including spending the money.

Item 3 can be as objective as selecting the best ROI among many or it can be as subjective and personal as whether or not to give up the satisfaction of having dessert every night for a month. Regardless if the investor does not perceive sufficient potential for gain, the money will never change hands.

1.2.1.2 Debt Finance and Equity Finance - The Two Pillars of Modern Finance

Financing activity for most ventures are either **debt financing** or **equity financing**.

Once an investor has decided to engage in financing any business venture or project, he has three concerns to address: risk, protective claim, and return.

These three concerns are essentially hierarchical. The latter two depend on and counterbalance with the first. Higher risk is only attractive when associated with higher returns. The protective claim then acts like a fulcrum to fine tune the balance between risk and return.

1.2.1.2.1 Debt Financing

Debt financing. In this mode money is borrowed, and usually the borrower (debtor) gives the lender (creditor) a promisory note. This, usually, obligated the debtor to pay back a certain defined amount at a particular and defined time in the future.

Forms of debt financing can include credit cards, mortgages, signature loans, bonds, IOUs, and HELOCs (Home Equity Lines of Credit) as examples. Treasury debt, savings bonds, corporate bonds are also forms of debt financing.

With debt financing, the creditor's return is fixed and understandable. It is, quite simply, the agreed upon interest rate for the debt. This rate can vary from a single digit rate to 25% or perhaps even 30% depending on the debtor. Risk is determined by a handful of factors the most significant usually being one's credit history. The protective claim offered to creditors in debt financing is a claim on the debtor's assets. Should the debtor fail to repay, the creditor may forcibly take possession of other debtor property and sell it, using the money to offset the loss of the loan. The claim of creditors takes priority over the claim of those who participate in equity financing.

1.2.1.2.2 Equity Financing

Equity financing is generally considered less certain than debt financing. Equity financing is also typically where non-cash assets such as equipment, skills, and land are invested alongside regular cash. This is the category in which we also find venture capital, shares of stock, angel investors, and more. The terms that are used to describe the equity financing relationship are more varied and, as such, will be simply dubbed equity investors. Later on, more proper names will be provided which, for the time being, are immaterial.

The return of equity financing is the claim on a business's profits; not just today's profits, but in modern companies that issue stock, all future potential profits as well. For this reason, i.e. because most personal finance does not involve the debtor making a profit, almost all of personal finance is debt financing. The exceptions will be noted shortly.

While it's true that in equity financing, the equity investor still has some claim on the business' assets, the creditor's prior claim renders this point moot from a practical standpoint. What protection, then, is offered for equity financing? The claim to management rights. As an equity investor, with a few notable exceptions, you are granted the right to do everything in your personal power along with the other equity investors to make sure that the business goes in a profitable direction.

1.2.1.3 Ratio Analysis

Ratio analysis is one core theme of business finance. To understand the concept of ratio analysis we must know that there are five basic types of ratio analysis.

1. Liquidity Ratio
2. Activity Ratio
3. Debt Ratio
4. Profitability Ratio
5. Markets Ratio.

Now we discuss one by one the impacts of these ratios on the business and their implementation in the business environment.

1.2.1.3.1 Liquidity Ratios

In liquidity ratio analysis there are two types of ratios:

- Current Ratio
- Quick (Acid-Test) Ratio.

Current Ratio

Current Ratio shows how many $1 of current assets are available for paying $1 of current liabilities of the company, firm or organization. As some financial analysts suggests that the more current assets that are available to the company, the better. But in some cases, a high current ratio may indicate too much inventory or too much in prepaid or other current assets. It could also indicate idle cash, and as a result, a poor investment strategy. A current ratio that is high is not as bad as one that is low, however a high current ratio is an indication that financial policies either do not exist or are not being implemented. A low or declining current ratio is always bad. It is an indicator of rising current liabilities and declining current assets. A current ratio of 1 or

less is an indication of insolvency. Further declines in the ratio could trigger collection actions on the part of creditors and send the company into bankruptcy.

Quick (Acid-Test) Ratio

The quick ratio is calculated by dividing cash by current liabilities. This is the true test of a companies ability to pay its debts. A high current ratio and a low quick ratio could indicate too much is invested in inventory or other current assets, assets that are not very liquid and therefore could not be depended on to pay current liabilities. An increase in inventory could be a signal that sales have fallen, production has slowed and management should take action to prevent any damage to the financial condition of the company. Both ratios should be analyzed together to get the correct picture of the companies financial health.

Chapter 2 The Basics

2.1 An Overview on Money

Money is the underlying concept of finance which is an abstract unit form of a resource. Finance studies and addresses the ways in which individuals and organizations raise, allocate, and use monetary resources over time while taking into account risk. Since we are dealing with modern times, these monetary resources refer to money as we know it. Before getting into the principles of finance one must have an understanding of money and its origins.

2.1.1 What is Money?

Money is anything that is generally accepted as payment for goods and services and repayment of debts. Money thus enables payments to be made for purchases and savings. It can come in various forms, such as coins, notes, cheques and credit cards.

2.1.2 Role of a CFO and Finance Managers

Finance manager normally has following functions or areas of responsibilities:

1. Planning function

Chapter 3 Financial Markets and Institutions

3.1 Stock Markets

A **stock market** or **equity market** is a public entity (a loose network of economic transactions, not a physical facility or discrete entity) for the trading of company stock (ares) and derivatives at an agreed price; these are securities listed on a stock exchange as well as those only traded privately.

The size of the world stock market was estimated at about $36.6 trillion at the beginning of October 2008 [1]. The total world derivatives market has been estimated at about $791 trillion face or nominal value [2], 11 times the size of the entire world economy [3]. The value of the derivatives market, because it is stated in terms of notional values, cannot be directly compared to a stock or a fixed income security, which traditionally refers to an actual value. Moreover, the vast majority of derivatives 'cancel' each other out (i.e., a derivative 'bet' on an event occurring is offset by a comparable derivative 'bet' on the event not occurring). Many such relatively illiquid securities are valued as marked to model, rather than an actual market price.

The stocks are listed and traded on stock exchanges which are entities of a corporation or mutual organization specialized in the business of bringing buyers and sellers of the organizations to a listing of stocks and securities together. The largest stock market in the United States, by market capitalization, is the New York Stock Exchange (NYSE). In Canada, the largest stock market is the Toronto Stock Exchange. Major European examples of stock exchanges include the Amsterdam Stock Exchange, London Stock Exchange, Paris Bourse, and the Deutsche Börse (Frankfurt Stock Exchange). In Africa, examples include Nigerian Stock Exchange, JSE Limited, etc. Asian examples include the Singapore Exchange, the Tokyo Stock Exchange, the Hong Kong Stock Exchange, the Shanghai Stock Exchange, and the Bombay Stock Exchange. In Latin America, there are such exchanges as the BM&F Bovespa and the BMV.

Market participants include individual retail investors, institutional investors such as mutual funds, banks, insurance companies and hedge funds, and also publicly traded corporations trading in their own shares. Some studies have suggested that institutional investors and corporations trading in their own shares generally receive higher risk-adjusted returns than retail investors [4].

1. "World Equity Market Declines: -$25.9 Trillion" (http://seekingalpha.com/article/99256-world-equity-market-declines-25_9-trillion). Seeking Alpha. Retrieved 2011-05-31.
2. "Quarterly Review Statistical Annex – December 2008" (http://www.bis.org/publ/qtrpdf/r_qa0812.pdf). Bis.org. September 7, 2008. Retrieved March 5, 2010.
3. "Central Intelligence Agency"(https://www.cia.gov/library/publications/the-world-factbook/rankorder/2001rank.html). Cia.gov. Retrieved 2011-05-31.
4. Amedeo De Cesari, Susanne Espenlaub, Arif Khurshed, and Michael Simkovic, The Effects of Ownership and Stock Liquidity on the Timing of Repurchase Transactions (October 2010) (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1884171). Paolo Baffi Centre Research Paper No. 2011-100.

3.1.1 Trading

Participants in the stock market range from small individual stock investors to large hedge fund traders, who can be based anywhere. Their orders usually end up with a professional at a stock exchange, who executes the order of buying or selling.

Figure 3.1 The London Stock Exchange

Some exchanges are physical locations where transactions are carried out on a trading floor, by a method known as open outcry. This type of auction is used in stock exchanges and commodity exchanges where traders may enter "verbal" bids and offers simultaneously. The other type of stock exchange is a virtual kind, composed of a network of computers where trades are made electronically via traders.

Actual trades are based on an auction market model where a potential buyer bids a specific price for a stock and a potential seller asks a specific price for the stock. (Buying or selling at market means you will accept any ask price or bid price for the stock, respectively.) When the bid and ask prices match, a sale takes place, on a first-come-first-served basis if there are multiple bidders or askers at a given price.

The purpose of a stock exchange is to facilitate the exchange of securities between buyers and sellers, thus providing a marketplace (virtual or real). The exchanges provide real-time trading information on the listed securities, facilitating price discovery.

Figure 3.2 The New York Stock Exchange

The New York Stock Exchange(NYSE) is a physical exchange, also referred to as a listed exchange – only stocks listed with the exchange may be traded, with a hybrid market for placing orders both electronically and manually on the trading floor. Orders executed on the trading floor enter by way of exchange members and flow down to a floor broker, who goes to the floor trading post specialist for that stock to trade the order. The specialist's job is to match buy and sell orders using open outcry. If a spread exists, no trade immediately takes place—in this case the specialist should use his/her own resources (money or stock) to close the difference after his/her judged time. Once a trade has been made the details are reported on the "tape" and sent back to the brokerage firm, which then notifies the investor who placed the order. Although there is a significant amount of human contact in this process, computers play an important role, especially for so-called "program trading".

The NASDAQ is a virtual listed exchange, where all of the trading is done over a computer network. The process is similar to the New York Stock Exchange. However, buyers and sellers are electronically matched. One or more NASDAQ market makers will always provide a bid and ask price at which they will always purchase or sell 'their' stock [5].

The Paris Bourse, now part of Euronext, is an order-driven, electronic stock exchange. It was automated in the late 1980s. Prior to the 1980s, it consisted of an open outcry exchange. Stockbrokers met on the trading floor or the Palais Brongniart. In 1986, the CATS trading system was introduced, and the order matching process was fully automated.

5. "What's the difference between a Nasdaq market maker and a NYSE specialist?" (http://www.investopedia.com/ask/answers/128.asp). Investopedia.com. Retrieved March 5, 2010.

From time to time, active trading (especially in large blocks of securities) have moved away from the 'active' exchanges. Securities firms, led by UBS AG, Goldman Sachs Group Inc. and Credit Suisse Group, already steer 12 percent of U.S. security trades away from the exchanges to their internal systems. That share probably will increase to 18 percent by 2010 as more investment banks bypass the NYSE and NASDAQ and pair buyers and sellers of securities themselves, according to data compiled by Boston-based Aite Group LLC, a brokerage-industry consultant [6].

Now that computers have eliminated the need for trading floors like the Big Board's, the balance of power in equity markets is shifting. By bringing more orders in-house, where clients can move big blocks of stock anonymously, brokers pay the exchanges less in fees and capture a bigger share of the $11 billion a year that institutional investors pay in trading commissions.

3.1.2 Market participants

Market participants include individual retail investors, institutional investors such as mutual funds, banks, insurance companies and hedge funds, and also publicly traded corporations trading in their own shares. Some studies have suggested that institutional investors and corporations trading in their own shares generally receive higher risk-adjusted returns than retail investors [7].

A few decades ago, worldwide, buyers and sellers were individual investors, such as wealthy businessmen, usually with long family histories to particular corporations. Over time, markets have become more "institutionalized"; buyers and sellers are largely institutions (e.g., pension funds, insurance companies, mutual funds, index funds, exchange-traded funds, hedge funds, investor groups, banks and various other financial institutions).

The rise of the institutional investor has brought with it some improvements in market operations. There has been a gradual tendency for "fixed" (and exorbitant) fees being reduced for all investors, partly from falling administration costs but also assisted by large institutions challenging brokers' oligopolistic approach to setting standardised fees.

3.1.3 History

In 12th century France the *courretiers de change* were concerned with managing and regulating the debts of agricultural communities on behalf of the banks. Because these men also traded with debts, they could be called the first brokers. A common

6. Ortega, Edgar (2006-12-04). "UBS, Goldman Threaten NYSE, Nasdaq With Rival Stock Markets". (http://www.bloomberg.com/apps/news?pid=newsarchive&sid=al86iws61SPY&refer=home) Bloomberg.com. Retrieved 2011-05-31.
7. Amedeo De Cesari, Susanne Espenlaub, Arif Khurshed, and Michael Simkovic, The Effects of Ownership and Stock Liquidity on the Timing of Repurchase Transactions (October 2010) (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1884171). Paolo Baffi Centre Research Paper No. 2011-100.

misbelief is that in late 13th century Bruges commodity traders gathered inside the house of a man called Van der Beurze, and in 1309 they became the "Brugse Beurse", institutionalizing what had been, until then, an informal meeting, but actually, the family Van der Beurze had a building in Antwerp where those gatherings occurred [8]; the Van der Beurze had Antwerp, as most of the merchants of that period, as their primary place for trading. The idea quickly spread around Flanders and neighboring counties and "Beurzen" soon opened in Ghent and Amsterdam.

In the middle of the 13th century, Venetian bankers began to trade in government securities. In 1351 the Venetian government outlawed spreading rumors intended to lower the price of government funds. Bankers in Pisa, Verona, Genoa and Florence also began trading in government securities during the 14th century. This was only possible because these were independent city states not ruled by a duke but a council of influential citizens. Italian companies were also the first to issue shares. Companies in England and the Low Countries followed in the 16th century. The Dutch East India Company (founded in 1602) was the first joint-stock company to get a fixed capital stock and as a result, continuous trade in company stock emerged on the Amsterdam Exchange. Soon thereafter, a lively trade in various derivatives, among which options and repos, emerged on the Amsterdam market. Dutch traders also pioneered short selling - a practice which was banned by the Dutch authorities as early as 1610 [9].

8. "16de eeuwse traditionele bak- en zandsteenarchitectuur Oude Beurs Antwerpen 1 (centrum) / Antwerp foto". (http://www.belgiumview.com/belgiumview/tl1/view0002205.php4) Belgiumview.com. Retrieved March 5, 2010.
9. "PhD thesis 'The world's first stock exchange'". (http://www.lodewijkpetram.nl/index-eng.html) Retrieved 2011-10-01.

Figure 3.3 Established in 1875, the Bombay Stock Exchange is Asia's first stock exchange

There are now stock markets in virtually every developed and most developing economies, with the world's largest markets being in the United States, United Kingdom, Japan, India, China, Canada, Germany (Frankfurt Stock Exchange), France, South Korea and the Netherlands [10].

10. "World Federation of Exchanges Monthly YTD Data". (http://world-exchanges.org/statistics/ytd-monthly) World-exchanges.org. Retrieved 2011-05-31.

3.1.4 Importance of stock market

3.1.4.1 Function and purpose

The **stock market** is one of the most important sources for companies to raise money. This allows businesses to be publicly traded, or raise additional financial capital for expansion by selling shares of ownership of the company in a public market. The liquidity that an exchange affords the investors gives them the ability to quickly and easily sell securities. This is an attractive feature of investing in stocks, compared to other less liquid investments such as real estate. Some companies actively increase liquidity by trading in their own shares [11], [12].

History has shown that the price of shares and other assets is an important part of the dynamics of economic activity, and can influence or be an indicator of social mood. An economy where the stock market is on the rise is considered to be an up-and-coming economy. In fact, the stock market is often considered the primary indicator of a country's economic strength and development.

Rising share prices, for instance, tend to be associated with increased business investment and vice versa. Share prices also affect the wealth of households and their consumption. Therefore, central banks tend to keep an eye on the control and behavior of the stock market and, in general, on the smooth operation of financial system functions. Financial stability is the raison d'être of central banks.

Exchanges also act as the clearinghouse for each transaction, meaning that they collect and deliver the shares, and guarantee payment to the seller of a security. This eliminates the risk to an individual buyer or seller that the counterparty could default on the transaction.

The smooth functioning of all these activities facilitates economic growth in that lower costs and enterprise risks promote the production of goods and services as well as possibly employment. In this way the financial system is assumed to contribute to increased prosperity.

11. Cesari, Amedeo De; Espenlaub, Susanne; Khurshed, Arif; Simkovic, Michael (2010). "The Effects of Ownership and Stock Liquidity on the Timing of Repurchase Transactions". Paolo Baffi Centre Research Paper No. 2011-100.
12. Simkovic, Michael (2009). "The Effect of Enhanced Disclosure on Open Market Stock Repurchases". Berkeley Business Law Journal 6 (1).

Figure 3.4 The main trading room of the Tokyo Stock Exchange,where trading is currently completed through computers.

3.1.4.2 Relation of the stock market to the modern financial system

The financial system in most western countries has undergone a remarkable transformation. One feature of this development is disintermediation. A portion of the funds involved in saving and financing, flows directly to the financial markets instead of being routed via the traditional bank lending and deposit operations. The general

public interest in investing in the stock market, either directly or through mutual funds, has been an important component of this process.

Statistics show that in recent decades shares have made up an increasingly large proportion of households' financial assets in many countries. In the 1970s, in Sweden, deposit accounts and other very liquid assets with little risk made up almost 60 percent of households' financial wealth, compared to less than 20 percent in the 2000s. The major part of this adjustment is that financial portfolios have gone directly to shares but a good deal now takes the form of various kinds of institutional investment for groups of individuals, e.g., pension funds, mutual funds, hedge funds, insurance investment of premiums, etc.

The trend towards forms of saving with a higher risk has been accentuated by new rules for most funds and insurance, permitting a higher proportion of shares to bonds. Similar tendencies are to be found in other industrialized countries. In all developed economic systems, such as the European Union, the United States, Japan and other developed nations, the trend has been the same: saving has moved away from traditional (government insured) bank deposits to more risky securities of one sort or another

3.1.4.3 United States S&P stock market returns

(assumes 2% annual dividend)

Years to December 30 2011	Average Annual Return %	Average Compounded Annual Return %
1	2.0	2.0
3	14.3	8.1
5	2.3	4.4
10	5.1	3.9
15	7.7	3.6
20	9.6	4.6
30	11.7	6.2
40	10.2	7.0
50	9.3	7.3
60	10.5	7.5

13

13. "No. HS-38. Stock Prices and Yields: 1900 to 2002" (PDF). (http://www.census.gov/statab/hist/HS-38.pdf) Retrieved 2011-05-31.

3.1.4.4 The behavior of the stock market

From experience we know that investors may 'temporarily' move financial prices away from their long term aggregate price 'trends'. (Positive or up trends are referred to as bull markets; negative or down trends are referred to as bear markets.) Over-reactions may occur—so that excessive optimism (euphoria) may drive prices unduly high or excessive pessimism may drive prices unduly low. Economists continue to debate whether financial markets are 'generally' efficient.

According to one interpretation of the efficient-market hypothesis (EMH), only changes in fundamental factors, such as the outlook for margins, profits or dividends, ought to affect share prices beyond the short term, where random 'noise' in the system may prevail. (But this largely theoretic academic viewpoint—known as 'hard' EMH—also predicts that little or no trading should take place, contrary to fact, since prices are already at or near equilibrium, having priced in all public knowledge.) The 'hard' efficient-market hypothesis is sorely tested by such events as the stock market crash in 1987, when the Dow Jones index plummeted 22.6 percent—the largest-ever one-day fall in the United States [14].

14. Cutler, D. Poterba, J. & Summers, L. (1991). "Speculative dynamics". Review of Economic Studies 58: 520–546.

Figure 3.5 NASDAQ in Times Square, New York City

This event demonstrated that share prices can fall dramatically even though, to this day, it is impossible to fix a generally agreed upon definite cause: a thorough search failed to detect any 'reasonable' development that might have accounted for the crash. (But note that such events are predicted to occur strictly by chance, although very rarely.) It seems also to be the case more generally that many price movements (beyond that which are predicted to occur 'randomly') are not occasioned by new

information; a study of the fifty largest one-day share price movements in the United States in the post-war period seems to confirm this [15].

However, a 'soft' EMH has emerged which does not require that prices remain at or near equilibrium, but only that market participants not be able to systematically profit from any momentary market 'inefficiencies'. Moreover, while EMH predicts that all price movement (in the absence of change in fundamental information) is random (i.e., non-trending), many studies have shown a marked tendency for the stock market to trend over time periods of weeks or longer. Various explanations for such large and apparently non-random price movements have been promulgated. For instance, some research has shown that changes in estimated risk, and the use of certain strategies, such as stop-loss limits and Value at Risk limits, *theoretically could* cause financial markets to overreact. But the best explanation seems to be that the distribution of stock market prices is non-Gaussian (in which case EMH, in any of its current forms, would not be strictly applicable) [16], [17].

Other research has shown that psychological factors may result in exaggerated (statistically anomalous) stock price movements (contrary to EMH which assumes such behaviors 'cancel out'). Psychological research has demonstrated that people are predisposed to 'seeing' patterns, and often will perceive a pattern in what is, in fact, just *noise*. (Something like seeing familiar shapes in clouds or ink blots.) In the present context this means that a succession of good news items about a company may lead investors to overreact positively (unjustifiably driving the price up). A period of good returns also boosts the investor's self-confidence, reducing his (psychological) risk threshold [18].

Another phenomenon—also from psychology—that works against an objective assessment is groupthink. As social animals, it is not easy to stick to an opinion that differs markedly from that of a majority of the group. An example with which one may be familiar is the reluctance to enter a restaurant that is empty; people generally prefer to have their opinion validated by those of others in the group.

In one paper the authors draw an analogy with gambling [19]. In normal times the market behaves like a game of roulette; the probabilities are known and largely independent of the investment decisions of the different players. In times of market stress, however, the game becomes more like poker (herding behavior takes over). The players now must give heavy weight to the psychology of other investors and how they are likely to react psychologically.

The stock market, as with any other business, is quite unforgiving of amateurs. Inexperienced investors rarely get the assistance and support they need. In the period running up to the 1987 crash, less than 1 percent of the analyst's recommendations had been to sell (and even during the 2000–2002 bear market, the average did not rise above 5 %). In the run up to 2000, the media amplified the general euphoria, with

15. Cutler, D. Poterba, J. & Summers, L. (1991). "Speculative dynamics". Review of Economic Studies 58: 520–546.
16. Mandelbrot, Benoit & Hudson, Richard L. (2006). The Misbehavior of Markets: A Fractal View of Financial Turbulence, annot. ed.. Basic Books. ISBN 0-465-04357-7.
17. Taleb, Nassim Nicholas (2008). Fooled by Randomness: The Hidden Role of Chance in Life and in the Markets, 2nd ed.. Random House. ISBN 1-4000-6793-6.
18. Tversky, A. & Kahneman, D. (1974). "Judgement under uncertainty: heuristics and biases". Science 185 (4157): 1124–1131. doi:10.1126/science.185.4157.1124. PMID 17835457.
19. Morris, Stephen; Shin, Hyun Song (1999). "Risk management with interdependent choice". Oxford Review of Economic Policy 15 (3): 52–62. doi:10.1093/oxrep/15.3.52.

reports of rapidly rising share prices and the notion that large sums of money could be quickly earned in the so-called new economy stock market. (And later amplified the gloom which descended during the 2000–2002 bear market, so that by summer of 2002, predictions of a DOW average below 5000 were quite common.)

3.1.4.5 Irrational behavior

Sometimes, the market seems to react irrationally to economic or financial news, even if that news is likely to have no real effect on the fundamental value of securities itself. But, this may be more apparent than real, since often such news has been anticipated, and a counterreaction may occur if the news is better (or worse) than expected. Therefore, the stock market may be swayed in either direction by press releases, rumors, euphoria and mass panic; but generally only briefly, as more experienced investors (especially the hedge funds) quickly rally to take advantage of even the slightest, momentary hysteria.

Over the short-term, stocks and other securities can be battered or buoyed by any number of fast market-changing events, making the stock market behavior difficult to predict. Emotions can drive prices up and down, people are generally not as rational as they think, and the reasons for buying and selling are generally obscure. Behaviorists argue that investors often behave 'irrationally' when making investment decisions thereby incorrectly pricing securities, which causes market inefficiencies, which, in turn, are opportunities to make money [20]. However, the whole notion of EMH is that these non-rational reactions to information cancel out, leaving the prices of stocks rationally determined.

The Dow Jones Industrial Average biggest gain in one day was 936.42 points or 11 percent, this occurred on October 13, 2008 [21].

3.1.4.6 Crashes

A stock market crash is often defined as a sharp dip in share prices of equities listed on the stock exchanges. In parallel with various economic factors, a reason for stock market crashes is also due to panic and investing public's loss of confidence. Often, stock market crashes end speculative economic bubbles.

There have been famous stock market crashes that have ended in the loss of billions of dollars and wealth destruction on a massive scale. An increasing number of people are involved in the stock market, especially since the social security and retirement plans are being increasingly privatized and linked to stocks and bonds and other elements of the market. There have been a number of famous stock market crashes

20. Sergey Perminov, Trendocracy and Stock Market Manipulations (2008, ISBN 978-1-4357-5244-3).
21. "News Headlines". Cnbc.com. October 13, 2008. Retrieved March 5, 2010.

like the Wall Street Crash of 1929, the stock market crash of 1973–4, the Black Monday crash of 1987, the Dot-com bubble of 2000, and the Stock Market Crash of 2008.

One of the most famous stock market crashes started October 24, 1929 on Black Thursday. The Dow Jones Industrial lost 50 % during this stock market crash. It was the beginning of the Great Depression. Another famous crash took place on October 19, 1987 – Black Monday. The crash began in Hong Kong and quickly spread around the world.

By the end of October, stock markets in Hong Kong had fallen 45.5 %%, Australia 41.8 %%, Spain 31 %%, the United Kingdom 26.4 %%, the United States 22.68 %%, and Canada 22.5 %%. Black Monday itself was the largest one-day percentage decline in stock market history – the Dow Jones fell by 22.6 %% in a day. The names “Black Monday” and “Black Tuesday” are also used for October 28–29, 1929, which followed Terrible Thursday—the starting day of the stock market crash in 1929.

The crash in 1987 raised some puzzles-–main news and events did not predict the catastrophe and visible reasons for the collapse were not identified. This event raised questions about many important assumptions of modern economics, namely, the theory of rational human conduct, the theory of market equilibrium and the efficient-market hypothesis. For some time after the crash, trading in stock exchanges worldwide was halted, since the exchange computers did not perform well owing to enormous quantity of trades being received at one time. This halt in trading allowed the Federal Reserve system and central banks of other countries to take measures to control the spreading of worldwide financial crisis. In the United States the SEC introduced several new measures of control into the stock market in an attempt to prevent a re-occurrence of the events of Black Monday.

Since the early 1990's, many of the largest exchanges have adopted electronic 'matching engines' to bring together buyers and sellers, replacing the open outcry system. Electronic trading now accounts for the majority of trading in many developed countries. Computer systems were upgraded in the stock exchanges to handle larger trading volumes in a more accurate and controlled manner. The SEC modified the margin requirements in an attempt to lower the volatility of common stocks, stock options and the futures market. The New York Stock Exchange and the Chicago Mercantile Exchange introduced the concept of a circuit breaker. The circuit breaker halts trading if the Dow declines a prescribed number of points for a prescribed amount of time. In February 2012, the Investment Industry Regulatory Organization of Canada (IIROC) introduced single-stock circuit breakers [22].

- New York Stock Exchange (NYSE) circuit breakers [23]

22. Completing the Circuit: Canadian Regulation, (http://fixglobal.com/content/completing-circuit-canadian-regulation) FIXGlobal, February 2012
23. Chris Farrell. "Where are the circuit breakers". (http://www.marketplace.org/topics/your-money/getting-personal/where-are-stock-market-circuit-breakers) Retrieved October 16, 2008.

% drop	time of drop	close trading for
10	before 2 pm	one hour halt
10	2 pm – 2:30 pm	half-hour halt
10	after 2:30 pm	market stays open
20	before 1 pm	halt for two hours
20	1 pm – 2 pm	halt for one hour
20	after 2 pm	close for the day
30	any time during day	close for the day

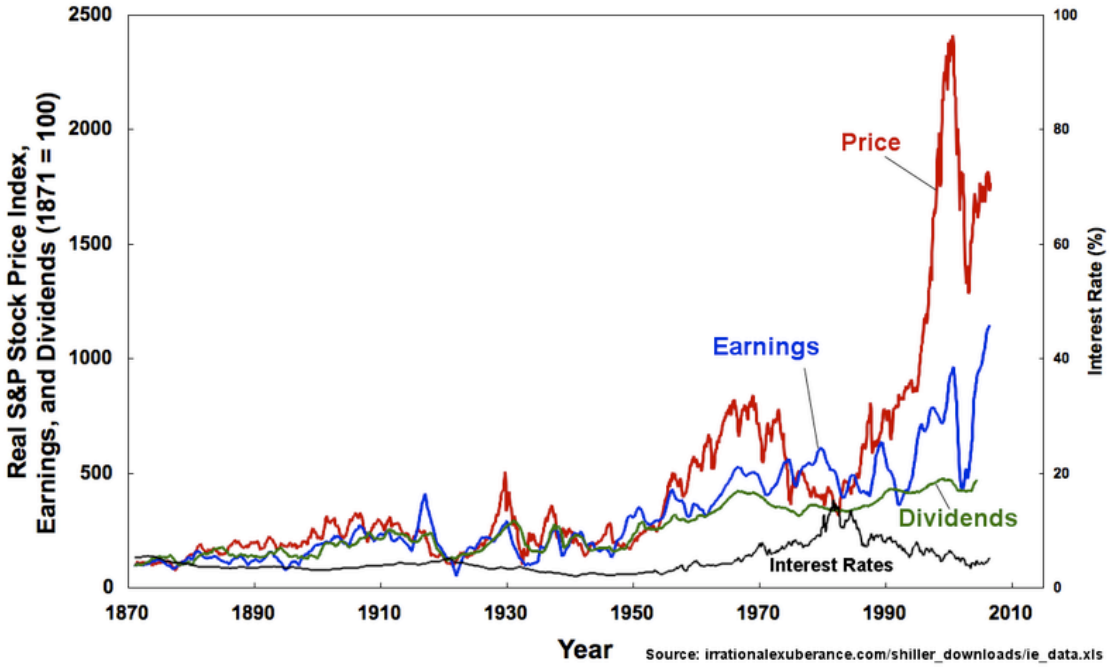

Figure 3.6

Robert Shiller's plot of the S&P Composite Real Price Index, Earnings, Dividends, and Interest Rates, from Irrational Exuberance, 2d ed. [24] In the preface to this edition, Shiller warns, "The stock market has not come down to historical levels: the price-earnings ratio as I define it in this book is still, at this writing [2005], in the mid-20s, far higher than the historical average... People still place too much confidence in the markets and have too strong a belief that paying attention to the gyrations in their investments will someday make them rich, and so they do not make conservative preparations for possible bad outcomes."

24. Shiller, Robert (2005). Irrational Exuberance (2d ed.). Princeton University Press. ISBN 0-691-12335-7.

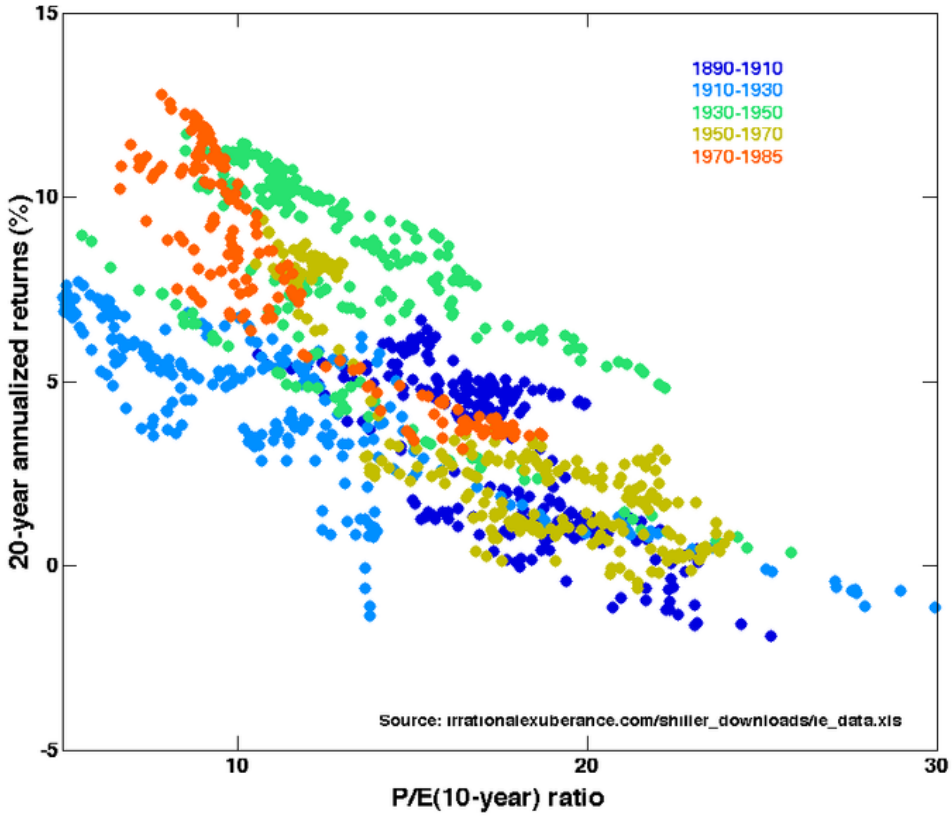

Figure 3.7

Price-Earnings ratios as a predictor of twenty-year returns based upon the plot by Robert Shiller (Figure 10.1, [25] source). The horizontal axis shows the real price-earnings ratio of the S&P Composite Stock Price Index as computed in Irrational Exuberance (inflation adjusted price divided by the prior ten-year mean of inflation-adjusted earnings). The vertical axis shows the geometric average real annual return on investing in the S&P Composite Stock Price Index, reinvesting dividends, and selling twenty years later. Data from different twenty year periods is color-coded as shown in the key. See also ten-year returns. Shiller states that this plot "confirms that long-term investors—investors who commit their money to an investment for ten full years—did do well when prices were low relative to earnings at the beginning of the ten years. Long-term investors would be well advised, individually, to lower their exposure to the stock market when it is high, as it has been recently, and get into the market when it is low." [26]

3.1.5 Stock market index

The movements of the prices in a market or section of a market are captured in price indices called stock market indices, of which there are many, e.g., the S&P, the FTSE and the Euronext indices. Such indices are usually market capitalization weighted, with the weights reflecting the contribution of the stock to the index. The constituents of the index are reviewed frequently to include/exclude stocks in order to reflect the changing business environment.

25. Shiller, Robert (2005). Irrational Exuberance (2d ed.). Princeton University Press. ISBN 0-691-12335-7.
26. Shiller, Robert (2005). Irrational Exuberance (2d ed.). Princeton University Press. ISBN 0-691-12335-7.

3.1.6 Derivative instruments

Financial innovation has brought many new financial instruments whose pay-offs or values depend on the prices of stocks. Some examples are exchange-traded funds (ETFs), stock index and stock options, equity swaps, single-stock futures, and stock index futures. These last two may be traded on futures exchanges (which are distinct from stock exchanges—their history traces back to commodities futures exchanges), or traded over-the-counter. As all of these products are only derived from stocks, they are sometimes considered to be traded in a (hypothetical) derivatives market, rather than the (hypothetical) stock market.

3.1.7 Leveraged strategies

Stock that a trader does not actually own may be traded using short selling; margin buying may be used to purchase stock with borrowed funds; or, derivatives may be used to control large blocks of stocks for a much smaller amount of money than would be required by outright purchase or sales.

3.1.7.1 Short selling

In short selling, the trader borrows stock (usually from his brokerage which holds its clients' shares or its own shares on account to lend to short sellers) then sells it on the market, hoping for the price to fall. The trader eventually buys back the stock, making money if the price fell in the meantime and losing money if it rose. Exiting a short position by buying back the stock is called "covering a short position." This strategy may also be used by unscrupulous traders in illiquid or thinly traded markets to artificially lower the price of a stock. Hence most markets either prevent short selling or place restrictions on when and how a short sale can occur. The practice of naked shorting is illegal in most (but not all) stock markets.

3.1.7.2 Margin buying

In margin buying, the trader borrows money (at interest) to buy a stock and hopes for it to rise. Most industrialized countries have regulations that require that if the borrowing is based on collateral from other stocks the trader owns outright, it can be a maximum of a certain percentage of those other stocks' value. In the United States, the margin requirements have been 50 % for many years (that is, if you want to make

a $1000 investment, you need to put up $500, and there is often a maintenance margin below the $500).

A margin call is made if the total value of the investor's account cannot support the loss of the trade. (Upon a decline in the value of the margined securities additional funds may be required to maintain the account's equity, and with or without notice the margined security or any others within the account may be sold by the brokerage to protect its loan position. The investor is responsible for any shortfall following such forced sales.)

Regulation of margin requirements (by the Federal Reserve) was implemented after the Crash of 1929. Before that, speculators typically only needed to put up as little as 10 percent (or even less) of the total investment represented by the stocks purchased. Other rules may include the prohibition of free-riding: putting in an order to buy stocks without paying initially (there is normally a three-day grace period for delivery of the stock), but then selling them (before the three-days are up) and using part of the proceeds to make the original payment (assuming that the value of the stocks has not declined in the interim).

3.1.8 New issuance

Global issuance of equity and equity-related instruments totaled $505 billion in 2004, a 29.8 % increase over the $389 billion raised in 2003. Initial public offerings (IPOs) by US issuers increased 221 % with 233 offerings that raised $45 billion, and IPOs in Europe, Middle East and Africa (EMEA) increased by 333 %, from $ 9 billion to $39 billion.

3.1.9 Investment strategies

One of the many things people always want to know about the stock market is, "How do I make money investing?" There are many different approaches; two basic methods are classified by either fundamental analysis or technical analysis. Fundamental analysis refers to analyzing companies by their financial statements found in SEC Filings, business trends, general economic conditions, etc. Technical analysis studies price actions in markets through the use of charts and quantitative techniques to attempt to forecast price trends regardless of the company's financial prospects. One example of a technical strategy is the Trend following method, used by John W. Henry and Ed Seykota, which uses price patterns, utilizes strict money management and is also rooted in risk control and diversification.

Additionally, many choose to invest via the index method. In this method, one holds a weighted or unweighted portfolio consisting of the entire stock market or some segment of the stock market (such as the S&P 500 or Wilshire 5000). The principal aim of this strategy is to maximize diversification, minimize taxes from too frequent

trading, and ride the general trend of the stock market (which, in the U.S., has averaged nearly 10 % per year, compounded annually, since World War II).

3.1.10 Taxation

According to much national or state legislation, a large array of fiscal obligations are taxed for capital gains. Taxes are charged by the state over the transactions, dividends and capital gains on the stock market, in particular in the stock exchanges. However, these fiscal obligations may vary from jurisdictions to jurisdictions because, among other reasons, it could be assumed that taxation is already incorporated into the stock price through the different taxes companies pay to the state, or that tax free stock market operations are useful to boost economic growth.

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21. Shiller, Robert (2005). Irrational Exuberance (2d ed.). Princeton University Press. ISBN 0-691-12335-7.
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3.2 Bond Markets

The **bond market** (also known as the **credit**, or **fixed income market**) is a financial market where participants can issue new debt, known as the primary market, or buy and sell debt securities, known as the Secondary market, usually in the form of bonds. The primary goal of the bond market is to provide a mechanism for long term funding of public and private expenditures. Traditionally, the bond market was largely dominated by the United States, but today the US is about 44% of the market [27]. As of 2009, the size of the worldwide bond market (total debt outstanding) is an estimated $82.2 trillion [28], of which the size of the outstanding U.S. bond market debt was $31.2 trillion according to Bank for International Settlements (BIS), or alternatively $35.2 trillion as of Q2 2011 according to Securities Industry and Financial Markets Association (SIFMA) [29].

27. http://www.investinginbondseurope.org/Pages/LearnAboutBonds.aspx?folder_id=464
28. Outstanding World Bond Market Debt (http://www.aametrics.com/pdfs/world_stock_and_bond_markets_nov2009.pdf) from the Bank for International Settlements via Asset Allocation Advisor. Original BIS data as of March 31, 2009; Asset Allocation Advisor compilation as of November 15, 2009. Accessed January 7, 2010.
29. Outstanding World Bond Market Debt (http://www.aametrics.com/pdfs/world_stock_and_bond_markets_nov2009.pdf) from the Bank for International Settlements via Asset Allocation Advisor. Original BIS data as of March 31, 2009; Asset Allocation Advisor compilation as of November 15, 2009. Accessed January 7, 2010.

Nearly all of the $822 billion average daily trading volume in the U.S. bond market [30] takes place between broker-dealers and large institutions in a decentralized, over-the-counter (OTC) market. However, a small number of bonds, primarily corporate, are listed on exchanges.

References to the "bond market" usually refer to the government bond market, because of its size, liquidity, relative lack of credit risk and, therefore, sensitivity to interest rates. Because of the inverse relationship between bond valuation and interest rates, the bond market is often used to indicate changes in interest rates or the shape of the yield curve. The yield curve is the measure of "cost of funding".

3.2.1 Types of bond markets

The Securities Industry and Financial Markets Association (SIFMA) classifies the broader bond market into five specific bond markets.

- Corporate
- Government & agency
- Municipal
- Mortgage backed, asset backed, and collateralized debt obligation
- Funding

3.2.2 Bond market participants

Bond market participants are similar to participants in most financial markets and are essentially either buyers (debt issuer) of funds or sellers (institution) of funds and often both.

Participants include:

- Institutional investors
- Governments
- Traders
- Individuals

Because of the specificity of individual bond issues, and the lack of liquidity in many smaller issues, the majority of outstanding bonds are held by institutions like pension funds, banks and mutual funds. In the United States, approximately 10% of the market is currently held by private individuals.

30. Avg Daily Trading Volume (http://www.sifma.org/uploadedFiles/Research/Statistics/SIFMA_USBondMarketTradingVolume.pdf) SIFMA 2009 Jan-Nov Average Daily Trading Volume. Accessed January 6, 2010.

3.2.3 Bond market size

Amounts outstanding on the global bond market increased by 5% in 2010 to a record $95 trillion. Domestic bonds accounted for 70% of the total and international bonds for the remainder. The US was the largest market with 39% of the total followed by Japan (20%). As a proportion of global GDP, the bond market increased to 130% in 2010 from 119% in 2008 and 80% a decade earlier. The considerable growth means that at the end of 2010 it was much larger than the global equity market which had a market capitalisation of around $55 trillion. Growth of the market since the start of the economic slowdown was largely a result of an increase in issuance by governments, with government bonds accounting for 43% of the value outstanding at the end of 2010, up from 39% a year earlier.

The outstanding value of international bonds increased by 3% in 2010 to $28 trillion. The $1.5 trillion issued during the year was down 35% on the 2009 total. The first quarter of 2011 was off to a strong start with issuance of nearly $500bn. The US was the leading centre in terms of value outstanding with 24% of the total followed by the UK 13% [31].

3.2.3.1 U.S. bond market size

According to the Securities Industry and Financial Markets Association (SIFMA) [32], as of Q2 2011, the U. S. bond market size is (in trillions of dollars)

Category	Amount	Percentage
Government	9.2	28
Municipal	2.9	9
Agency	2.4	7
Corporate	7.7	24
Mortgage related	8.3	26
Asset Backed	1.9	6
Total	32.3	100

Note that the total Federal Government debts recognized by SIFMA are significantly less than the total bills, notes and bonds issued by the U. S. Treasury Department [33], of some 14.4 trillion dollars at the time. This figure is likely to have excluded the inter-

31. [1] (http://www.thecityuk.com/assets/Uploads/BondMarkets2011.pdf) Bond Markets 2011 report
32. [2] (http://www.sifma.org/research/statistics.aspx) SIFMA Statistics
33. [3](http://www.fms.treas.gov/bulletin/index.html) Treasury Bulletin

governmental debts such as those held by the Federal Reserve and the Social Security Trust.

3.2.4 Bond market volatility

For market participants who own a bond, collect the coupon and hold it to maturity, market volatility is irrelevant; principal and interest are received according to a pre-determined schedule.

But participants who buy and sell bonds before maturity are exposed to many risks, most importantly changes in interest rates. When interest rates increase, the value of existing bonds falls, since new issues pay a higher yield. Likewise, when interest rates decrease, the value of existing bonds rises, since new issues pay a lower yield. This is the fundamental concept of bond market volatility: changes in bond prices are inverse to changes in interest rates. Fluctuating interest rates are part of a country's monetary policy and bond market volatility is a response to expected monetary policy and economic changes.

Economists' views of economic indicators versus actual released data contribute to market volatility. A tight consensus is generally reflected in bond prices and there is little price movement in the market after the release of "in-line" data. If the economic release differs from the consensus view the market usually undergoes rapid price movement as participants interpret the data. Uncertainty (as measured by a wide consensus) generally brings more volatility before and after an economic release. Economic releases vary in importance and impact depending on where the economy is in the business cycle.

3.2.5 Bond market influence

Bond markets determine the price in terms of yield that a borrower must pay in order to receive funding. In one notable instance, when President Clinton attempted to increase the US budget deficit in the 1990s, it led to such a sell-off (decreasing prices; increasing yields) that he was forced to abandon the strategy and instead balance the budget [34], [35].

“ I used to think that if there was reincarnation, I wanted to come back as the president or the pope or as a .400 baseball hitter. But now I would like to come back as the bond market. You can intimidate everybody. ”

— James Carville, political advisor to President Clinton, Bloomberg [36]

34. M&G Investments - Bond Vigilantes - Are the bond vigilantes vigilant enough? (http://www.bondvigilantes.co.uk/blog/2009/02/20/1235143740000.html), 20 February 2009
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3.2.6 Bond investments

Investment companies allow individual investors the ability to participate in the bond markets through bond funds, closed-end funds and unit-investment trusts. In 2006 total bond fund net inflows increased 97% from $30.8 billion in 2005 to $60.8 billion in 2006 [37]. Exchange-traded funds (ETFs) are another alternative to trading or investing directly in a bond issue. These securities allow individual investors the ability to overcome large initial and incremental trading sizes [38].

3.2.7 Bond indices

A number of bond indices exist for the purposes of managing portfolios and measuring performance, similar to the S&P 500 or Russell Indexes for stocks. The most common American benchmarks are the Barclays Capital Aggregate Bond Index, Citigroup BIG and Merrill Lynch Domestic Master. Most indices are parts of families of broader indices that can be used to measure global bond portfolios, or may be further subdivided by maturity and/or sector for managing specialized portfolios.

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3.3 Money Markets

As money became a commodity, the **money market** became a component of the financial markets for assets involved in short-term borrowing, lending, buying and selling with original maturities of one year or less. Trading in the money markets is done over the counter, is wholesale. Various instruments like Treasury bills, commercial paper, bankers' acceptances, deposit deposits, certificates of deposit, bills of exchange, repurchase agreements, federal funds, and short-lived mortgage-backed security|mortgage- and asset-backed securities do exist [39]. It provides market liquidity funding for the global financial system. Money markets and capital markets are parts of financial markets. The instruments bear differing maturities, currencies, credit risks, and structure. Therefore they may be used to distribute the exposure [40].

3.3.1 History

The money market developed because parties had surplus funds, while others needed cash [41], [42].Today it comprises cash instruments as well.

3.3.2 Participants

The money market consists of financial institutions and dealers in money or credit who wish to either borrow or lend. Participants borrow and lend for short periods of time, typically up to thirteen months. Money market trades in short-term financial instruments commonly called "paper." This contrasts with the capital market for longer-term funding, which is supplied by Bond (finance)|bonds and stock|equity.

The core of the money market consists of interbank lending--banks borrowing and lending to each other using commercial paper, repurchase agreements and similar instruments. These instruments are often benchmarked to (i.e. priced by reference to) the London Interbank Offered Rate (LIBOR) for the appropriate term and currency.

Finance companies typically fund themselves by issuing large amounts of asset-backed commercial paper (ABCP) which is secured by the pledge of eligible assets into an ABCP conduit. Examples of eligible assets include auto loans, credit card receivables, residential/commercial mortgage loans, mortgage-backed

39. Frank J. Fabozzi, Steve V. Mann, Moorad Choudhry, The Global Money Markets, Wiley Finance, Wiley & Sons (2002), ISBN 0-471-22093-0
40. Money Market, (http://www.investopedia.com/university/moneymarket/), Investopedia.
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42. Bill of Exchange, (http://en.wikisource.org/wiki/1911_Encyclop%C3%A6dia_Britannica/Bill_of_Exchange), Encyclopædia Britannica, 1911.

security|mortgage-backed securities and similar financial assets. Certain large corporations with strong credit ratings, such as General Electric, issue commercial paper on their own credit. Other large corporations arrange for banks to issue commercial paper on their behalf via commercial paper lines.

In the United States, federal, state and local governments all issue paper to meet funding needs. States and local governments issue municipal bond|municipal paper, while the US Treasury issues Treasury bills to fund the US public debt.

- Trading companies often purchase bankers' acceptances to be tendered for payment to overseas suppliers.
- Retail and institutional money market funds
- Banks
- Central banks
- Cash management programs
- Merchant Banks

3.3.3 Functions of the money market

The money market functions are [43], [44]:

- transfer of large sums of money
- transfer from parties with surplus funds to parties with a deficit
- allow governments to raise funds
- help to implement monetary policy
- determine short-term interest rates

3.3.4 Common money market instruments

- Certificate of deposit - Time deposit, commonly offered to consumers by banks, thrift institutions, and credit unions.
- Repurchase agreements - Short-term loans—normally for less than two weeks and frequently for one day—arranged by selling securities to an investor with an agreement to repurchase them at a fixed price on a fixed date.
- Commercial paper - Unsecured promissory notes with a fixed maturity of one to 270 days; usually sold at a discount from face value.
- Eurodollar deposit - Deposits made in U.S. dollars at a bank or bank branch located outside the United States.
- Federal agency short-term securities - (in the U.S.). Short-term securities issued by government sponsored enterprises such as the Farm Credit System, the Federal Home Loan Banks and the Federal National Mortgage Association.

43. Money Market and Money Market Instruments (http://www.caalley.com/art/Money_Market_and_Money_Market_Instruments.pdf)
44. Functions and importance of Money Market (http://www.preservearticles.com/201012281812/functions-and-importance-of-money-market.html)

- Federal funds - (in the U.S.). Interest-bearing deposits held by banks and other depository institutions at the Federal Reserve; these are immediately available funds that institutions borrow or lend, usually on an overnight basis. They are lent for the federal funds rate.
- Municipal notes - (in the U.S.). Short-term notes issued by municipalities in anticipation of tax receipts or other revenues.
- Treasury bills - Short-term debt obligations of a national government that are issued to mature in three to twelve months.
- Money funds - Pooled short maturity, high quality investments which buy money market securities on behalf of retail or institutional investors.
- Foreign Exchange Swaps - Exchanging a set of currencies in spot date and the reversal of the exchange of currencies at a predetermined time in the future.
- Short-lived mortgage-backed security mortgage- and asset-backed securities

3.3.5 Discount and accrual instruments

There are two types of instruments in the fixed income market that pay the interest at maturity, instead of paying it as coupons. **Discount instruments**, like repurchase agreements, are issued at a discount of the face value, and their maturity value is the face value. **Accrual instruments** are issued at the face value and mature at the face value plus interest [45].

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45. Discount Instrument, (http://www.riskglossary.com/link/discount_instrument.htm), riskglossary.com, accessed 2012-05-14.

3.4 Derivatives Markets

The **derivatives market** is the financial market for derivatives, financial instruments like futures contracts or options, which are derived from other forms of assets.

The market can be divided into two, that for exchange-traded derivatives and that for over-the-counter derivatives. The legal nature of these products is very different as well as the way they are traded, though many market participants are active in both.

3.4.1 Futures markets

Futures exchanges, such as Euronext.liffe and the Chicago Mercantile Exchange, trade in standardized derivative contracts. These are options contracts and futures contracts on a whole range of underlying products. The members of the exchange hold positions in these contracts with the exchange, who acts as central counterparty. When one party goes long (buys a futures contract), another goes short (sells). When a new contract is introduced, the total position in the contract is zero. Therefore, the sum of all the long positions must be equal to the sum of all the short positions. In other words, risk is transferred from one party to another. The total notional amount of all the outstanding positions at the end of June 2004 stood at $53 trillion [46]. That figure grew to $81 trillion by the end of March 2008 [47]

3.4.2 Over-the-counter markets

Tailor-made derivatives, not traded on a futures exchange are traded on **over-the-counter markets**, also known as the OTC market. These consist of investment banks who have traders who make markets in these derivatives, and clients such as hedge funds, commercial banks, government sponsored enterprises, etc. Products that are always traded over-the-counter are swaps, forward rate agreements, forward contracts, credit derivatives, accumulators etc. The total notional amount of all the outstanding positions at the end of June 2004 stood at $220 trillion [48]. By the end of 2007 this figure had risen to $596 trillion and in 2009 it stood at $615 trillion [49].

46. Bank for International Settlements (BIS) (http://www.bis.org/publ/regpubl.htm)
47. Bank for International Settlements (BIS) (http://www.bis.org/publ/qtrpdf/r_qa0806.pdf#page=108)
48. Bank for International Settlements (BIS) (http://www.bis.org/publ/regpubl.htm)
49. Bank for International Settlements (BIS) (http://www.bis.org/statistics/otcder/dt1920a.pdf)

3.4.3 Netting

Global:

US: Figures below are from SECOND QUARTER, 2008 [50]

- Total derivatives (notional amount): $182.2 trillion (SECOND QUARTER, 2008)
  - Interest rate contracts: $145.0 trillion (80%)
  - Foreign exchange contracts: $18.2 trillion(10%)
  - 2008 Second Quarter, banks reported trading revenues of $1.6 billion
- Total number of commercial banks holding derivatives: 975

[51]

According to Bank for International Settlements "$516 trillion at the end of June 2007"

Positions in the OTC derivatives market have increased at a rapid pace since the last triennial survey was undertaken in 2004. Notional amounts outstanding of such instruments totalled $516 trillion at the end of June 2007, 135% higher than the level recorded in the 2004 survey (Graph 4). This corresponds to an annualised compound rate of growth of 33%, which is higher than the approximatively 25% average annual rate of increase since positions in OTC derivatives were first surveyed by the BIS in 1995. Notional amounts outstanding provide useful information on the structure of the OTC derivatives market but should not be interpreted as a measure of the riskiness of these positions. Gross market values, which represent the cost of replacing all open contracts at the prevailing market prices, have increased by 74% since 2004, to $11 trillion at the end of June 2007 [52].

3.4.4 Controversy about the financial crisis

The derivative markets have been accused lately for their alleged role in the financial crisis of 2007-2010. The leveraged operations are said to have generated an “irrational appeal” for risk taking, and the lack of clearing obligations also appeared as very damaging for the balance of the market. The G-20’s proposals for financial markets reform all stress these points, and suggest:

- higher capital standards
- stronger risk management
- international surveillance of financial firms' operations
- dynamic capital rules.

50. http://www.occ.treas.gov/deriv/deriv.htm
51. http://www.occ.treas.gov/ftp/release/2008-115a.pdf
52. page 28, http://www.bis.org/publ/qtrpdf/r_qt0712.pdf

3.4.5 Further reading

Weinberg, Ari, "The Great Derivatives Smackdown", Forbes magazine, May 9, 2003.

European Central Bank (Editor: Tom Kokkola), "The Payment System", Frankfurt am Main 2010, Chapter 3, ISBN 978-92-899-0632-6.

3.4.6 External links

- PBS (WGBH, Boston), "The Warning", Frontline TV public affairs program, October 20, 2009. "At the center of it all he finds Brooksley Born, who speaks for the first time on television about her failed campaign to regulate the secretive, multitrillion-dollar derivatives market whose crash helped trigger the financial collapse in the fall of 2008."

3.5 Foreign Exchange Markets

The **foreign exchange market** (**forex**, **FX**, or **currency market**) is a form of exchange for the global decentralized trading of international currencies. Financial centers around the world function as anchors of trading between a wide range of different types of buyers and sellers around the clock, with the exception of weekends. The foreign exchange market determines the relative values of different currencies [53].

The foreign exchange market assists international trade and investment by enabling currency conversion. For example, it permits a business in the United States to import goods from the European Union member states especially Eurozone members and pay Euros, even though its income is in United States dollars. It also supports direct speculation in the value of currencies, and the carry trade, speculation based on the interest rate differential between two currencies [54].

In a typical foreign exchange transaction, a party purchases some quantity of one currency by paying some quantity of another currency. The modern foreign exchange market began forming during the 1970s after three decades of government restrictions on foreign exchange transactions (the Bretton Woods system of monetary management established the rules for commercial and financial relations among the world's major industrial states after World War II), when countries gradually switched to floating exchange rates from the previous exchange rate regime, which remained fixed as per the Bretton Woods system.

53. The Economist – Guide to the Financial Markets (pdf) (https://docs.google.com/fileview?id=0B_Qxj5U7eaJTZTJkODYzN2ItZjE3Yy00Y2M0LTk2ZmUtZGU0NzA3NGI4Y2Y5&hl=en&pli=1)
54. Global imbalances and destabilizing speculation (2007) (http://www.igidr.ac.in/~money/mfc_10/Massimiliano_submission_40.pdf), UNCTAD Trade and development report 2007 (Chapter 1B).

The foreign exchange market is unique because of the following characteristics:

- its huge trading volume representing the largest asset class in the world leading to high liquidity;
- its geographical dispersion;
- its continuous operation: 24 hours a day except weekends, i.e., trading from 20:15 GMT on Sunday until 22:00 GMT Friday;
- the variety of factors that affect exchange rates;
- the low margins of relative profit compared with other markets of fixed income; and
- the use of leverage to enhance profit and loss margins and with respect to account size.

As such, it has been referred to as the market closest to the ideal of perfect competition, notwithstanding currency intervention by central banks. According to the Bank for International Settlements [55], as of April 2010, average daily turnover in global foreign exchange markets is estimated at $3.98 trillion, a growth of approximately 20% over the $3.21 trillion daily volume as of April 2007. Some firms specializing on foreign exchange market had put the average daily turnover in excess of US$4 trillion [56].

The $3.98 trillion break-down is as follows:

- $1.490 trillion in spot transactions
- $475 billion in outright forwards
- $1.765 trillion in foreign exchange swaps
- $43 billion currency swaps
- $207 billion in options and other products

3.5.1 History

3.5.1.1 Ancient

Forex first existed in ancient times [57]. Money-changing people, people helping others to change money and also taking a commission or charging a fee were living in the times of the Talmudic writings (Biblical times). These people (sometimes called "kollybistės") used city-stalls, at feast times the temples Court of the Gentiles instead

55. 2010 Triennial Central Bank Survey, (http://www.bis.org/publ/rpfxf10t.htm), Bank for International Settlements.
56. "What is Foreign Exchange?" (http://au.ibtimes.com/articles/110821/20110210/what-is-foreign-exchange-currency-conversion-financial-markets-forex-foreign-exchange-markets.htm). Published by the International Business Times AU. Retrieved: February 11, 2011.
57. CR Geisst - Encyclopedia of American Business History (http://books.google.co.uk/books?id=5dGig0fYlj8C&pg=PA169&dq=ancient+history+foreign+exchange&hl=en&sa=X&ei=6ucBUK6YGY-U0QWxy8GQBw&redir_esc=y#v=onepage&q=ancient%20history%20foreign%20exchange&f=false) Infobase Publishing, 1 Jan 2009 Retrieved 2012-07-14 ISBN 1438109873

[58]. The money-changer was also in more recent ancient times silver-smiths and, or, gold-smiths [59].

During the fourth century the Byzantium government kept a monopoly on forexes [60].

3.5.1.2 Medieval and later

During the fifteenth century the Medici family were required to open banks at foreign locations in order to exchange currencies to act for textile merchants [61], [62]. To facilitate trade the bank created the nostro (from Italian translated - "ours") account book which contained two columned entries showing amounts of foreign and local currencies, information pertaining to the keeping of an account with a foreign bank [63], [64], [65], [66]. During the 17th (or 18th) century Amsterdam maintained an active forex market [67]. During 1704 foreign exchange took place between agents acting in the interests of the nations of Engaland and Holland [68].

58. GW Bromiley - International Standard Bible Encyclopedia: A-D (http://books.google.co.uk/books?id=wo8csizDv0gC&pg=PA408&dq=money+changers+bible&hl=en&sa=X&ei=MOkBULWpB4Ss0QXMqdW8Bw&redir_esc=y#v=onepage&q=money%20changers%20bible&f=false) Wm. B. Eerdmans Publishing, 13 Feb 1995 Retrieved 2012-07-14 ISBN 0802837816
59. T Crump - The Phenomenon of Money (Routledge Revivals) (http://books.google.co.uk/books?id=Qt3mrYvhOJkC&pg=PA146&dq=ancient+foreign+exchanges&hl=en&sa=X&ei=m-4BUP2vB-mu0QWNuISxBw&redir_esc=y#v=onepage&q=ancient%20foreign%20exchanges&f=false) Taylor & Francis US, 14 Jan 2011 Retrieved 2012-07-14 ISBN 0415611873
60. J Hasebroek - Trade and Politics in Ancient Greece (http://books.google.co.uk/books?id=743zWquWmesC&pg=PA156&dq=ancient+foreign+exchanges&hl=en&sa=X&ei=kPABUPOpOLOr0AW9oO2hBw&ved=0CFoQ6AEwBTgK#v=onepage&q=ancient%20foreign%20exchanges&f=false) Biblo & Tannen Publishers, 1 Mar 1933 Retrieved 2012-07-14 ISBN 0819601500
61. RC Smith, I Walter, G DeLong - Global Banking (http://books.google.co.uk/books?id=V05oVTC2cFMC&pg=PA3&dq=history+of+foreign+exchange&hl=en&sa=X&ei=E7EAUMm1LsnE0QWFrYGoBw&ved=0CDoQ6AEwADgo#v=onepage&q=history%20of%20foreign%20exchange&f=false) Oxford University Press, 17 Jan 2012 Retrieved 2012-07-13 ISBN 0195335937
62. (tertiary) - G Vasari - The Lives of the Artists Retrieved 2012-07-13 ISBN 019283410X
63. (page 130 of) RA De Roover - The Rise and Decline of the Medici Bank: 1397-1494 (http://books.google.co.uk/books?id=3ptzaUifK2AC&pg=PA132&dq=foreign+exchange+Medici&hl=en&sa=X&ei=WeEBULGGBYGb1AW2rf2tBw&ved=0CEAQ6AEwAA#v=onepage&q=foreign%20exchange%20Medici&f=false) Beard Books, 1999 Retrieved 2012-07-14 ISBN 1893122328
64. RA De Roover - The Medici Bank: its organization, management, operations and decline (http://books.google.co.uk/books?id=Or0WAQAAMAAJ&q=Medici+Nostro+accounts&dq=Medici+Nostro+accounts&hl=en&sa=X&ei=2OIBUOXmE-is0QWupP24Bw&redir_esc=y) New York Univ. Press, 1948 Retrieved 2012-07-14
65. Cambridge dictionaries online - "nostro account"
66. Oxford dictionaries online - "nostro account"
67. S Homer, Richard E Sylla A History of Interest Rates (http://books.google.co.uk/books?id=aASnQujNgzoC&pg=PT153&dq=foreign+exchange+history+London&hl=en&sa=X&ei=K-ABUKLWNIap0AWv3f2jBA&ved=0CFkQ6AEwBTgK#v=onepage&q=foreign%20exchange%20history%20London&f=false) John Wiley & Sons, 29 Aug 2005 Retrieved 2012-07-14 ISBN 0471732834
68. T Southcliffe Ashton - An Economic History of England: The 18th Century, Volume 3 (http://books.google.co.uk/books?id=zjkOAAAAQAAJ&pg=PA167&dq=history+of+foreign+exchange&hl=en&sa=X&ei=r5UAUOG3OuzY0QXX88WkBw&ved=0CGsQ6AEwCA#v=onepage&q=history%20of%20foreign%20exchange&f=false) Taylor & Francis, 1955 Retrieved 2012-07-13

3.5.1.3 Early modern

The firm Alexander Brown & Sons traded foreign currencies exchange sometime about 1850 and were a leading participant in this within the U.S. of A [69]. During 1880 J.M. do Espírito Santo de Silva (Banco Espírito e Comercial de Lisboa) applied for and was given permission to began to engage in a foreign exchange trading business [70], [71].

1880 is considered by one source to be the beginning of modern foreign exchange, significant for the fact of the beginning of the gold standard during the year [72].

3.5.1.4 Modern to post-modern

3.5.1.4.1 Before WWII

From 1899 to 1913 holdings of countries foreign exchange increased by 10.8%, while holdings of gold increased by 6.3% [73]. At the time of the closing of the year 1913, nearly half of the world's forexes were being performed using sterling [74]. The number of foreign banks operating within the boundaries of London increased in the years from 1860 to 1913 from 3 to 71. In 1902 there were altogether two London foreign exchange brokers [75]. In the earliest years of the twentieth century trade was most active in Paris, New York and Berlin, while Britain remained largely uninvolved in trade until 1914. Between 1919 and 1922 the employment of a foreign exchange brokers within London increased to 17, in 1924 there were 40 firms operating for the purposes

69. (page 196 of) JW Markham A Financial History of the United States, Volumes 1-2 (http://books.google.co.uk/books?id=Uazpff00Y5EC&pg=PA196&dq=history+of+Foreign+exchange&hl=en&sa=X&ei=I8oBUJb9AcLO0QWIramyBw&ved=0CFcQ6AEwBTge#v=onepage&q=history%20of%20Foreign%20exchange&f=false) M.E. Sharpe, 2002 Retrieved 2012-07-14 ISBN 0765607301
70. (page 847) of M Pohl, European Association for Banking History - Handbook on the History of European Banks (http://books.google.co.uk/books?id=eXvfNDHpfWwC&pg=PA845&dq=history+of+foreign+exchange+1983&hl=en&sa=X&ei=q80BUP7yOsPs0gXhgYX_Bg&ved=0CDoQ6AEwADgU#v=onepage&q=history%20of%20foreign%20exchange%201983&f=false) Edward Elgar Publishing, 1994 Retrieved 2012-07-14
71. (secondary) - [1] Retrieved 2012-07-13
72. S Shamah - A Foreign Exchange Primer (http://books.google.co.uk/books?id=2xwPXhbXDO4C&printsec=frontcover&dq=foreign+exchange&source=bl&ots=W-uC3FcK3N&sig=vbTqNnUdFAbvnF6cPOqe93WOCX4&hl=en&sa=X&ei=3pYSUNyvAcuS0QWttYDwBw&sqi=2&redir_esc=y#v=onepage&q=foreign%20exchange&f=false) ["1880" is within 1.2 Value Terms] John Wiley & Sons, 22 Nov 2011 Retrieved 2102-07-27 ISBN 1119994896
73. P Mathias, S Pollard - The Cambridge Economic History of Europe: The industrial economies : the development of economic and social policies (http://books.google.co.uk/books?id=VZKkCLs3f90C&pg=PA205&dq=history+of+foreign+exchange&hl=en&sa=X&ei=bpQAUJzrEq6A0AWCpKmhBw&redir_esc=y#v=onepage&q=history%20of%20foreign%20exchange&f=false) Cambridge University Press, 1989 Retrieved 2012-07-13 ISBN 0521225043
74. S Misra, PK Yadav [2] - International Business: Text And Cases (http://books.google.co.uk/books?id=glhOOU1_gGUC&pg=PA171&lpg=PA171&dq=history+of+foreign+exchange+1880&source=bl&ots=W92oE3_LRy&sig=YkT5XXC3MRT9LfZfmkUtoEAcP4s&hl=en&sa=X&ei=cJgSUOm1Bqmb1AWck4D4DQ&redir_esc=y#v=onepage&q=history%20of%20foreign%20exchange%201880&f=false) PHI Learning Pvt. Ltd. 2009 Retrieved 2012-07-27 ISBN 8120336526
75. P. L. Cottrell - Centres and Peripheries in Banking: The Historical Development of Financial Markets (http://books.google.co.uk/books?id=1ZTIm_h0qdEC&pg=PA41&dq=history+of+foreign+exchange&hl=en&sa=X&ei=GpkAUImUGvCZ0QWJ18HTAw&ved=0CFEQ6AEwBDgK#v=onepage&q=history%20of%20foreign%20exchange&f=false) Ashgate Publishing, Ltd., 2007 Retrieved 2012-07-13 ISBN 0754661210

of exchange [76]. During the 1920's the occurrence of trade in London resembled more the modern manifestation, by 1928 forex trade was integral to the financial functioning of the city. Continental exchange controls, plus other factors, in Europe and Latin America, hampered any attempt at wholesale prosperity from trade for those of 1930's London [77].

During the 1920s foreign exchange the Kleinwort family were known to be the leaders of the market, Japhets, S,Montagu & Co. and Seligmans as significant participants still warrant recognition [78]. In the year 1945 the nation of Ethiopias' government possessed a foreign exchange surplus [79].

3.5.1.4.2 After WWII

After WWII the Bretton Woods Accord was signed allowing currencies to fluctuate within a range of 1% to the currencies par [80]. In Japan the law was changed during 1954 by the Foreign Exchange Bank Law, so, the Bank of Tokyo was to become because of this the centre of foreign exchange by September of that year. Between 1954 and 1959 Japanese law was made to allow the inclusion of many more Occidental currencies in Japanese forex [81].

President Nixon is credited with ending the Bretton Woods Accord, and fixed rates of exchange, bringing about eventually a free-floating currency system. After the ceasing of the enactment of the Bretton Woods Accord (during 1971 [82]) the Smithsonian agreement allowed trading to range to 2%. During 1961-62 the amount of foreign operations by the U.S. of America's Federal Reserve was relatively low [83], [84]. Those

76. P. L. Cottrell (p.75)
77. J Atkin - The Foreign Exchange Market Of London: Development Since 1900 (http://books.google.co.uk/books?id=ZGRAn2J5whQC&pg=PA32&dq=Kleinwort+foreign+exchange&hl=en&sa=X&ei=VosAUJqmHabF0QWwwri2Bw&redir_esc=y#v=onepage&q=Kleinwort%20foreign%20exchange&f=false) Psychology Press, 2005 Retrieved 2012-07-13 ISBN 041534901X
78. J Wake - Kleinwort, Benson: The History of Two Families in Banking (http://books.google.co.uk/books?id=Qm1fHrcgZuoC&pg=PA213&dq=history+of+forex&hl=en&sa=X&ei=QokAULaZIuWu0QXNu4inBw&ved=0CGQQ6AEwBzge#v=onepage&q=history%20of%20forex&f=false) Oxford University Press, 27 Feb 1997 Retrieved 2012-07-13 ISBN 0198282990,
79. HG Marcus A History of Ethiopia (http://books.google.co.uk/books?id=jX7-0ROBfyIC&pg=PA156&dq=foreign+exchange+history&hl=en&sa=X&ei=YdwBUKGfEaqx0QXV9a2iBw&ved=0CEAQ6AEwATha#v=onepage&q=foreign%20exchange%20history&f=false) University of California Press, 30 Sep 1994 Retrieved 2012-07-14 ISBN 0520081218
80. Laurence S. Copeland - Exchange Rates and International Finance (http://books.google.co.uk/books?id=AL7TsSY5KZUC&pg=PA444&lpg=PA444&dq=Bretton+woods+currencies+fluctuate+1%25+either+side&source=bl&ots=Mb7A6w8LXI&sig=FnIxrYYrC60nwt0UFkw1HtK1sOY&hl=en&sa=X&ei=Z9UCUISSDOXS0QX-wsmbBw&ved=0CF4Q6AEwAjgK#v=onepage&q=Bretton%20woods%20currencies%20fluctuate%201%25%20either%20side&f=false) Pearson Education, 2008 Retrieved 2012-07-15 ISBN 0273710273
81. M Sumiya - A History of Japanese Trade and Industry Policy (http://books.google.co.uk/books?id=mVN_OTa_KCYC&pg=PA357&dq=history+of+foreign+exchange&hl=en&sa=X&ei=PawAUOfPDZG20QWKm7CFBw&ved=0CDoQ6AEwADgU#v=onepage&q=history%20of%20foreign%20exchange&f=false) Oxford University Press, 2000 Retrieved 2012-07-13 ISBN 0198292511
82. RC Smith, I Walter, G DeLong (p.4)
83. AH Meltzer - A History of the Federal Reserve, Volume 2, Book 1 (http://books.google.co.uk/books?id=8peFljjm5CQC&pg=PA354&dq=history+of+foreign+exchange&hl=en&sa=X&ei=V6kAUPKYJ8ax0QWr8bCJBw&ved=0CF0Q6AEwBjgK#v=onepage&q=history%20of%20foreign%20exchange&f=false); Books 1951-1969 University of Chicago Press, 1 Feb 2010 Retrieved 2012-07-14 ISBN 0226520013
84. (page 7 "fixed exchange rates" of) DF DeRosa -Options on Foreign Exchange (http://books.google.co.uk/books?id=zYTlYowJ_QMC&pg=PT22&dq=Bretton+woods+accord+foreign+exchange&hl=en&sa=X&ei=edkCUMC5KYS30QWE9tCqBw&ved=0CDgQ6AEwADgK#v=onepage&q=Bretton%20woods%20accord%20foreign%20exchange&f=false) Retrieved 2012-07-15

involved in controlling exchange rates found the boundaries of the Agreement were not realistic and so ceased this in March of 1973, when sometime afterward none of the major currencies were maintained with a capacity for conversion to gold, organisations relied instead on reserves of currency [85], [86]. During 1970 to 1973 the amount of trades occurring in the market increased three-fold [87], [88], [89].At some time (according to Gandolfo during February-March 1973) some of the markets' were "split", so a two tier currency market was subsequently introduced, with dual currency rates. This was abolished during March of 1974 [90], [91], [92].

Reuters introduced during June of 1973 computer monitors, replacing the telephones and telex used previously for trading quotes [93].

3.5.1.4.3 -markets close

Due to the ultimate ineffectiveness of the Bretton Woods Accord and the European Joint Float the forex markets were forced to close sometime during 1972 and March 1973 [94], [95]. The very largest of all purchases of dollars in the history of 1976 was when

85. K Butcher - Forex Made Simple: A Beginner's Guide to Foreign Exchange Success (http://books.google.co.uk/books?id=91lFR1KM4nEC&pg=PR3&dq=history+of+forex&hl=en&sa=X&ei=iHgAUMWFEKaK0AWwtPj-Bg&ved=0CFgQ6AEwBTgK#v=onepage&q=history%20of%20forex&f=false) John Wiley and Sons, 18 Feb 2011 Retrieved 2012-07-13 ISBN 0730375250
86. J Madura - International Financial Management (http://books.google.co.uk/books?id=t6gLAhWXv5gC&pg=PA58&dq=foreign+exchange+history+London&hl=en&sa=X&ei=cN0BUIqoK-m90QWN2JimBw&ved=0CGAQ6AEwBjgK#v=onepage&q=foreign%20exchange%20history%20London&f=false) Cengage Learning, 12 Oct 2011 Retrieved 2012-07-14 ISBN 0538482966
87. N DraKoln - Forex for Small Speculators (http://books.google.co.uk/books?id=SJ8Q7SvWH68C&pg=PA11&dq=history+of+forex&hl=en&sa=X&ei=Wn8AUOXrFe-T0QWR1viTBw&ved=0CEQQ6AEwAQ#v=onepage&q=history%20of%20forex&f=false) Enlightened Financial Press, 1 Apr 2004 Retrieved 2012-07-13 ISBN 0966624580
88. (SFO Magazine, RR Wasendorf, Jr.) (INT) - Forex Trading PA Rosenstreich - The Evolution of FX and Emerging Markets (http://books.google.co.uk/books?id=Tylr_ua-XKgC&pg=PT42&dq=history+of+forex&hl=en&sa=X&ei=sYAAUOGbJYuY0QXM1dm3Bw&ved=0CEYQ6AEwAjgK#v=onepage&q=history%20of%20forex&f=false) Traders Press, 30 Jun 2009 Retrieved 2012-07-13 ISBN 1934354104
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90. Franz Pick Pick's currency yearbook 1977 - Retrieved 2012-07-15
91. page 70 of Swoboda → [3] (http://books.google.co.uk/books?id=Hw3BOI36J1cC&pg=PA69&dq=the+foreign+exchange+markets+were+forced+to+close+from+February+of+1972+to+March+of+1973&hl=en&sa=X&ei=ItwCUJHEA9Or0AWWwJXGBw&ved=0CEgQ6AEwAzgU#v=onepage&q=the%20foreign%20exchange%20markets%20were%20forced%20to%20close%20from%20February%20of%201972%20to%20March%20of%201973&f=false)
92. G Gandolfo - International Finance and Open-Economy Macroeconomics (http://books.google.co.uk/books?id=F9Xr1_MXjwkC&pg=PA283&dq=foreign+exchange+1973+dual+markets&hl=en&sa=X&ei=z-ECUJaXEOLZ0QXxpNSkBw&ved=0CE4Q6AEwAw#v=onepage&q=foreign%20exchange%201973%20dual%20markets&f=false) Springer, 2002 Retrieved 2012-07-15 ISBN 3540434593
93. City of London: The History (http://books.google.co.uk/books?id=zhb9sEwQFZMC&pg=PT594&dq=the+foreign+exchange+markets+were+forced+to+close+from+February+of+1972+to+March+of+1973&hl=en&sa=X&ei=K-YCUObrGoSX0QX4kuiWBw&ved=0CFMQ6AEwBTge#v=onepage&q=the%20foreign%20exchange%20markets%20were%20forced%20to%20close%20from%20February%20of%201972%20to%20March%20of%201973&f=false) Random House, 31 Dec 2011 Retrieved 2012-07-15 ISBN 1448114721
94. C Robles - How To Profit From The Falling Dollar (http://books.google.co.uk/books?id=zUboEWsx5g0C&pg=PA90&dq=Bretton+woods+accord+foreign+exchange&hl=en&sa=X&ei=99cCUK7RCYLC0QXZke2WBw&ved=0CHYQ6AEwCQ#v=onepage&q=Bretton%20woods%20accord%20foreign%20exchange&f=false) AuthorHouse, 2007 Retrieved 2012-07-15 ISBN 1434311023
95. "Thursday was aborted by news of a record assault on the dollar that forced the closing of most foreign exchange markets." in The outlook: Volume 45, published by Standard and Poor's Corporation - 1972 - Retrieved 2012-07-15 → [4] (https://www.google.co.uk/

the West German government achieved an almost 3 billion dollar acquisition (a figure given as 2.75 billion in total by The Statesman: Volume 18 1974 [96]), this event indicated the impossibility of the balancing of exchange stabilities by the measures of control used at the time and the monetary system and the foreign exchange markets in "West" Germany and other countries within Europe closed for two weeks (during February and, or, March of 1973. Giersch, Paqué, & Schmieding state closed after purchase of "7.5 million Dmarks" Brawley states "... Exchange markets had to be closed. When they re-opened ... March 1 " that is a large purchase occurred after the close) [97], [98], [99], [100].

3.5.1.4.4 after 1973

In fact 1973 marks the point to which nation-state, banking trade and controlled foreign exchange ended and complete floating, relatively free conditions of a market characteristic of the situation in contemporary times began (according to one source) [101], although another states the first time a currency pair were given as an option for

search?tbm=bks&hl=en&q=the+foreign+exchange+markets+were+forced+to+close+from+February+of+1972+to+March+of+1973&btnG=#q=the+foreign+exchange+markets+were+forced+to+close+from+February+of+1972+to+March+of+1973&hl=en&tbm=bks&ei=e-cCUNXTD4We0QXE0NCeBw&start=40&sa=N&bav=on.2,or.r_gc.r_pw.r_cp.r_qf.,cf.osb&fp=e1175ee4201d696b&biw=1280&bih=845)

96. https://www.google.co.uk/search?tbm=bks&hl=en&q=the+foreign+exchange+markets+were+forced+to+close+from+February+of+1972+to+March+of+1973&btnG=#q=the+foreign+exchange+markets+were+forced+to+close+from+February+of+1972+to+March+of+1973&hl=en&tbm=bks&ei=EN8CUKr6Aoi_0QWoiqynBw&start=10&sa=N&bav=on.2,or.r_gc.r_pw.r_cp.r_qf.,cf.osb&fp=e1175ee4201d696b&biw=1280&bih=845
97. H Giersch, K-H Paqué, H Schmieding - The Fading Miracle: Four Decades of Market Economy in Germany (http://books.google.co.uk/books?id=kkXGk_HyIBAC&pg=PA180&dq=the+foreign+exchange+markets+were+forced+to+close+from+February+of+1972+to+March+of+1973&hl=en&sa=X&ei=y9oCUIbcO4jE0QWs1qWeBw&redir_esc=y#v=onepage&q=the%20foreign%20exchange%20markets%20were%20forced%20to%20close%20from%20February%20of%201972%20to%20March%20of%201973&f=false) Cambridge University Press, 10 Nov 1994 Retrieved 2012-07-15 ISBN 0521358698
98. International Center for Monetary and Banking Studies, (http://books.google.co.uk/books?id=Hw3BOI36J1cC&pg=PA69&dq=the+foreign+exchange+markets+were+forced+to+close+from+February+of+1972+to+March+of+1973&hl=en&sa=X&ei=ItwCUJHEA9Or0AWWwJXGBw&ved=0CEgQ6AEwAzgU#v=onepage&q=the%20foreign%20exchange%20markets%20were%20forced%20to%20close%20from%20February%20of%201972%20to%20March%20of%201973&f=false), AK Swoboda - Capital Movements and Their Control: Proceedings of the Second Conference of the International Center for Monetary and Banking Studies BRILL, 1976 Retrieved 2012-07-15 ISBN 902860295X
99. (-p. 332 of) MR Brawley - Power, Money, And Trade: Decisions That Shape Global Economic Relations (http://books.google.co.uk/books?id=yKa10GR9IwAC&pg=PA332&dq=the+foreign+exchange+markets+were+forced+to+close+from+February+of+1972+to+March+of+1973&hl=en&sa=X&ei=r-MCUKLkJqWx0AWjzJGFDA&ved=0CEYQ6AEwAjge#v=onepage&q=the%20foreign%20exchange%20markets%20were%20forced%20to%20close%20from%20February%20of%201972%20to%20March%20of%201973&f=false) University of Toronto Press, 2005 Retrieved 2012-07-15 ISBN 1551116839
100. "... forced to close for several days in mid-1972, ... The foreign exchange markets were closed again on two occasions at the beginning of 1973,.. " in H-J Rüstow New paths to full employment: the failure of orthodox economic theory Macmillan, 1991 Retrieved 2012-07-15 → [5] (https://www.google.co.uk/search?tbm=bks&hl=en&q=the+foreign+exchange+markets+were+forced+to+close+from+February+of+1972+to+March+of+1973&btnG=#hl=en&tbm=bks&sclient=psy-ab&q=the+foreign+exchange+markets++forced+to+close+1972++1973&oq=the+foreign+exchange+markets++forced+to+close+1972++1973&gs_l=serp.12...4375.4375.2.4999.1.1.0.0.0.0.396.396.3-1.1.0...0.0...1c.SRSBQ_o0-Ek&pbx=1&bav=on.2,or.r_gc.r_pw.r_cp.r_qf.,cf.osb&fp=e1175ee4201d696b&biw=1280&bih=845)
101. J Chen - Essentials of Foreign Exchange Trading (http://books.google.co.uk/books?id=8zTsnBYiDGkC&pg=PA1&dq=history+of+foreign+exchange&hl=en&sa=X&ei=SKYAUNKqII6o0AWV3KSGBw&redir_esc=y#v=onepage&q=history%20of%20foreign%20exchange&f=false) John Wiley & Sons, 9 Mar 2009 Retrieved 2012-07-13 ISBN 0470390867

U.S.A. traders to purchase was during 1982, with additional currencies available by the next year [102], [103].

On January the 1st of 1981 (as part of changes beginning during 1978 [104]) the Bank of China allowed certain domestic "enterprises" to participate in foreign exchange trading [105]. Sometime during the months of 1981 the South Korean government ended forex controls and allowed free trade to occur for the first time. During 1988 the countries government accepted the IMF quota for international trade [106].

Intervention by European banks especially the Bundesbank influenced the forex market, on February the 27th 1985 particularly [107]. The greatest proportion of all trades world-wide during 1987 were within the United Kingdom, slightly over one quarter, with the U.S. of America the nation with the second most places involved in trading [108].

During 1991 the republic of Iran changed international agreements with some countries from oil-barter to foreign exchange [109].

3.5.2 Market size and liquidity

The foreign exchange market is the most liquid financial market in the world. Traders include large banks, central banks, institutional investors, currency speculators, corporations, governments, other financial institutions, and retail investors. The average daily turnover in the global foreign exchange and related markets is

102. (page 1 of) A Hicks - Managing Currency Risk Using Foreign Exchange Options (http://books.google.co.uk/books?id=vIuavf6a1R8C&pg=PA1&dq=history+of+Foreign+exchange&hl=en&sa=X&ei=wcIBUIy5J6O_0QW2-8SLBw&ved=0CEQQ6AEwAg#v=onepage&q=history%20of%20Foreign%20exchange&f=false) Woodhead Publishing, 2000 Retrieved 2012-07-14 ISBN 1855734915
103. (secondary) -GG Johnson Formulation of Exchange Rate Policies in Adjustment Programs (http://books.google.co.uk/books?id=8FQWkffo7wwC&pg=PA15&dq=foreign+exchange+1982&hl=en&sa=X&ei=nsQBUPO1JunN0QXLi9CuBw&ved=0CHUQ6AEwCQ#v=onepage&q=foreign%20exchange%201982&f=false) International Monetary Fund, 15 Aug 1985 Retrieved 2012-07-14 ISBN 0939934507
104. JA Dorn - China in the New Millennium: Market Reforms and Social Development (http://books.google.co.uk/books?id=BIGnLYA4PtsC&pg=PA208&dq=foreign+exchange+in+1981&hl=en&sa=X&ei=A9kBUIm2MOmo0AXmloiSBw&ved=0CFgQ6AEwBTgK#v=onepage&q=foreign%20exchange%20in%201981&f=false) Cato Institute, 1998 Retrieved 2012-07-14 ISBN 1882577612
105. B Laurens, H Mehran, M Quintyn, T Nordman - Monetary and Exchange System Reforms in China: An Experiment in Gradualism (http://books.google.co.uk/books?id=PJwCbEC9lJYC&pg=PT131&dq=foreign+exchange+in+1981&hl=en&sa=X&ei=59cBUMfYLIKf0QWA4vSuBw&ved=0CGwQ6AEwCA#v=onepage&q=foreign%20exchange%20in%201981&f=false) International Monetary Fund, 26 Sep 1996 Retrieved 2012-07-14 ISBN 1452766126
106. Y-I Chung - South Korea in the Fast Lane: Economic Development and Capital Formation (http://books.google.co.uk/books?id=-0n9n3vNMeYC&pg=PA106&dq=foreign+exchange+in+1981&hl=en&sa=X&ei=zNUBUNbPLKXB0QXpjejHBw&redir_esc=y#v=onepage&q=foreign%20exchange%20in%201981&f=false) Oxford University Press, 20 Jul 2007 Retrieved 2012-07-14 ISBN 0195325451
107. KM Dominguez, JA Frankel - Does Foreign Exchange Intervention Work? (http://books.google.co.uk/books?id=i6QViZToLTIC&pg=PA9&dq=history+of+foreign+exchange+1983&hl=en&sa=X&ei=5csBUKGvE8mw0QW_kq24Bw&ved=0CEcQ6AEwAjgK#v=onepage&q=history%20of%20foreign%20exchange%201983&f=false) Peterson Institute, 1993 Retrieved 2012-07-14 ISBN 0881321044
108. (page 211 - [source BIS 2007])H Van Den Berg - International Finance and Open-Economy Macroeconomics: Theory, History, and Policy (http://books.google.co.uk/books?id=1Qhfgvkf4S0C&pg=PA210&dq=foreign+exchange+history&hl=en&sa=X&ei=k9oBUIfEB-PQ0QWZ3ZGhBw&ved=0CDoQ6AEwADgK#v=onepage&q=foreign%20exchange%20history&f=false) World Scientific, 31 Aug 2010 Retrieved 2012-07-14 ISBN 9814293512
109. PJ Quirk Issues in International Exchange and Payments Systems (http://books.google.co.uk/books?id=fcUjRujvzt4C&pg=PA26&dq=foreign+exchange+in+1981&hl=en&sa=X&ei=wtYBULDjH4ah0QWm1qG7Bw&ved=0CFwQ6AEwBQ#v=onepage&q=foreign%20exchange%20in%201981&f=false) International Monetary Fund, 13 Apr 1995 Retrieved 2012-07-14 ISBN 1557754802

continuously growing. According to the 2010 Triennial Central Bank Survey, coordinated by the Bank for International Settlements, average daily turnover was US$3.98 trillion in April 2010 (vs $1.7 trillion in 1998) [110]. Of this $3.98 trillion, $1.5 trillion was spot transactions and $2.5 trillion was traded in outright forwards, swaps and other derivatives.

Trading in the United Kingdom accounted for 36.7% of the total, making it by far the most important centre for foreign exchange trading. Trading in the United States accounted for 17.9%, and Japan accounted for 6.2% [111].

Turnover of exchange-traded foreign exchange futures and options have grown rapidly in recent years, reaching $166 billion in April 2010 (double the turnover recorded in April 2007). Exchange-traded currency derivatives represent 4% of OTC foreign exchange turnover. Foreign exchange futures contracts were introduced in 1972 at the Chicago Mercantile Exchange and are actively traded relative to most other futures contracts.

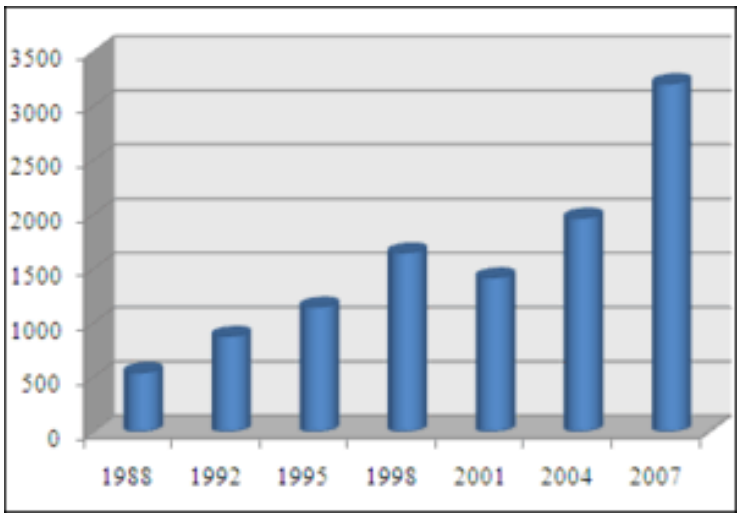

Figure 3.8 Main foreign exchange market turnover, 1988–2007, measured in billions of USD.

Most developed countries permit the trading of derivative products (like futures and options on futures) on their exchanges. All these developed countries already have fully convertible capital accounts. Some governments of emerging economies do not allow foreign exchange derivative products on their exchanges because they have capital controls. The use of derivatives is growing in many emerging economies [112]. Countries such as Korea, South Africa, and India have established currency futures exchanges, despite having some capital controls.

Top 10 currency traders [113]
% of overall volume, May 2012

110. 2010 Triennial Central Bank Survey, (http://www.bis.org/publ/rpfxf10t.htm), Bank for International Settlements.
111. BIS Triennial Central Bank Survey, (http://www.bis.org/publ/rpfx10.pdf), published in September 2010.
112. "Derivatives in emerging markets", (http://www.bis.org/publ/qtrpdf/r_qt1012f.htm), the Bank for International Settlements, December 13, 2010
113. Source: Euromoney FX survey FX survey 2012: The Euromoney FX survey is the largest global poll of foreign exchange service providers.' (http://www.euromoney.com/poll/3301/PollsAndAwards/Foreign-Exchange.html)

Rank	Name	Market share
1	Deutsche Bank	14.57%
2	Citi	12.26%
3	Barclays Investment Bank	10.95%
4	UBS AG	10.48%
5	HSBC	6.72%
6	JPMorgan	6.6%
7	Royal Bank of Scotland	5.86%
8	Credit Suisse	4.68%
9	Morgan Stanley	3.52%
10	Goldman Sachs	3.12%

Foreign exchange trading increased by 20% between April 2007 and April 2010 and has more than doubled since 2004 [114]. The increase in turnover is due to a number of factors: the growing importance of foreign exchange as an asset class, the increased trading activity of high-frequency traders, and the emergence of retail investors as an important market segment. The growth of electronic execution and the diverse selection of execution venues has lowered transaction costs, increased market liquidity, and attracted greater participation from many customer types. In particular, electronic trading via online portals has made it easier for retail traders to trade in the foreign exchange market. By 2010, retail trading is estimated to account for up to 10% of spot turnover, or $150 billion per day (see retail foreign exchange platform).

Foreign exchange is an over-the-counter market where brokers/dealers negotiate directly with one another, so there is no central exchange or clearing house. The biggest geographic trading center is the United Kingdom, primarily London, which according to TheCityUK estimates has increased its share of global turnover in traditional transactions from 34.6% in April 2007 to 36.7% in April 2010. Due to London's dominance in the market, a particular currency's quoted price is usually the London market price. For instance, when the International Monetary Fund calculates the value of its special drawing rights every day, they use the London market prices at noon that day.

3.5.3 Market participants

Unlike a stock market, the foreign exchange market is divided into levels of access. At the top is the interbank market, which is made up of the largest commercial banks and securities dealers. Within the interbank market, spreads, which are the difference

114. "The $4 trillion question: what explains FX growth since the 2007 survey?, (http://www.bis.org/publ/qtrpdf/r_qt1012e.htm), the Bank for International Settlements, December 13, 2010

between the bid and ask prices, are razor sharp and not known to players outside the inner circle. The difference between the bid and ask prices widens (for example from 0-1 pip to 1-2 pips for a currencies such as the EUR) as you go down the levels of access. This is due to volume. If a trader can guarantee large numbers of transactions for large amounts, they can demand a smaller difference between the bid and ask price, which is referred to as a better spread. The levels of access that make up the foreign exchange market are determined by the size of the "line" (the amount of money with which they are trading). The top-tier interbank market accounts for 53% of all transactions. From there, smaller banks, followed by large multi-national corporations (which need to hedge risk and pay employees in different countries), large hedge funds, and even some of the retail market makers. According to Galati and Melvin, “Pension funds, insurance companies, mutual funds, and other institutional investors have played an increasingly important role in financial markets in general, and in FX markets in particular, since the early 2000s.” (2004) In addition, he notes, “Hedge funds have grown markedly over the 2001–2004 period in terms of both number and overall size” [115]. Central banks also participate in the foreign exchange market to align currencies to their economic needs.

3.5.3.1 Commercial companies

An important part of this market comes from the financial activities of companies seeking foreign exchange to pay for goods or services. Commercial companies often trade fairly small amounts compared to those of banks or speculators, and their trades often have little short term impact on market rates. Nevertheless, trade flows are an important factor in the long-term direction of a currency's exchange rate. Some multinational companies can have an unpredictable impact when very large positions are covered due to exposures that are not widely known by other market participants.

3.5.3.2 Central banks

National central banks play an important role in the foreign exchange markets. They try to control the money supply, inflation, and/or interest rates and often have official or unofficial target rates for their currencies. They can use their often substantial foreign exchange reserves to stabilize the market. Nevertheless, the effectiveness of central bank "stabilizing speculation" is doubtful because central banks do not go bankrupt if they make large losses, like other traders would, and there is no convincing evidence that they do make a profit trading.

115. Gabriele Galati, Michael Melvin (December 2004). "Why has FX trading surged? Explaining the 2004 triennial survey" (http://www.bis.org/publ/qtrpdf/r_qt0412f.pdf). Bank for International Settlements.

3.5.3.3 Foreign exchange fixing

Foreign exchange fixing is the daily monetary exchange rate fixed by the national bank of each country. The idea is that central banks use the fixing time and exchange rate to evaluate behavior of their currency. Fixing exchange rates reflects the real value of equilibrium in the market. Banks, dealers and traders use fixing rates as a trend indicator.

The mere expectation or rumor of a central bank foreign exchange intervention might be enough to stabilize a currency, but aggressive intervention might be used several times each year in countries with a dirty float currency regime. Central banks do not always achieve their objectives. The combined resources of the market can easily overwhelm any central bank [116]. Several scenarios of this nature were seen in the 1992–93 European Exchange Rate Mechanism collapse, and in more recent times in Southeast Asia.

3.5.3.4 Hedge funds as speculators

About 70% to 90% of the foreign exchange transactions are speculative. In other words, the person or institution that bought or sold the currency has no plan to actually take delivery of the currency in the end; rather, they were solely speculating on the movement of that particular currency. Hedge funds have gained a reputation for aggressive currency speculation since 1996. They control billions of dollars of equity and may borrow billions more, and thus may overwhelm intervention by central banks to support almost any currency, if the economic fundamentals are in the hedge funds' favor.

3.5.3.5 Investment management firms

Investment management firms (who typically manage large accounts on behalf of customers such as pension funds and endowments) use the foreign exchange market to facilitate transactions in foreign securities. For example, an investment manager bearing an international equity portfolio needs to purchase and sell several pairs of foreign currencies to pay for foreign securities purchases.

Some investment management firms also have more speculative specialist currency overlay operations, which manage clients' currency exposures with the aim of generating profits as well as limiting risk. While the number of this type of specialist

116. Alan Greenspan, The Roots of the Mortgage Crisis: Bubbles cannot be safely defused by monetary policy before the speculative fever breaks on its own.(http://opinionjournal.com/editorial/feature.html?id=110010981) , the Wall Street Journal, December 12, 2007

firms is quite small, many have a large value of assets under management) and, hence, can generate large trades.

3.5.3.6 Retail foreign exchange traders

Individual Retail speculative traders constitute a growing segment of this market with the advent of retail foreign exchange platforms, both in size and importance. Currently, they participate indirectly through brokers or banks. Retail brokers, while largely controlled and regulated in the USA by the Commodity Futures Trading Commission and National Futures Association have in the past been subjected to periodic Foreign exchange fraud [117], [118]. To deal with the issue, in 2010 the NFA required its members that deal in the Forex markets to register as such (I.e., Forex CTA instead of a CTA). Those NFA members that would traditionally be subject to minimum net capital requirements, FCMs and IBs, are subject to greater minimum net capital requirements if they deal in Forex. A number of the foreign exchange brokers operate from the UK under Financial Services Authority regulations where foreign exchange trading using margin is part of the wider over-the-counter derivatives trading industry that includes Contract for differences and financial spread betting.

There are two main types of retail FX brokers offering the opportunity for speculative currency trading: *brokers and dealers or market makers. Brokers* serve as an agent of the customer in the broader FX market, by seeking the best price in the market for a retail order and dealing on behalf of the retail customer. They charge a commission or mark-up in addition to the price obtained in the market. *Dealers or market makers*, by contrast, typically act as principal in the transaction versus the retail customer, and quote a price they are willing to deal at.

3.5.3.7 Non-bank foreign exchange companies

Non-bank foreign exchange companies offer currency exchange and international payments to private individuals and companies. These are also known as foreign exchange brokers but are distinct in that they do not offer speculative trading but rather currency exchange with payments (i.e., there is usually a physical delivery of currency to a bank account).

It is estimated that in the UK, 14% of currency transfers/payments [119] are made via Foreign Exchange Companies [120]. These companies' selling point is usually that they will offer better exchange rates or cheaper payments than the customer's bank. These

117. McKay, Peter A. (2005-07-26). "Scammers Operating on Periphery Of CFTC's Domain Lure Little Guy With Fantastic Promises of Profits" (http://online.wsj.com/article/SB112233850336095645.html?mod=Markets-Main). The Wall Street Journal (Dow Jones and Company). Retrieved 2007-10-31.
118. Egan, Jack (2005-06-19). "Check the Currency Risk. Then Multiply by 100" (http://www.nytimes.com/2005/06/19/business/yourmoney/19fore.html?_r=2&adxnnl=1&oref=slogin&adxnnlx=1191337503-g1yHfewhqPWye0XtI+Eq0A&oref=slogin). The New York Times. Retrieved 2007-10-30.
119. The Sunday Times (UK), 16 July 2006
120. The 5 largest in the UK are Travelex, Moneycorp, HiFX, World First and Currencies Direct

companies differ from Money Transfer/Remittance Companies in that they generally offer higher-value services.

3.5.3.8 Money transfer/remittance companies and bureaux de change

Money transfer companies/remittance companies perform high-volume low-value transfers generally by economic migrants back to their home country. In 2007, the Aite Group estimated that there were $369 billion of remittances (an increase of 8% on the previous year). The four largest markets (India, China, Mexico and the Philippines) receive $95 billion. The largest and best known provider is Western Union with 345,000 agents globally followed by UAE Exchange

Bureaux de change or currency transfer companies provide low value foreign exchange services for travelers. These are typically located at airports and stations or at tourist locations and allow physical notes to be exchanged from one currency to another. They access the foreign exchange markets via banks or non bank foreign exchange companies.

3.5.4 Trading characteristics

There is no unified or centrally cleared market for the majority of trades, and there is very little cross-border regulation. Due to the over-the-counter (OTC) nature of currency markets, there are rather a number of interconnected marketplaces, where different currencies instruments are traded. This implies that there is not a *single* exchange rate but rather a number of different rates (prices), depending on what bank or market maker is trading, and where it is. In practice the rates are quite close due to arbitrage. Due to London's dominance in the market, a particular currency's quoted price is usually the London market price. Major trading exchanges include EBS and Reuters, while major banks also offer trading systems. A joint venture of the Chicago Mercantile Exchange and Reuters, called Fxmarketspace opened in 2007 and aspired but failed to the role of a central market clearing mechanism.

The main trading centers are New York and London, though Tokyo, Hong Kong and Singapore are all important centers as well. Banks throughout the world participate. Currency trading happens continuously throughout the day; as the Asian trading session ends, the European session begins, followed by the North American session and then back to the Asian session, excluding weekends.

Fluctuations in exchange rates are usually caused by actual monetary flows as well as by expectations of changes in monetary flows caused by changes in gross domestic product (GDP) growth, inflation (purchasing power parity theory), interest rates (interest rate parity, Domestic Fisher effect, International Fisher effect), budget and trade deficits or surpluses, large cross-border M&A deals and other macroeconomic conditions. Major news is released publicly, often on scheduled dates, so many people

have access to the same news at the same time. However, the large banks have an important advantage; they can see their customers' order flow.

Currencies are traded against one another. Each currency pair thus constitutes an individual trading product and is traditionally noted XXXYYY or XXX/YYY, where XXX and YYY are the ISO 4217 international three-letter code of the currencies involved. The first currency (XXX) is the base currency that is quoted relative to the second currency (YYY), called the counter currency (or quote currency). For instance, the quotation EURUSD (EUR/USD) 1.5465 is the price of the euro expressed in US dollars, meaning 1 euro = 1.5465 dollars. The market convention is to quote most exchange rates against the USD with the US dollar as the base currency (e.g. USDJPY, USDCAD, USDCHF). The exceptions are the British pound (GBP), Australian dollar (AUD), the New Zealand dollar (NZD) and the euro (EUR) where the USD is the counter currency (e.g. GBPUSD, AUDUSD, NZDUSD, EURUSD).

The factors affecting XXX will affect both XXXYYY and XXXZZZ. This causes positive currency correlation between XXXYYY and XXXZZZ.

On the spot market, according to the 2010 Triennial Survey, the most heavily traded bilateral currency pairs were:

- EURUSD: 28%
- USDJPY: 14%
- GBPUSD (also called cable): 9%

and the US currency was involved in 84.9% of transactions, followed by the euro (39.1%), the yen (19.0%), and sterling (12.9%) (see table). Volume percentages for all individual currencies should add up to 200%, as each transaction involves two currencies.

Trading in the euro has grown considerably since the currency's creation in January 1999, and how long the foreign exchange market will remain dollar-centered is open to debate. Until recently, trading the euro versus a non-European currency ZZZ would have usually involved two trades: EURUSD and USDZZZ. The exception to this is EURJPY, which is an established traded currency pair in the interbank spot market. As the dollar's value has eroded during 2008, interest in using the euro as reference currency for prices in commodities (such as oil), as well as a larger component of foreign reserves by banks, has increased dramatically. Transactions in the currencies of commodity-producing countries, such as AUD, NZD, CAD, have also increased

3.5.5 Determinants of exchange rates

The following theories explain the fluctuations in exchange rates in a floating exchange rate regime (In a fixed exchange rate regime, rates are decided by its government):

1. International parity conditions: Relative Purchasing Power Parity, interest rate parity, Domestic Fisher effect, International Fisher effect. Though to some extent

the above theories provide logical explanation for the fluctuations in exchange rates, yet these theories falter as they are based on challengeable assumptions [e.g., free flow of goods, services and capital] which seldom hold true in the real world.

2. Balance of payments model (see exchange rate): This model, however, focuses largely on tradable goods and services, ignoring the increasing role of global capital flows. It failed to provide any explanation for continuous appreciation of dollar during 1980s and most part of 1990s in face of soaring US current account deficit.
3. Asset market model (see exchange rate): views currencies as an important asset class for constructing investment portfolios. Assets prices are influenced mostly by people's willingness to hold the existing quantities of assets, which in turn depends on their expectations on the future worth of these assets. The asset market model of exchange rate determination states that “the exchange rate between two currencies represents the price that just balances the relative supplies of, and demand for, assets denominated in those currencies.”

None of the models developed so far succeed to explain exchange rates and volatility in the longer time frames. For shorter time frames (less than a few days) algorithms can be devised to predict prices. It is understood from the above models that many macroeconomic factors affect the exchange rates and in the end currency prices are a result of dual forces of demand and supply. The world's currency markets can be viewed as a huge melting pot: in a large and ever-changing mix of current events, supply and demand factors are constantly shifting, and the price of one currency in relation to another shifts accordingly. No other market encompasses (and distills) as much of what is going on in the world at any given time as foreign exchange [121].

Supply and demand for any given currency, and thus its value, are not influenced by any single element, but rather by several. These elements generally fall into three categories: economic factors, political conditions and market psychology.

3.5.5.1 Economic factors

These include: (a) economic policy, disseminated by government agencies and central banks, (b) economic conditions, generally revealed through economic reports, and other economic indicators.

- Economic policy comprises government fiscal policy (budget/spending practices) and monetary policy (the means by which a government's central bank influences the supply and "cost" of money, which is reflected by the level of interest rates).
- Government budget deficits or surpluses: The market usually reacts negatively to widening government budget deficits, and positively to narrowing budget deficits. The impact is reflected in the value of a country's currency.

121. The Microstructure Approach to Exchange Rates, Richard Lyons, MIT Press (pdf chapter 1) (http://faculty.haas.berkeley.edu/lyons/docs/bookch1.pdf)

- Balance of trade levels and trends: The trade flow between countries illustrates the demand for goods and services, which in turn indicates demand for a country's currency to conduct trade. Surpluses and deficits in trade of goods and services reflect the competitiveness of a nation's economy. For example, trade deficits may have a negative impact on a nation's currency.
- Inflation levels and trends: Typically a currency will lose value if there is a high level of inflation in the country or if inflation levels are perceived to be rising. This is because inflation erodes purchasing power, thus demand, for that particular currency. However, a currency may sometimes strengthen when inflation rises because of expectations that the central bank will raise short-term interest rates to combat rising inflation.
- Economic growth and health: Reports such as GDP, employment levels, retail sales, capacity utilization and others, detail the levels of a country's economic growth and health. Generally, the more healthy and robust a country's economy, the better its currency will perform, and the more demand for it there will be.
- Productivity of an economy: Increasing productivity in an economy should positively influence the value of its currency. Its effects are more prominent if the increase is in the traded sector [122].

3.5.5.2 Political conditions

Internal, regional, and international political conditions and events can have a profound effect on currency markets.

All exchange rates are susceptible to political instability and anticipations about the new ruling party. Political upheaval and instability can have a negative impact on a nation's economy. For example, destabilization of coalition governments in Pakistan and Thailand can negatively affect the value of their currencies. Similarly, in a country experiencing financial difficulties, the rise of a political faction that is perceived to be fiscally responsible can have the opposite effect. Also, events in one country in a region may spur positive/negative interest in a neighboring country and, in the process, affect its currency.

3.5.5.3 Market psychology

Market psychology and trader perceptions influence the foreign exchange market in a variety of ways:

- Flights to quality: Unsettling international events can lead to a "flight to quality", a type of capital flight whereby investors move their assets to a perceived "safe haven". There will be a greater demand, thus a higher price, for currencies

122. T Crump - The Phenomenon of Money (Routledge Revivals) (http://books.google.co.uk/books?id=Qt3mrYvhOJkC&pg=PA146&dq=ancient+foreign+exchanges&hl=en&sa=X&ei=m-4BUP2vB-mu0QWNuISxBw&redir_esc=y#v=onepage&q=ancient%20foreign%20exchanges&f=false) Taylor & Francis US, 14 Jan 2011 Retrieved 2012-07-14 ISBN 0415611873

perceived as stronger over their relatively weaker counterparts. The U.S. dollar, Swiss franc and gold have been traditional safe havens during times of political or economic uncertainty[123].

- Long-term trends: Currency markets often move in visible long-term trends. Although currencies do not have an annual growing season like physical commodities, business cycles do make themselves felt. Cycle analysis looks at longer-term price trends that may rise from economic or political trends [124].
- "Buy the rumor, sell the fact": This market truism can apply to many currency situations. It is the tendency for the price of a currency to reflect the impact of a particular action before it occurs and, when the anticipated event comes to pass, react in exactly the opposite direction. This may also be referred to as a market being "oversold" or "overbought" [125]. To buy the rumor or sell the fact can also be an example of the cognitive bias known as anchoring, when investors focus too much on the relevance of outside events to currency prices.
- Economic numbers: While economic numbers can certainly reflect economic policy, some reports and numbers take on a talisman-like effect: the number itself becomes important to market psychology and may have an immediate impact on short-term market moves. "What to watch" can change over time. In recent years, for example, money supply, employment, trade balance figures and inflation numbers have all taken turns in the spotlight.
- Technical trading considerations: As in other markets, the accumulated price movements in a currency pair such as EUR/USD can form apparent patterns that traders may attempt to use. Many traders study price charts in order to identify such patterns [126].

3.5.6 Financial instruments

3.5.6.1 Spot

A spot transaction is a two-day delivery transaction (except in the case of trades between the US Dollar, Canadian Dollar, Turkish Lira, EURO and Russian Ruble, which settle the next business day), as opposed to the futures contracts, which are usually three months. This trade represents a “direct exchange” between two currencies, has the shortest time frame, involves cash rather than a contract; and interest is not included in the agreed-upon transaction.

123. Safe haven currency (http://glossary.reuters.com/index.php/Safe_Haven_Currency)
124. John J. Murphy, Technical Analysis of the Financial Markets (New York Institute of Finance, 1999), pp. 343–375.
125. Investopedia (http://www.investopedia.com/terms/o/overbought.asp)
126. Sam Y. Cross, All About the Foreign Exchange Market in the United States, (http://www.newyorkfed.org/education/addpub/usfxm/), Federal Reserve Bank of New York (1998), chapter 11, pp. 113–115.

3.5.6.2 Forward

One way to deal with the foreign exchange risk is to engage in a forward transaction. In this transaction, money does not actually change hands until some agreed upon future date. A buyer and seller agree on an exchange rate for any date in the future, and the transaction occurs on that date, regardless of what the market rates are then. The duration of the trade can be one day, a few days, months or years. Usually the date is decided by both parties. Then the forward contract is negotiated and agreed upon by both parties.

3.5.6.3 Swap

The most common type of forward transaction is the swap. In a swap, two parties exchange currencies for a certain length of time and agree to reverse the transaction at a later date. These are not standardized contracts and are not traded through an exchange. A deposit is often required in order to hold the position open until the transaction is completed.

3.5.6.4 Future

Futures are standardized forward contracts and are usually traded on an exchange created for this purpose. The average contract length is roughly 3 months. Futures contracts are usually inclusive of any interest amounts.

3.5.6.5 Option

A foreign exchange option (commonly shortened to just FX option) is a derivative where the owner has the right but not the obligation to exchange money denominated in one currency into another currency at a pre-agreed exchange rate on a specified date. The options market is the deepest, largest and most liquid market for options of any kind in the world.

3.5.7 Speculation

Controversy about currency speculators and their effect on currency devaluations and national economies recurs regularly. Nevertheless, economists including Milton Friedman have argued that speculators ultimately are a stabilizing influence on the market and perform the important function of providing a market for hedgers and transferring risk from those people who don't wish to bear it, to those who do [127]. Other economists such as Joseph Stiglitz consider this argument to be based more on politics and a free market philosophy than on economics [128].

Large hedge funds and other well capitalized "position traders" are the main professional speculators. According to some economists, individual traders could act as "noise traders" and have a more destabilizing role than larger and better informed actors [129].

Currency speculation is considered a highly suspect activity in many countries. While investment in traditional financial instruments like bonds or stocks often is considered to contribute positively to economic growth by providing capital, currency speculation does not; according to this view, it is simply gambling that often interferes with economic policy. For example, in 1992, currency speculation forced the Central Bank of Sweden to raise interest rates for a few days to 500% per annum, and later to devalue the krona [130]. Former Malaysian Prime Minister Mahathir Mohamad is one well known proponent of this view. He blamed the devaluation of the Malaysian ringgit in 1997 on George Soros and other speculators.

Gregory J. Millman reports on an opposing view, comparing speculators to "vigilantes" who simply help "enforce" international agreements and anticipate the effects of basic economic "laws" in order to profit [131].

In this view, countries may develop unsustainable financial bubbles or otherwise mishandle their national economies, and foreign exchange speculators made the inevitable collapse happen sooner. A relatively quick collapse might even be preferable to continued economic mishandling, followed by an eventual, larger, collapse. Mahathir Mohamad and other critics of speculation are viewed as trying to deflect the blame from themselves for having caused the unsustainable economic conditions.

127. Michael A. S. Guth, "Profitable Destabilizing Speculation," (http://michaelguth.com/economist/chap1.htm) Chapter 1 in Michael A. S. Guth, Speculative behavior and the operation of competitive markets under uncertainty, Avebury Ashgate Publishing, Aldorshot, England (1994), ISBN 1-85628-985-0.
128. What I Learned at the World Economic Crisis (http://www.globalpolicy.org/socecon/bwi-wto/critics/2000/whatilearned.htm) Joseph Stiglitz, The New Republic, April 17, 2000, reprinted at GlobalPolicy.org
129. Summers LH and Summers VP (1989) 'When financial markets work too well: a Cautious case for a securities transaction tax' Journal of financial services
130. But Don't Rush Out to Buy Kronor: Sweden's 500% Gamble - International Herald Tribune (http://web.archive.org/web/20080721213356/http://www.iht.com/articles/1992/09/17/perc.php)
131. Gregory J. Millman, Around the World on a Trillion Dollars a Day, Bantam Press, New York, 1995.

3.5.8 Risk aversion

Risk aversion is a kind of trading behavior exhibited by the foreign exchange market when a potentially adverse event happens which may affect market conditions. This behavior is caused when risk averse traders liquidate their positions in risky assets and shift the funds to less risky assets due to uncertainty [132].

In the context of the foreign exchange market, traders liquidate their positions in various currencies to take up positions in safe-haven currencies, such as the US Dollar [133]. Sometimes, the choice of a safe haven currency is more of a choice based on prevailing sentiments rather than one of economic statistics. An example would be the Financial Crisis of 2008. The value of equities across the world fell while the US Dollar strengthened (see Fig.3.9). This happened despite the strong focus of the crisis in the USA [134].

Figure 3.9 Fig.1 Chart showing MSCI World Index of Equities fell while the US Dollar Index rose.

3.5.9 Carry Trade

Currency carry trade refers to the act of borrowing one currency that has a low interest rate in order to purchase another with a higher interest rate. A large difference in rates can be highly profitable for the trader, especially if high leverage is used. However, with all levered investments this is a double edged sword, and large exchange rate fluctuations can suddenly swing trades into huge losses.

132. "Risk Averse" (http://www.investopedia.com/terms/r/riskaverse.asp). Investopedia. Retrieved 2010-02-25.
133. "Global markets-US stocks rebound, dollar gains on risk aversion" (http://www.reuters.com/article/idUSN0515775320100205). Reuters. 2010-02-05. Retrieved 2010-02-27.
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3.5.10 Forex Signals

Forex trade alerts, often referred to as Forex Signals are trade strategies provided by either experienced traders or market analysts. These signals which are often charged a premium fee for can then be copied or replicated by a trader to his own live account. Forex Signal products are packaged as either alerts delivered to a users inbox or sms, or can be installed to a trader's trading platform.

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3.5.12 External links

- A user's guide to the Triennial Central Bank Survey of foreign exchange market activity, Bank for International Settlements

- London Foreign Exchange Committee with links (on right) to committees in NY, Tokyo, Canada, Australia, HK, Singapore
- United States Federal Reserve daily update of exchange rates
- Bank of Canada historical (10-year) currency converter and data download
- Microstructure effects, bid-ask spreads and volatility in the spot foreign exchange market pre and post-EMU
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3.6 Determinants of Interest Rates

An **interest rate** is the price a borrower pays for the use of money he does not own, and the return a lender receives for deferring the use of funds, by lending it to the borrower. Interest rates are normally expressed as a percentage rate over the period of one year.

Interest rates targets are also a vital tool of monetary policy and are used to control variables like investment, inflation, and unemployment.

3.6.1 Historical interest rates

Germany experienced deposit interest rates from 14% in 1969 down to almost 2% in 2003

Figure 3.10

Interest rates throughout history have been variously set either by national governments or market forces. For example, the United States federal funds rate has varied between about 1% to 19% from 1954 to 2008, while the United Kingdom base rate varied between 15 and 3.5% from 1989 to 2008 [135], and Germany experienced rates close to 90% in the 1920s down to about 2% in the 2000s [136], [137].

3.6.2 Causes of interest rates

- **Deferred consumption.** When money is loaned the lender delays spending the money on Consumption (economics)|consumption goods. Since according to time preference theory people prefer goods now to goods later, in a free market there will be a positive interest rate.
- **Inflationary expectations.** Most economies generally exhibit inflation, meaning a given amount of money buys fewer goods in the future than it will now. The borrower needs to compensate the lender for this.
- **Alternative investments.** The lender has a choice between using his money in different investments. If he chooses one, he forgoes the returns from all the others. Different investments effectively compete for funds.

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- **Risks of investment.** There is always a risk that the borrower will go bankrupt, abscond, or otherwise default on the loan. This means that a lender generally charges a risk premium to ensure that, across his investments, he is compensated for those that fail.
- **Liquidity preference.** People prefer to have their resources available in a form that can immediately be exchanged, rather than a form that takes time or money to realise.
- **Taxes.** Because some of the gains from interest may be subject to taxes, the lender may insist on a higher rate to make up for this loss.

3.6.3 Real vs nominal interest rates

The **nominal interest rate** is the amount, in money terms, of interest payable.

For example, suppose a household deposits $100 with a bank for 1 year and they receive interest of $10. At the end of the year their balance is $110. In this case, the nominal interest rate is 10% per annum.

The **real interest rate**, which measures the purchasing power of interest receipts, is calculated by adjusting the nominal rate charged to take inflation into account.

If inflation in the economy has been 10% in the year, then the $110 in the account at the end of the year buys the same amount as the $100 did a year ago. The real interest rate, in this case, is zero.

After the fact, the 'realized' real interest rate, which has actually occurred, is:

$$i_r = i_n - p$$

where **p** = the actual inflation rate over the year.

The expected real returns on an investment, before it is made, are:

$$i_r = i_n - p_e$$

where:

i_n = nominal interest rate

i_r = real interest rate

p_e = expected or projected inflation over the year

3.6.4 Market interest rates

There is a market for investments which ultimately includes the money market, bond market, stock market and currency market as well as retail financial institutions like banks.

Exactly how these markets function is a complex question. However, economists generally agree that the interest rates yielded by any investment take into account:

- The risk-free cost of capital
- Inflationary expectations
- The level of risk in the investment
- The costs of the transaction

3.6.4.1 Risk-free cost of capital

The risk-free cost of capital is the real interest on a risk-free loan. While no loan is ever entirely risk-free, banknote|bills issued by major nations like the United States are generally regarded as risk-free benchmarks.

This rate incorporates the *deferred consumption and alternative investments* elements of interest.

3.6.4.2 Inflationary expectations

According to the theory of rational expectations, people form an expectation of what will happen to inflation in the future. They then ensure that they offer or ask a nominal interest rate that means they have the appropriate real interest rate on their investment.

This is given by the formula:

$$i_n = i_r + p_e$$

where:

i_n = offered nominal interest rate

i_r = desired real interest rate

p_e = inflationary expectations

3.6.4.3 Risk

The level of risk in investments is taken into consideration. This is why very volatile investments like shares and junk bonds have higher returns than safer ones like government bonds.

The extra interest charged on a risky investment is the risk premium. The required risk premium is dependent on the risk preferences of the lender.

If an investment is 50% likely to go bankrupt, a risk neutral|risk-neutral lender will require their returns to double. So for an investment normally returning $100 they would require $200 back. A risk-averse lender would require more than $200 back and a risk-loving lender less than $200. Evidence suggests that most lenders are in fact risk-averse.

Generally speaking a longer-term investment carries a **maturity risk premium**, because long-term loans are exposed to more risk of default during their duration.

3.6.4.4 Liquidity preference

Most investors prefer their money to be in cash than in less fungible investments. Cash is on hand to be spent immediately if the need arises, but some investments require time or effort to transfer into spendable form. This is known as liquidity preference. A 10-year loan, for instance, is very liquid compared to a 1-year loan. A 10-year US Treasury bond, however, is liquid because it can easily be sold on the market.

3.6.4.5 A market interest-rate model

A basic interest rate pricing model for an asset

$$i_n = i_r + p_e + rp + lp$$

Assuming perfect information, pe is the same for all participants in the market, and this is identical to:

$$i_n = i_n^* + rp + lp$$

where

$\mathbf{i_n}$ is the nominal interest rate on a given investment

$\mathbf{i_r}$ is the risk-free return to capital

i^*_n = the nominal interest rate on a short-term risk-free liquid bond (such as U.S. Treasury Bills).

rp = a risk premium reflecting the length of the investment and the likelihood the borrower will default

lp = liquidity premium (reflecting the perceived difficulty of converting the asset into money and thus into goods).

3.6.4.6 Interest rate notations

What is commonly referred to as the interest rate in the media is generally the rate offered on overnight deposits by the Central Bank or other authority, annualised.

The total interest on an investment depends on the timescale the interest is calculated on, because interest paid may be compound interest|compounded.

In finance, the effective interest rate is often derived from the yield, a composite measure which takes into account all payments of interest and capital from the investment.

In retail finance, the annual percentage rate and effective annual rate concepts have been introduced to help consumers easily compare different products with different payment structures.

Money market mutual funds quote their rate of interest as the 7 Day SEC Yield.

3.6.5 Interest rates in macroeconomics

3.6.5.1 Output and unemployment

Interest rates are the main determinant of investment on a macroeconomic scale. Broadly speaking, if interest rates increase across the board, then investment decreases, causing a fall in national income. Note that if interest rates are high, that means the broad economy is doing well and thus people will be willing to borrow money at higher interest rates.

Interest rates are set by a government institution, usually a central bank, as the main tool of monetary policy. The institution offers to buy or sell money at the desired rate and, because of their immense size, they are able to effectively set **i^*_n**.

By altering **i^*_n**, the government institution is able to affect the interest rates faced by everyone who wants to borrow money for economic investment. Investment can change rapidly to changes in interest rates, affecting national income.

Through Okun's Law changes in output affect unemployment.

3.6.5.2 Open Market Operations in the United States

The Federal Reserve (often referred to as 'The Fed') implements monetary policy largely by targeting the federal funds rate. This is the rate that banks charge each other for overnight loans of federal funds, which are the reserves held by banks at the Fed. Open market operations are one tool within monetary policy implemented by the Federal Reserve to steer short-term interest rates. Using the power to buy and sell treasury securities, the Open Market Desk at the Federal Reserve Bank of New York can supply the market with dollars by purchasing T-notes, hence increasing the nation's money supply. By increasing the money supply or Aggregate Supply of Funding (ASF), interest rates will fall due to the excess of dollars banks will end up with in their reserves. Excess reserves may be lent in the Federal funds|Fed funds market to other banks, thus driving down rates.

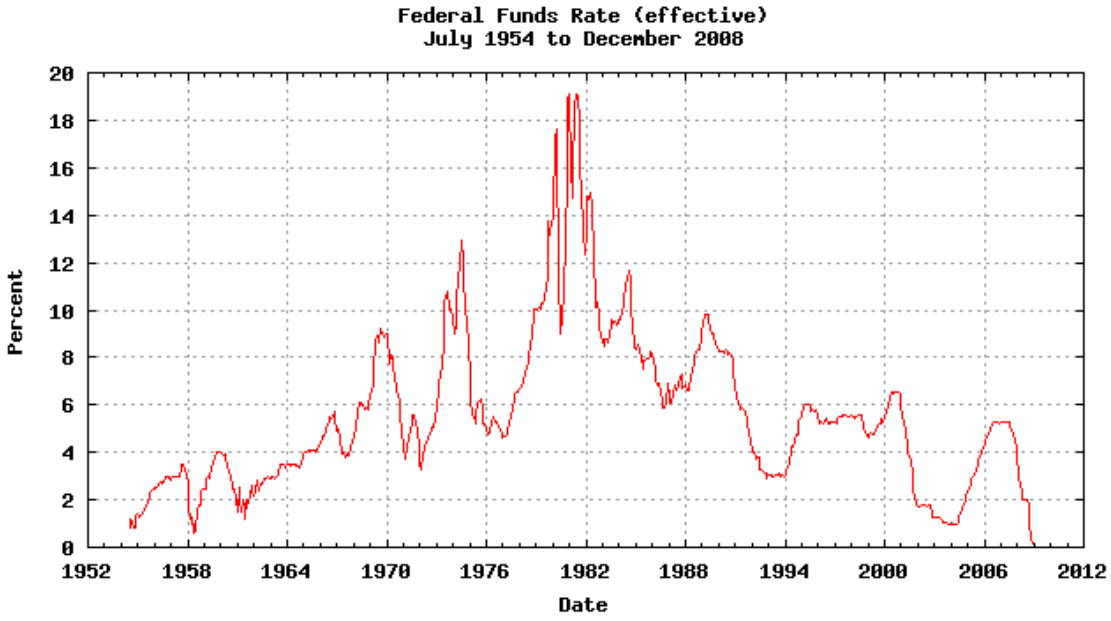


Figure 3.11

The effective federal funds rate charted over fifty years

3.6.5.3 Money and inflation

Loans, bonds, and shares have some of the characteristics of money and are included in the broad money supply.

By setting $\mathbf{i^*_n}$, the government institution can affect the markets to alter the total of loans, bonds and shares issued. Generally speaking, a higher real interest rate reduces the broad money supply.

Through the quantity theory of money, increases in the money supply lead to inflation. This means that interest rates can affect inflation in the future.

3.6.6 Mathematical note

Because interest and inflation are generally given as percentage increases, the formulas above are approximations.

For instance,

$$i_n = i_r + p_e$$

is only approximate. In reality, the relationship is

$$(1 + i_n) = (1 + i_r)(1 + p_e)$$

so

$$i_r = \frac{1 + i_n}{1 + p_e} - 1$$

The formulas in this article are exact if logarithms of index (economics)|indices are used in place of rates.

3.6.7 Notes

1. moneyextra.com Interest Rate History. Retrieved 2008-10-27
2. Sidney Homer, Richard Eugene Sylla, Richard Sylla (1996). A History of Interest Rates. Rutgers University Press. pp. 509. ISBN 0813522889. Retrieved 2008-10-27. (also ISBN 9780813522883)
3. Bundesbank. BBK - Statistics - Time series database. Retrieved 2008-10-27

3.7 The Federal Reserve System

The **Federal Reserve System** (also known as the **Federal Reserve**, and informally as the **Fed**) is the central banking system of the United States. It was created on December 23, 1913 with the enactment of the Federal Reserve Act largely in response to a series of financial panics, particularly a severe Panic of 1907|panic in 1907 [138], [139],

138. "Born of a panic: Forming the Federal Reserve System" (http://www.minneapolisfed.org/pubs/region/88-08/reg888a.cfm). The Federal Reserve Bank of Minneapolis. August 1988.
139. BoG 2006 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2006), pp. 1 "Just before the founding of the Federal Reserve, the nation was plagued with financial crises. At times, these crises led to 'panics,' in which people raced to their banks to withdraw their deposits. A particularly severe panic in 1907 resulted in bank runs that wreaked havoc on the fragile banking system and ultimately led Congress in 1913 to write the Federal Reserve Act. Initially created to address these banking panics, the Federal Reserve is now charged with a number of broader responsibilities, including fostering a sound banking system and a healthy economy."

[140], [141], [142], [143]. Over time, the roles and responsibilities of the Federal Reserve System have expanded and its structure has evolved [144], [145]. Events such as the Great Depression were major factors leading to changes in the system [146].

The Congress established three key objectives for monetary policy—maximum employment, stable prices, and moderate long-term interest rates—in the Federal Reserve Act. The first two objectives are sometimes referred to as the Federal Reserve's dual mandate [147]. Its duties have expanded over the years, and today, according to official Federal Reserve documentation, include conducting the nation's monetary policy, supervising and regulating banking institutions, maintaining the stability of the financial system and providing financial services to depository institutions, the U.S. government, and foreign official institutions [148] . The Fed also conducts research into the economy and releases numerous publications, such as the Beige Book.

The Federal Reserve System's structure is composed of the presidentially appointed Federal Reserve Board of Governors|Board of Governors (or Federal Reserve Board), the Federal Open Market Committee (FOMC), twelve regional Federal Reserve Banks located in major cities throughout the nation, numerous privately owned U.S. member banks and various advisory councils [149], [150], [151]. The FOMC is the committee responsible for setting monetary policy and consists of all seven members of the Board of Governors and the twelve regional bank presidents, though only five bank presidents vote at any given time. The Federal Reserve System has both private and public components, and was designed to serve the interests of both the general public and private bankers. The result is a structure that is considered unique among central banks. It is also unusual in that an entity outside of the central bank, namely the United States Department of the Treasury, creates the currency used [152].

According to the Board of Governors, the Federal Reserve is independent within government in that "its monetary policy decisions do not have to be approved by the

140. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. 1–2
141. Panic of 1907: J.P. Morgan Saves the Day (http://www.u-s-history.com/pages/h952.html)
142. Born of a Panic: Forming the Fed System (http://minneapolisfed.org/publications_papers/pub_display.cfm?id=3816)
143. The Financial Panic of 1907: Running from History (http://www.smithsonianmag.com/history-archaeology/1907_Panic.html)
144. BoG 2006 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2006), pp. 1 "Just before the founding of the Federal Reserve, the nation was plagued with financial crises. At times, these crises led to 'panics,' in which people raced to their banks to withdraw their deposits. A particularly severe panic in 1907 resulted in bank runs that wreaked havoc on the fragile banking system and ultimately led Congress in 1913 to write the Federal Reserve Act. Initially created to address these banking panics, the Federal Reserve is now charged with a number of broader responsibilities, including fostering a sound banking system and a healthy economy."
145. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. 1 "It was founded by Congress in 1913 to provide the nation with a safer, more flexible, and more stable monetary and financial system. Over the years, its role in banking and the economy has expanded."
146. Patrick, Sue C. (1993). Reform of the Federal Reserve System in the Early 1930's: The Politics of Money and Banking. Garland. ISBN 978-0-8153-0970-3.
147. "The Congress established two key objectives for monetary policy-maximum employment and stable prices-in the Federal Reserve Act. These objectives are sometimes referred to as the Federal Reserve's dual mandate" (http://www.federalreserve.gov/faqs/money_12848.htm). Federalreserve.gov. 2012-01-25. Retrieved 2012-04-30.
148. "FRB: Mission" (http://www.federalreserve.gov/generalinfo/mission/default.htm). Federalreserve.gov. 2009-11-06.
149. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. v (See structure)
150. "Federal Reserve Districts" (http://www.federalreserveonline.org/). Federal Reserve Online. Retrieved 2011-08-29.
151. Advisory Councils – http://www.federalreserve.gov/aboutthefed/advisorydefault.htm
152. "Coins and Currency" (http://www.treas.gov/topics/currency/). US Dept of Treasury website. 2011-08-24. Retrieved 2011-08-29.

President or anyone else in the executive or legislative branches of government." Its authority is derived from statutes enacted by the U.S. Congress and the System is subject to congressional oversight. The members of the Board of Governors, including its chairman and vice-chairman, are chosen by the President of the United States|President and confirmed by the Senate. The government also exercises some control over the Federal Reserve by appointing and setting the salaries of the system's highest-level employees. Thus the Federal Reserve has both private and public aspects [153], [154], [155], [156]. The U.S. Government receives all of the system's annual profits, after a statutory dividend of 6% on member banks' capital investment is paid, and an account surplus is maintained. In 2010, the Federal Reserve made a profit of $82 billion and transferred $79 billion to the U.S. Treasury [157]. This was followed at the end of 2011 with a transfer of $77 billion in profits to the U.S. Treasury Department [158].

3.7.1 History

3.7.1.1 Central banking in the United States

In 1690, the Massachusetts Bay Colony became the first to issue paper money in what would become the United States, but soon others began printing their own money as well. The demand for currency in the colonies was due to the scarcity of coins, which had been the primary means of trade [159]. Colonies' paper currencies were used to pay for their expenses, as well as a means to lend money to the colonies' citizens. Paper money quickly became the primary means of exchange within each colony, and it even began to be used in financial transactions with other colonies [160]. However, some of the currencies were not redeemable in gold or silver, which caused them to depreciate [161]. The Currency Act of 1751 set limits on the issuance of Bills of Credit by the New England states and set requirements for the redemption of any bills issued. This Act was in response to the overissuance of bills by Rhode Island, eventually reducing their value to 1/27 of the issuing value [162]. The Currency Act of 1764 completely banned the issuance of Bills of Credit (paper money) in the colonies and the making of such bills

153. "FAQ - Who owns the Federal Reserve?" (http://www.federalreserve.gov/faqs/about_14986.htm). Federal Reserve website.
154. Lapidos, Juliet (2008-09-19). "Is the Fed Private or Public?" (http://www.slate.com/id/2200411/). Slate. Retrieved 2011-08-29.
155. Toma, Mark (February 1, 2010). "Federal Reserve System" (http://eh.net/encyclopedia/article/toma.reserve). EH. Net Encyclopedia. Economic History Association. Retrieved February 27, 2011.
156. "Who owns the Federal Reserve Bank?" (http://www.factcheck.org/askfactcheck/who_owns_the_federal_reserve_bank.html). FactCheck. March 31, 2008. Retrieved February 27, 2011.
157. Appelbaum, Binyamin (March 22, 2011). "Fed Had Profit From Investments of $82 Billion Last Year" (http://www.nytimes.com/2011/03/23/business/economy/23fed.html?_r=1&ref=business). The New York Times. Retrieved March 22, 2011.
158. Fed Gives $77 Billion in Profits to Treasury Department Binyamin Appelbaum http://www.nytimes.com/2012/01/11/business/economy/fed-returns-77-billion-in-profits-to-treasury.html
159. Flamme, Karen. "1995 Annual Report: A Brief History of Our Nation's Paper Money" (http://www.frbsf.org/publications/federalreserve/annual/1995/history.html). Federal Reserve Bank of San Francisco. Retrieved August 26, 2010.
160. Grubb, Farley (March 30, 2006). "Benjamin Franklin And the Birth of a Paper Money Economy" (PDF) (http://www.philadelphiafed.org/publications/economic-education/ben-franklin-and-paper-money-economy.pdf). Federal Reserve Bank of Philadelphia. Retrieved August 26, 2010.
161. Flamme, Karen. "1995 Annual Report: A Brief History of Our Nation's Paper Money" (http://www.frbsf.org/publications/federalreserve/annual/1995/history.html). Federal Reserve Bank of San Francisco. Retrieved August 26, 2010.
162. "Eventually, the paper money was received for taxes at the rate of £27 in bills of credit for £1 in silver, and destroyed." (http://mises.org/freemarket_detail.aspx?control=336). Mises.org. Retrieved 2012-04-30.

legal tender because their depreciation allowed the discharge of debts with depreciated paper at a rate less than contracted for, to the great discouragement and prejudice of the trade and commerce of his Majesty's subjects. The ban proved extremely harmful to the economy of the colonies and inhibited trade, both within the colonies and abroad [163].

The first attempt at a national currency was during the American Revolutionary War. In 1775 the Continental Congress, as well as the states, began issuing paper currency, calling the bills "Early American currency|Continentals". The Continentals were backed only by future tax revenue, and were used to help finance the Revolutionary War. Overprinting, as well as British counterfeiting caused the value of the Continental to diminish quickly. This experience with paper money led the United States to strip the power to issue Bills of Credit (paper money) from a draft of the new Constitution on August 16, 1787 [164], as well as banning such issuance by the various states, and limiting the states ability to make anything but gold or silver coin legal tender [165].

In 1791 the government granted the First Bank of the United States a charter to operate as the U.S. central bank until 1811 [166]. The First Bank of the United States came to an end under James Madison|President Madison because Congress refused to renew its charter. The Second Bank of the United States was established in 1816, and lost its authority to be the central bank of the U.S. twenty years later under Andrew Jackson|President Jackson when its charter expired. Both banks were based upon the Bank of England [167]. Ultimately, a third national bank, known as the Federal Reserve, was established in 1913 and still exists to this day.

163. "The Currency Act of 1764" (http://www.carolana.com/SC/Royal_Colony/The_Currency_Act_1764.html). The Royal Colony of South Carolina. carolana.com. Retrieved January 3, 2012. "This act was not repealed prior to the American Revolution. It had very dire consequences for both North Carolina and South Carolina, both of whose economies were already shaky. The Currency Act was, therefore, a great hardship to trade within and without the colonies and, equally important, proof that the British government put the interests of mother country merchants ahead of theirs. ... The entire text of the Act is provided below." "...and whereas such bills of credit have greatly depreciated in their value, by means whereof debts have been discharged with a much less value than was contracted for, to the great discouragement and prejudice of the trade and commerce of his Majesty's subjects...no act, order, resolution, or vote of assembly, in any of his Majesty's colonies or plantations in America, shall be made, for creating or issuing any paper bills, or bills of credit of any kind or denomination whatsoever, declaring such paper bills, or bills of credit, to be legal tender in payment of any bargains, contracts, debts, dues, or demands whatsoever; and every clause or provision which shall hereafter be inserted in any act, order, resolution, or vote of assembly, contrary to this act, shall be null and void."
164. "Mr. Govr. MORRIS moved to strike out "and emit bills on the credit of the U. States"-If the United States had credit such bills would be unnecessary: if they had not, unjust & useless. ... On the motion for striking out N. H. ay. Mas. ay. Ct ay. N. J. no. Pa. ay. Del. ay. Md. no. Va. ay. N. C. ay. S. C. ay. Geo. ay."" (http://avalon.law.yale.edu/18th_century/debates_816.asp). Avalon.law.yale.edu. Retrieved 2012-04-30.
165. US Constitution Article 1, Section 10. "no state shall ..emit Bills of Credit; make any Thing but gold and silver Coin a Tender in Payment of Debts;"
166. Flamme, Karen. "1995 Annual Report: A Brief History of Our Nation's Paper Money" (http://www.frbsf.org/publications/federalreserve/annual/1995/history.html). Federal Reserve Bank of San Francisco. Retrieved August 26, 2010.
167. British Parliamentary reports on international finance: the Cunliffe Committee and the Macmillan Committee reports. (http://books.google.ca/books?hl=en&id=EkUTaZofJYEC&dq=British+Parliamentary+reports+on+international+finance&printsec=frontcover&source=web&ots=kHxssmPNow&sig=UyopnsiJSHwk152davClyQAMVdw&sa=X&oi=book_result&resnum=1&ct=result#PPA25,M1) Ayer Publishing. 1978. ISBN 978-0-405-11212-6. "description of the founding of Bank of England: 'Its foundation in 1694 arose out the difficulties of the Government of the day in securing subscriptions to State loans. Its primary purpose was to raise and lend money to the State and in consideration of this service it received under its Charter and various Act of Parliament, certain privileges of issuing bank notes. The corporation commenced, with an assured life of twelve years after which the Government had the right to annul its Charter on giving one year's notice. Subsequent extensions of this period coincided generally with the grant of additional loans to the State'"

3.7.1.1.1 Timeline of central banking in the United States

- 1791–1811: First Bank of the United States
- 1811–1816: No central bank
- 1816–1836: Second Bank of the United States
- 1837–1862: Free Bank Era
- 1846–1921: Independent Treasury System
- 1863–1913: National Banks
- 1913–Present: Federal Reserve System

Sources: "Remarks by Chairman Alan Greenspan – "Our banking history"". May 2, 1998., "History of the Federal Reserve"., "Historical Beginnings...The Federal Reserve" (PDF). 1999., Chapter 1

3.7.1.1.2 Creation of First and Second Central Bank

The first U.S. institution with central banking responsibilities was the First Bank of the United States, chartered by Congress and signed into law by President George Washington on February 25, 1791 at the urging of Alexander Hamilton. This was done despite strong opposition from Thomas Jefferson and James Madison, among numerous others. The charter was for twenty years and expired in 1811 under President Madison, because Congress refused to renew it [168].

In 1816, however, Madison revived it in the form of the Second Bank of the United States. Years later, early renewal of the bank's charter became the primary issue in the reelection of President Andrew Jackson. After Jackson, who was opposed to the central bank, was reelected, he pulled the government's funds out of the bank. Nicholas Biddle (banker)|Nicholas Biddle, President of the Second Bank of the United States, responded by contracting the money supply to pressure Jackson to renew the bank's charter forcing the country into a recession, which the bank blamed on Jackson's policies. Interestingly, Jackson is the only President to completely pay off the national debt. The bank's charter was not renewed in 1836. From 1837 to 1862, in the Free Banking Era there was no formal central bank. From 1862 to 1913, a system of national banks was instituted by the 1863 National Banking Act. A series of bank panics, in 1873, 1893, and 1907 [169], [170], [171], provided strong demand for the creation of a centralized banking system.

168. Johnson, Roger (December 1999). "Historical Beginnings... The Federal Reserve" (http://www.bos.frb.org/about/pubs/begin.pdf). Federal Reserve Bank of Boston. p. 8. Retrieved 2010-07-23.
169. Panic of 1907: J.P. Morgan Saves the Day (http://www.u-s-history.com/pages/h952.html)
170. Born of a Panic: Forming the Fed System (http://minneapolisfed.org/publications_papers/pub_display.cfm?id=3816)
171. The Financial Panic of 1907: Running from History (http://www.smithsonianmag.com/history-archaeology/1907_Panic.html)

3.7.1.1.3 Creation of Third Central Bank

The main motivation for the third central banking system came from the Panic of 1907, which caused renewed demands for banking and currency reform [172], [173], [174], [175]. During the last quarter of the 19th century and the beginning of the 20th century the United States economy went through a series of financial panics [176]. According to many economists, the previous national banking system had two main weaknesses: an inelastic currency and a lack of liquidity [177]. In 1908, Congress enacted the Aldrich-Vreeland Act, which provided for an emergency currency and established the National Monetary Commission to study banking and currency reform [178]. The National Monetary Commission returned with recommendations which were repeatedly rejected by Congress. A revision crafted during a secret meeting on Jekyll Island by Senator Aldrich and representatives of the nation's top finance and industrial groups later became the basis of the Federal Reserve Act [179], [180]. The House voted on December 22, 1913 with 298 yeas to 60 nays and 76 not voting and the Senate voting on December 23, 1913 with 43 yeas to 25 nays and 27 not voting [181]. President Woodrow Wilson signed the bill later that day at 6:02pm [182].

3.7.1.1.4 Federal Reserve Act

The head of the bipartisan National Monetary Commission was financial expert and Senate Republican Party (United States)|Republican leader Nelson Aldrich. Aldrich set up two commissions—one to study the American monetary system in depth and the other, headed by Aldrich himself, to study the European central banking systems and report on them [183]. Aldrich went to Europe opposed to centralized banking, but after viewing Germany's monetary system he came away believing that a centralized bank

172. Panic of 1907: J.P. Morgan Saves the Day (http://www.u-s-history.com/pages/h952.html)
173. Born of a Panic: Forming the Fed System (http://minneapolisfed.org/publications_papers/pub_display.cfm?id=3816)
174. The Financial Panic of 1907: Running from History (http://www.smithsonianmag.com/history-archaeology/1907_Panic.html)
175. Herrick, Myron (March 1908). "The Panic of 1907 and Some of Its Lessons" (http://links.jstor.org/sici?sici=0002-7162(190803)31%3C8%3ATPO1AS%3E2.0.CO%3B2-7). Annals of the American Academy of Political and Social Science. Retrieved 2011-08-29.
176. Flaherty, Edward (June 16, 1997, updated August 24, 2001). "A Brief History of Central Banking in the United States" (http://odur.let.rug.nl/~usa/E/usbank/bank00.htm). Netherlands: University of Groningen.
177. Flaherty, Edward (June 16, 1997, updated August 24, 2001). "A Brief History of Central Banking in the United States" (http://odur.let.rug.nl/~usa/E/usbank/bank00.htm). Netherlands: University of Groningen.
178. Whithouse, Michael (May 1989). "Paul Warburg's Crusade to Establish a Central Bank in the United States" (http://www.minneapolisfed.org/pubs/region/89-05/reg895d.cfm). The Federal Reserve Bank of Minneapolis. Retrieved 2011-08-29.
179. "For years members of the Jekyll Island Club would recount the story of the secret meeting and by the 1930s the narrative was considered a club tradition." (http://www.jekyllislandhistory.com/federalreserve.shtml). Jekyllislandhistory.com. Retrieved 2012-04-30.
180. "Papers of Frank A.Vanderlip "I wish I could sit down with you and half a dozen others in the sort of conference that created the Federal Reserve Act"" (PDF) (http://fraser.stlouisfed.org/chfrs/record.php?id=5653). Retrieved 2012-04-30.
181. "The Federal Reserve Act of 1913 - A Legislative History" (http://www.llsdc.org/FRA-LH/). Llsdc.org. Retrieved 2012-04-30.
182. "Affixes His Signature at 6:02 P.M., Using Four Gold Pens." (http://query.nytimes.com/mem/archive-free/pdf?res=9B04E3DB173DE633A25757C2A9649D946296D6CF). New York Times. 1913-12-24. Retrieved 2012-04-30.
183. Whithouse, Michael (May 1989). "Paul Warburg's Crusade to Establish a Central Bank in the United States" (http://www.minneapolisfed.org/pubs/region/89-05/reg895d.cfm). The Federal Reserve Bank of Minneapolis. Retrieved 2011-08-29.

was better than the government-issued bond system that he had previously supported.

In early November 1910, Aldrich met with five well known members of the New York banking community to devise a central banking bill. Paul Warburg, an attendee of the meeting and longtime advocate of central banking in the U.S., later wrote that Aldrich was "bewildered at all that he had absorbed abroad and he was faced with the difficult task of writing a highly technical bill while being harassed by the daily grind of his parliamentary duties" [184]. After ten days of deliberation, the bill, which would later be referred to as the "Aldrich Plan", was agreed upon. It had several key components, including a central bank with a Washington-based headquarters and fifteen branches located throughout the U.S. in geographically strategic locations, and a uniform elastic currency based on gold and commercial paper. Aldrich believed a central banking system with no political involvement was best, but was convinced by Warburg that a plan with no public control was not politically feasible [185]. The compromise involved representation of the public sector on the Board of Directors [186].

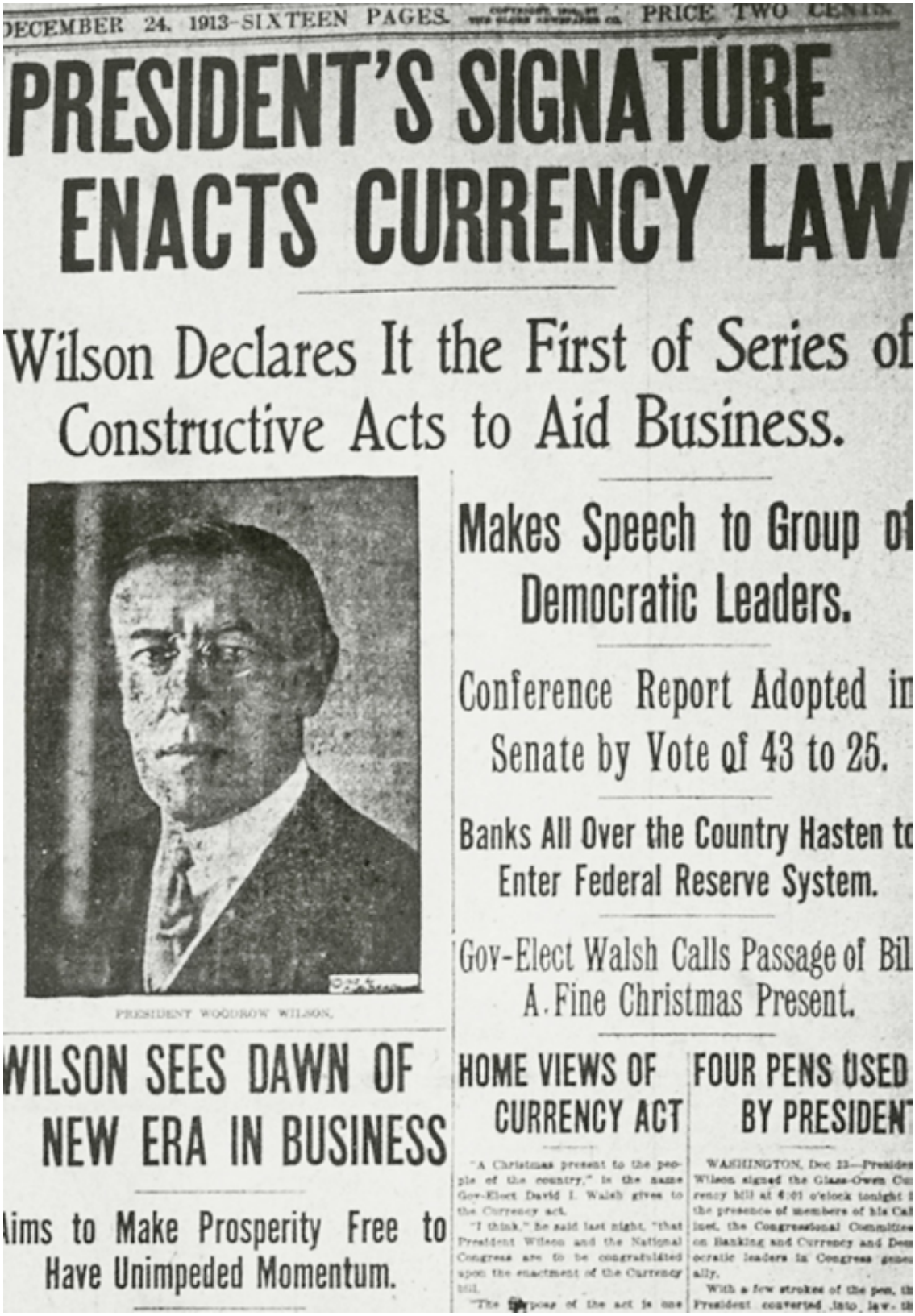
Aldrich's bill met much opposition from politicians. Critics charged Aldrich of being biased due to his close ties to wealthy bankers such as J. P. Morgan and John D. Rockefeller, Jr., Aldrich's son-in-law. Most Republicans favored the Aldrich Plan [187], but it lacked enough support in Congress to pass because rural and western states viewed it as favoring the "eastern establishment" [188]. In contrast, progressive Democrats favored a reserve system owned and operated by the government; they believed that public ownership of the central bank would end Wall Street's control of the American currency supply [189]. Conservative Democrats fought for a privately owned, yet decentralized, reserve system, which would still be free of Wall Street's control [190].

The original Aldrich Plan was dealt a fatal blow in 1912, when Democrats won the White House and Congress [191]. Nonetheless, President Woodrow Wilson believed that the Aldrich plan would suffice with a few modifications. The plan became the basis for the Federal Reserve Act, which was proposed by Senator Robert Owen in May 1913. The primary difference between the two bills was the transfer of control of the Board of Directors (called the Federal Open Market Committee in the Federal Reserve Act) to

184. "Paul Warburg's Crusade to Establish a Central Bank in the United States" (http://www.minneapolisfed.org/publications_papers/pub_display.cfm?id=3815). The Federal Reserve Bank of Minneapolis.
185. "Paul Warburg's Crusade to Establish a Central Bank in the United States" (http://www.minneapolisfed.org/publications_papers/pub_display.cfm?id=3815). The Federal Reserve Bank of Minneapolis.
186. "America's Unknown Enemy: Beyond Conspiracy" (http://www.cooperativeindividualism.org/aier_on_conspiracy_04.html). American Institute of Economic Research.
187. "America's Unknown Enemy: Beyond Conspiracy" (http://www.cooperativeindividualism.org/aier_on_conspiracy_04.html). American Institute of Economic Research.
188. "Born of a panic: Forming the Federal Reserve System" (http://www.minneapolisfed.org/pubs/region/88-08/reg888a.cfm). The Federal Reserve Bank of Minneapolis. August 1988.
189. "America's Unknown Enemy: Beyond Conspiracy" (http://www.cooperativeindividualism.org/aier_on_conspiracy_04.html). American Institute of Economic Research.
190. "America's Unknown Enemy: Beyond Conspiracy" (http://www.cooperativeindividualism.org/aier_on_conspiracy_04.html). American Institute of Economic Research.
191. "Paul Warburg's Crusade to Establish a Central Bank in the United States" (http://www.minneapolisfed.org/publications_papers/pub_display.cfm?id=3815). The Federal Reserve Bank of Minneapolis.

the government [192], [193]. The bill passed Congress on December 23, 1913 [194], [195], on a mostly partisan basis, with most Democrats voting "yea" and most Republicans voting "nay" [196].

192. "Born of a panic: Forming the Federal Reserve System" (http://www.minneapolisfed.org/pubs/region/88-08/reg888a.cfm). The Federal Reserve Bank of Minneapolis. August 1988.
193. Johnson, Roger (December 1999). "Historical Beginnings... The Federal Reserve" (http://www.bos.frb.org/about/pubs/begin.pdf). Federal Reserve Bank of Boston. p. 8. Retrieved 2010-07-23.
194. "Congressional Record - House" (http://www.scribd.com/doc/17411624/Congressional-Record-Dec-22-1913-pg1465). Scribd.com. 1913-12-22. p. 1465. Retrieved 2011-08-29.
195. "Congressional Record - Senate" (http://www.scribd.com/doc/17234309/Congressional-Record-Dec-23-1913). Scribd.com. 1913-12-23. p. 1468. Retrieved 2011-08-29.
196. Johnson, Roger (December 1999). "Historical Beginnings... The Federal Reserve" (http://www.bos.frb.org/about/pubs/begin.pdf). Federal Reserve Bank of Boston. p. 8. Retrieved 2010-07-23.



DECEMBER 24, 1913—SIXTEEN PAGES. PRICE TWO CENTS

PRESIDENT'S SIGNATURE ENACTS CURRENCY LAW

Wilson Declares It the First of Series of Constructive Acts to Aid Business.

PRESIDENT WOODROW WILSON.

WILSON SEES DAWN OF NEW ERA IN BUSINESS

Aims to Make Prosperity Free to Have Unimpeded Momentum.

Makes Speech to Group of Democratic Leaders.

Conference Report Adopted in Senate by Vote of 43 to 25.

Banks All Over the Country Hasten to Enter Federal Reserve System.

Gov-Elect Walsh Calls Passage of Bill A Fine Christmas Present.

HOME VIEWS OF CURRENCY ACT

"A Christmas present to the people of the country," is the name Gov-Elect David I. Walsh gives to the Currency act.

"I think," he said last night, "that President Wilson and the National Congress are to be congratulated upon the enactment of the Currency bill.

"The purpose of the act is one

FOUR PENS USED BY PRESIDENT

WASHINGTON, Dec 23—President Wilson signed the Glass-Owen Currency bill at 6:01 o'clock tonight in the presence of members of his Cabinet, the Congressional Committees on Banking and Currency and Democratic leaders in Congress generally.

With a few strokes of the pen, the President converted into law the

Figure 3.12 Newspaper clipping, December 24, 1913

3.7.1.2 Key laws

Key laws affecting the Federal Reserve have been [197]:

197. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. 2

- Federal Reserve Act
- Glass–Steagall Act
- Banking Act of 1935
- Employment Act of 1946
- Federal Reserve-Treasury Department Accord of 1951
- Bank Holding Company Act of 1956 and the amendments of 1970
- Federal Reserve Reform Act of 1977
- International Banking Act of 1978
- Full Employment and Balanced Growth Act (1978)
- Depository Institutions Deregulation and Monetary Control Act (1980)
- Financial Institutions Reform, Recovery and Enforcement Act of 1989
- Federal Deposit Insurance Corporation Improvement Act of 1991
- Gramm-Leach-Bliley Act (1999)
- Financial Services Regulatory Relief Act (2006)
- Emergency Economic Stabilization Act (2008)
- Dodd-Frank Wall Street Reform and Consumer Protection Act (2010)

3.7.2 Purpose

The primary motivation for creating the Federal Reserve System was to address banking panics [198]. Other purposes are stated in the Federal Reserve Act, such as "to furnish an elastic currency, to afford means of rediscounting commercial paper, to establish a more effective supervision of banking in the United States, and for other purposes" [199]. Before the founding of the Federal Reserve, the United States underwent several financial crises. A particularly severe crisis in 1907 led Congress to enact the Federal Reserve Act in 1913. Today the Federal Reserve System has broader responsibilities than only ensuring the stability of the financial system [200].

Current functions of the Federal Reserve System include [201], [202]:

- To address the problem of banking panics
- To serve as the central bank for the United States
- To strike a balance between private interests of banks and the centralized responsibility of government
  - To supervise and regulate banking institutions
  - To protect the credit rights of consumers

198. BoG 2006 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2006), pp. 1 "Just before the founding of the Federal Reserve, the nation was plagued with financial crises. At times, these crises led to 'panics,' in which people raced to their banks to withdraw their deposits. A particularly severe panic in 1907 resulted in bank runs that wreaked havoc on the fragile banking system and ultimately led Congress in 1913 to write the Federal Reserve Act. Initially created to address these banking panics, the Federal Reserve is now charged with a number of broader responsibilities, including fostering a sound banking system and a healthy economy."
199. "Federal Reserve Act" (http://web.archive.org/web/20080517044141/http://www.federalreserve.gov/GeneralInfo/fract/). Board of Governors of the Federal Reserve System. May 14, 2003. Archived from the original on May 17, 2008.
200. BoG 2006 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2006), pp. 1
201. "FRB: Mission" (http://www.federalreserve.gov/generalinfo/mission/default.htm). Federalreserve.gov. 2009-11-06.
202. BoG 2006 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2006), pp. 1

- To manage the nation's money supply through monetary policy to achieve the sometimes-conflicting goals of
  - maximum employment
  - stable prices, including prevention of either inflation or deflation [203]
  - moderate long-term interest rates
- To maintain the stability of the financial system and contain systemic risk in financial markets
- To provide financial services to depository institutions, the U.S. government, and foreign official institutions, including playing a major role in operating the nation's payments system
  - To facilitate the exchange of payments among regions
  - To respond to local liquidity needs
- To strengthen U.S. standing in the world economy

3.7.2.1 Addressing the problem of bank panics

Bank runs occur because banking institutions in the United States are only required to hold a fraction of their depositors' money in reserve. This practice is called fractional-reserve banking. As a result, most banks invest the majority of their depositors' money. On rare occasion, too many of the bank's customers will withdraw their savings and the bank will need help from another institution to continue operating. Bank runs can lead to a multitude of social and economic problems. The Federal Reserve was designed as an attempt to prevent or minimize the occurrence of bank runs, and possibly act as a lender of last resort if a bank run does occur. Many economists, following Milton Friedman, believe that the Federal Reserve inappropriately refused to lend money to small banks during the bank runs of 1929 [204].

3.7.2.1.1 Elastic currency

One way to prevent bank runs is to have a money supply that can expand when money is needed. The term "elastic currency" in the Federal Reserve Act does not just mean the ability to expand the money supply, but also to contract it. Some economic theories have been developed that support the idea of expanding or shrinking a money supply as economic conditions warrant. Elastic currency is defined by the Federal Reserve as [205]:

203. Remarks by Governor Ben S. Bernanke Before the National Economists Club, Washington, D.C. (2002-11-21). "Deflation: Making Sure "It" Doesn't Happen Here" (http://www.federalreserve.gov/BOARDDOCS/SPEECHES/2002/20021121/default.htm). Board of Governors of the Federal Reserve System. Retrieved 2011-10-29.
204. Bernanke, Ben (2003-10-24). "Remarks by Governor Ben S. Bernanke: At the Federal Reserve Bank of Dallas Conference on the Legacy of Milton and Rose Friedman's Free to Choose, Dallas, Texas" (text) (http://www.federalreserve.gov/boardDocs/Speeches/2003/20031024/default.htm).
205. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. 113

Currency that can, by the actions of the central monetary authority, expand or contract in amount warranted by economic conditions.

Monetary policy of the Federal Reserve System is based partially on the theory that it is best overall to expand or contract the money supply as economic conditions change.

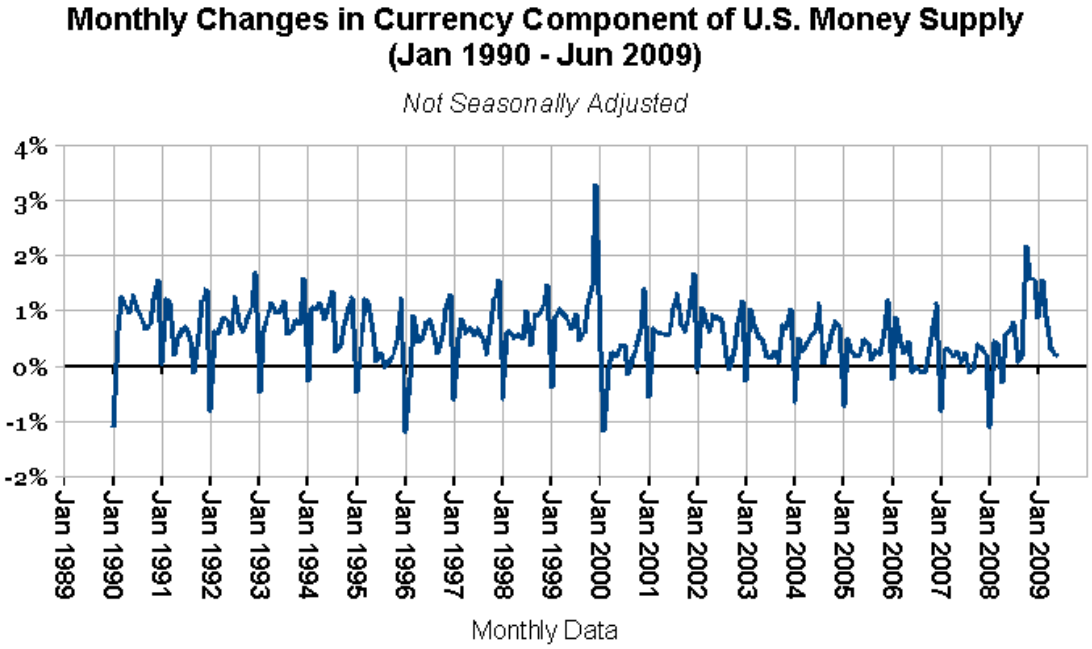


Figure 3.13 The monthly changes in the currency component of the U.S. money supply show currency being added into (% change greater than zero) and removed from circulation (% change less than zero). The most noticeable changes occur around the Christmas holiday shopping season as new currency is created so people can make withdrawals at banks, and then removed from circulation afterwards, when less cash is demanded.

3.7.2.1.2 Check Clearing System

Because some banks refused to clear checks from certain others during times of economic uncertainty, a check-clearing system was created in the Federal Reserve system. It is briefly described in The Federal Reserve System—Purposes and Functions as follows [206]:

By creating the Federal Reserve System, Congress intended to eliminate the severe financial crises that had periodically swept the nation, especially the sort of financial panic that occurred in 1907. During that episode, payments were disrupted throughout the country because many banks and clearinghouses refused to clear checks drawn on certain other banks, a practice that contributed to the failure of otherwise solvent banks. To address these problems, Congress gave the Federal Reserve System the authority to establish a nationwide check-clearing system. The System, then, was to provide not only an elastic currency—that is, a currency that would expand or shrink in amount as economic conditions warranted—but also an efficient and equitable check-collection system.

206. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. 83

3.7.2.1.3 Lender of last resort

In the United States, the Federal Reserve serves as the lender of last resort to those institutions that cannot obtain credit elsewhere and the collapse of which would have serious implications for the economy. It took over this role from the private sector "clearing houses" which operated during the Free Banking Era; whether public or private, the availability of liquidity was intended to prevent bank runs.

3.7.2.1.4 Emergencies

According to the Federal Reserve Bank of Minneapolis, "the Federal Reserve has the authority and financial resources to act as 'lender of last resort' by extending credit to depository institutions or to other entities in unusual circumstances involving a national or regional emergency, where failure to obtain credit would have a severe adverse impact on the economy." [207] The Federal Reserve System's role as lender of last resort has been criticized because it shifts the risk and responsibility away from lenders and borrowers and places it on others in the form of inflation [208].

3.7.2.1.5 Fluctuations

Through its discount and credit operations, Reserve Banks provide liquidity to banks to meet short-term needs stemming from seasonal fluctuations in deposits or unexpected withdrawals. Longer term liquidity may also be provided in exceptional circumstances. The rate the Fed charges banks for these loans is the discount rate (officially the primary credit rate).

By making these loans, the Fed serves as a buffer against unexpected day-to-day fluctuations in reserve demand and supply. This contributes to the effective functioning of the banking system, alleviates pressure in the reserves market and reduces the extent of unexpected movements in the interest rates [209]. For example, on September 16, 2008, the Federal Reserve Board authorized an $85 billion loan to stave off the bankruptcy of international insurance giant American International Group (AIG) [210] [211].

207. lender of last resort (http://www.minneapolisfed.org/glossary.cfm?js=0#l), Federal Reserve Bank of Minneapolis, retrieved May 21, 2010
208. Griffin, G. Edward (2002). The Creature from Jekyll Island: A Second Look at the Federal Reserve. American Media. ISBN 978-0-912986-39-5.
209. "The Federal Reserve, Monetary Policy and the Economy—Everyday Economics—FRB Dallas" (http://www.dallasfed.org/educate/everyday/ev4.html). Dallasfed.org. Retrieved 2011-08-29.
210. "Press Release: Federal Reserve Board, with full support of the Treasury Department, authorizes the Federal Reserve Bank of New York to lend up to $85 billion to the American International Group (AIG)" (http://www.federalreserve.gov/newsevents/press/other/20080916a.htm). Board of Governors of the Federal Reserve. 2008-09-16. Retrieved 2011-08-29.
211. Andrews, Edmund L.; de la Merced, Michael J.; Walsh, Mary Williams (2008-09-16). "Fed's $85 Billion Loan Rescues Insurer" (http://www.nytimes.com/2008/09/17/business/17insure.html?hp). The New York Times. Retrieved 2008-09-17.

3.7.2.2 Central bank

In its role as the central bank of the United States, the Fed serves as a banker's bank and as the government's bank. As the banker's bank, it helps to assure the safety and efficiency of the payments system. As the government's bank, or fiscal agent, the Fed processes a variety of financial transactions involving trillions of dollars. Just as an individual might keep an account at a bank, the U.S. Treasury keeps a checking account with the Federal Reserve, through which incoming federal tax deposits and outgoing government payments are handled. As part of this service relationship, the Fed sells and redeems U.S. government securities such as savings bonds and Treasury bills, notes and bonds. It also issues the nation's coin and paper currency. The U.S. Treasury, through its Bureau of the Mint and Bureau of Engraving and Printing, actually produces the nation's cash supply and, in effect, sells the paper currency to the Federal Reserve Banks at manufacturing cost, and the coins at face value. The Federal Reserve Banks then distribute it to other financial institutions in various ways [212]. During the Fiscal Year 2008, the Bureau of Engraving and Printing delivered 7.7 billion notes at an average cost of 6.4 cents per note [213].

3.7.2.2.1 Federal funds

Federal funds are the reserve balances (also called federal reserve accounts) that private banks keep at their local Federal Reserve Bank [214], [215]. These balances are the namesake reserves of the Federal Reserve System. The purpose of keeping funds at a Federal Reserve Bank is to have a mechanism for private banks to lend funds to one another. This market for funds plays an important role in the Federal Reserve System as it is what inspired the name of the system and it is what is used as the basis for monetary policy. Monetary policy works partly by influencing how much interest the private banks charge each other for the lending of these funds.

Federal reserve accounts contain federal reserve credit, which can be converted into federal reserve notes. Private banks maintain their bank reserves in federal reserve accounts.

212. "How Currency Gets into Circulation" (http://www.newyorkfed.org/aboutthefed/fedpoint/fed01.html). Federal Reserve Bank of New York. June 2008. Retrieved 2011-08-29.
213. "Annual Production Figures" (http://www.bep.treas.gov/uscurrency/annualproductionfigures.html). Bureau of Engraving and Printing. Retrieved 2011-08-29.
214. "Federal Funds" (http://www.newyorkfed.org/aboutthefed/fedpoint/fed15.html). Federal Reserve Bank of New York. August 2007. Retrieved 2011-08-29.
215. Cook, Timothy Q.; Laroche, Robert K., eds (1993). "Instruments of the Money Market" (http://www.richmondfed.org/publications/research/special_reports/instruments_of_the_money_market/pdf/full_publication.pdf). Federal Reserve Bank of Richmond. Retrieved 2011-08-29.

3.7.2.3 Balance between private banks and responsibility of governments

The system was designed out of a compromise between the competing philosophies of privatization and government regulation. In 2006 Donald L. Kohn, vice chairman of the Board of Governors, summarized the history of this compromise [216]:

Agrarian and progressive interests, led by William Jennings Bryan, favored a central bank under public, rather than banker, control. But the vast majority of the nation's bankers, concerned about government intervention in the banking business, opposed a central bank structure directed by political appointees.

The legislation that Congress ultimately adopted in 1913 reflected a hard-fought battle to balance these two competing views and created the hybrid public-private, centralized-decentralized structure that we have today.

In the current system, private banks are for-profit businesses but government regulation places restrictions on what they can do. The Federal Reserve System is a part of government that regulates the private banks. The balance between privatization and government involvement is also seen in the structure of the system. Private banks elect members of the board of directors at their regional Federal Reserve Bank while the members of the Board of Governors are selected by the President of the United States and confirmed by the Senate. The private banks give input to the government officials about their economic situation and these government officials use this input in Federal Reserve policy decisions. In the end, private banking businesses are able to run a profitable business while the U.S. government, through the Federal Reserve System, oversees and regulates the activities of the private banks.

3.7.2.3.1 Government regulation and supervision

Federal Banking Agency Audit Act enacted in 1978 as Public Law 95-320 and Section 31 USC 714 of U.S. Code establish that the Federal Reserve may be audited by the Government Accountability Office (GAO) [217]. The GAO has authority to audit check-processing, currency storage and shipments, and some regulatory and bank examination functions, however there are restrictions to what the GAO may in fact audit. Audits of the Reserve Board and Federal Reserve banks may not include:

216. "FRB: Speech-Kohn, The Evolving Role of the Federal Reserve Banks" (http://www.federalreserve.gov/newsevents/speech/kohn20061103a.htm). Federalreserve.gov. 2006-11-03. Retrieved 2011-08-29.
217. Federal Reserve System (http://www.federalreserve.gov/faqs/about_12784.htm). Retrieved 2013-09-30. "The Board of Governors, the Federal Reserve Banks, and the Federal Reserve System as a whole are all subject to several levels of audit and review. Under the Federal Banking Agency Audit Act (enacted in 1978 as Public Law 95-320), which authorizes the Comptroller General of the United States to audit the Federal Reserve System, the Government Accountability Office (GAO) has conducted numerous reviews of Federal Reserve activities"

1. transactions for or with a foreign central bank or government, or nonprivate international financing organization;
2. deliberations, decisions, or actions on monetary policy matters;
3. transactions made under the direction of the Federal Open Market Committee; or
4. a part of a discussion or communication among or between members of the Board of Governors and officers and employees of the Federal Reserve System related to items (1), (2), or (3) [218], [219].

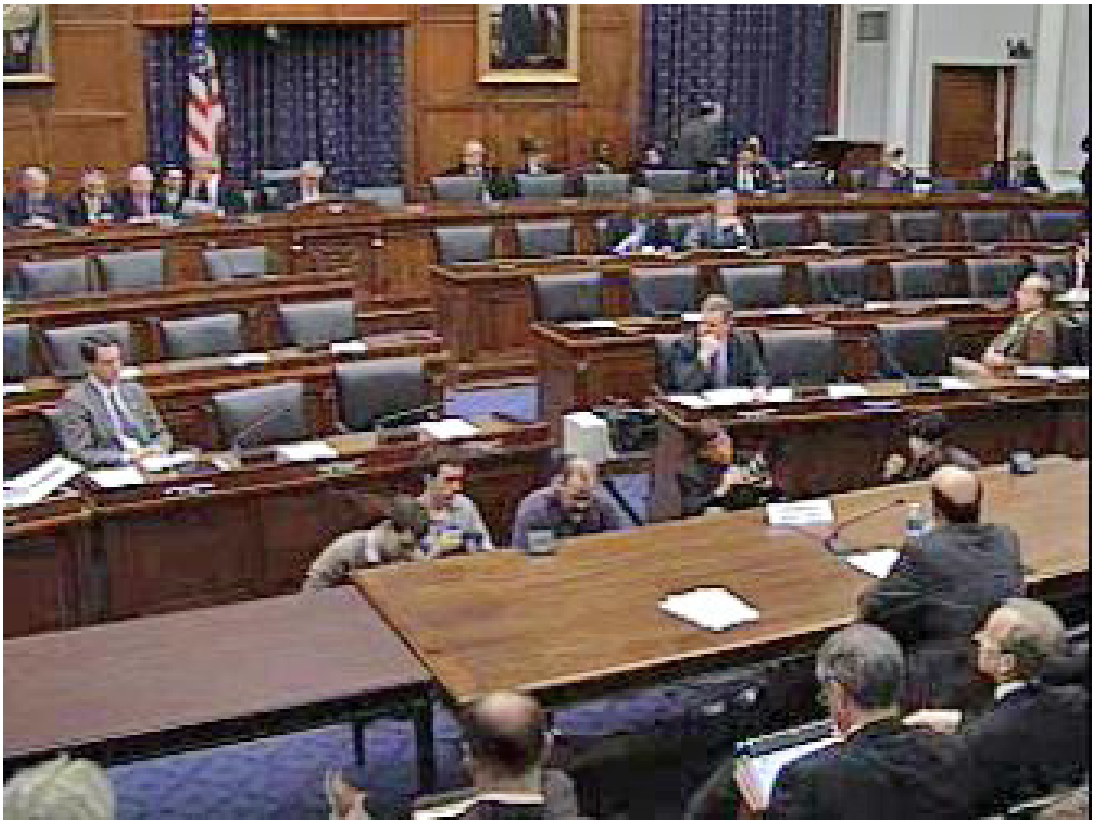


Figure 3.14

Ben Bernanke (lower-right), Chairman of the Federal Reserve Board of Governors, at a House Financial Services Committee hearing on February 10, 2009. Members of the Board frequently testify before congressional committees such as this one. The Senate equivalent of the House Financial Services Committee is the Senate Committee on Banking, Housing, and Urban Affairs.

The financial crisis which began in 2007, corporate bailouts, and concerns over the Fed's secrecy have brought renewed concern regarding ability of the Fed to effectively

218. "Federal Reserve System Current and Future Challenges Require System wide Attention: Statement of Charles A. Bowsher" (http://www.gao.gov/archive/1996/gg96159t.pdf). United States General Accounting Office. 1996-07-26. Retrieved 2011-08-29. Under the Federal Banking Agency Audit Act, 31 U.S.C. section 714(b), our audits of the Federal Reserve Board and Federal Reserve banks may not include (1) transactions for or with a foreign central bank or government, or nonprivate international financing organization; (2) deliberations, decisions, or actions on monetary policy matters; (3) transactions made under the direction of the Federal Open Market Committee; or (4) a part of a discussion or communication among or between members of the Board of Governors and officers and employees of the Federal Reserve System related to items (1), (2), or (3). See Federal Reserve System Audits: Restrictions on GAO's Access (GAO/T-GGD-94-44), statement of Charles A. Bowsher. The real purpose of this historic "duck hunt" was to formulate a plan for U.S. banking and currency reform that Aldrich could present to Congress.
219. "About The Audit" (http://www.auditthefed.com/about-the-audit/). Audit the Fed Coalition. 2009. Retrieved 2011-08-29. Although the Fed is currently audited by outside agencies, these audits are not thorough and do not include monetary policy decisions or agreements with foreign central banks and governments. The crucial issue of Federal Reserve transparency requires an analysis of 31 USC 714, the section of U.S. Code which establishes that the Federal Reserve may be audited by the Government Accountability Office (GAO), but which simultaneously severely restricts what the GAO may in fact audit. Essentially, the GAO is only allowed to audit check-processing, currency storage and shipments, and some regulatory and bank examination functions, etc. The most important matters, which directly affect the strength of the dollar and the health of the financial system, are immune from oversight.

manage the national monetary system [220]. A July 2009 Gallup Poll found only 30% Americans thought the Fed was doing a good or excellent job, a rating even lower than that for the Internal Revenue Service, which drew praise from 40% [221]. The Federal Reserve Transparency Act was introduced by congressman Ron Paul in order to obtain a more detailed audit of the Fed. The Fed has since hired Linda Robertson who headed the Washington lobbying office of Enron Corp. and was adviser to all three of the Clinton administration's Treasury secretaries [222], [223], [224], [225].

The Board of Governors in the Federal Reserve System has a number of supervisory and regulatory responsibilities in the U.S. banking system, but not complete responsibility. A general description of the types of regulation and supervision involved in the U.S. banking system is given by the Federal Reserve [226]:

The Board also plays a major role in the supervision and regulation of the U.S. banking system. It has supervisory responsibilities for state-chartered banks [227] that are members of the Federal Reserve System, bank holding companies (companies that control banks), the foreign activities of member banks, the U.S. activities of foreign banks, and Edge Act and "agreement corporations" (limited-purpose institutions that engage in a foreign banking business). The Board and, under delegated authority, the Federal Reserve Banks, supervise approximately 900 state member banks and 5,000 bank holding companies. Other federal agencies also serve as the primary federal supervisors of commercial banks; the Office of the Comptroller of the Currency supervises national banks, and the Federal Deposit Insurance Corporation supervises state banks that are not members of the Federal Reserve System.

Some regulations issued by the Board apply to the entire banking industry, whereas others apply only to member banks, that is, state banks that have chosen to join the Federal Reserve System and national banks, which by law must be members of the System. The Board also issues regulations to carry out major federal laws governing consumer credit protection, such as the Truth in Lending, Equal Credit Opportunity, and Home Mortgage Disclosure Acts. Many of these consumer protection regulations apply to various lenders outside the banking industry as well as to banks.

Members of the Board of Governors are in continual contact with other policy makers in government. They frequently testify before congressional committees on the economy, monetary policy, banking supervision and regulation, consumer credit protection, financial markets, and other matters.

220. "An Open Letter to the U.S. House of Representatives" (http://www.auditthefed.com/). Audit the Fed Coalition. 2009. Retrieved 2011-08-29.
221. Reddy, Sudeep (2009-11-23). "Congress Grows Fed Up Despite Central Bank's Push" (http://online.wsj.com/article/SB125876136781358287.html). The Wall Street Journal. Retrieved 2011-08-29.The Fed's ability to influence Congress is diluted by public anger. A July 2009 Gallup Poll found only 30% Americans thought the Fed was doing a good or excellent job, a rating even lower than that for the Internal Revenue Service, which drew praise from 40%.
222. Schmidt, Robert (2009-06-05). "Fed Intends to Hire Lobbyist in Campaign to Buttress Its Image" (http://www.bloomberg.com/apps/news?pid=20601087&sid=aZjQKyLci1AM). Bloomberg. Retrieved 2011-08-29.
223. "Board Actions taken during the week ending July 25, 2009" (http://www.federalreserve.gov/releases/h2/20090725/default.htm). Retrieved 2011-08-29.
224. "VP Linda Robertson to join Federal Reserve System" (http://gazette.jhu.edu/2009/06/08/vp-linda-robertson-to-join-federal-reserve-system/). The Johns Hopkins University. Retrieved 2011-08-29.
225. Mark Calabria, Bert Ely, Congressman Ron Paul, Gilbert Schwartz. (2009-06-24). Ron Paul: Bringing Transparency to the Federal Reserve (http://fora.tv/2009/06/24/Ron_Paul_Bringing_Transparency_to_the_Federal_Reserve). Cato Institute: FORA.tv.. Event occurs at 00:11:04. Retrieved 2011-08-29.
226. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. 4–5
227. See example: "Advantages of Being/Becoming a State Chartered Bank" (http://www.state.ar.us/bank/benefits_advantages.html). Arkansas State Bank Department. 2009-03-31. Retrieved 2011-08-29.

The Board has regular contact with members of the President's Council of Economic Advisers and other key economic officials. The Chairman also meets from time to time with the President of the United States and has regular meetings with the Secretary of the Treasury. The Chairman has formal responsibilities in the international arena as well.

3.7.2.3.2 Preventing asset bubbles

The board of directors of each Federal Reserve Bank District also has regulatory and supervisory responsibilities. For example, a member bank (private bank) is not permitted to give out too many loans to people who cannot pay them back. This is because too many defaults on loans will lead to a bank run. If the board of directors has judged that a member bank is performing or behaving poorly, it will report this to the Board of Governors. This policy is described in United States Code [228]:

Each Federal reserve bank shall keep itself informed of the general character and amount of the loans and investments of its member banks with a view to ascertaining whether undue use is being made of bank credit for the speculative carrying of or trading in securities, real estate, or commodities, or for any other purpose inconsistent with the maintenance of sound credit conditions; and, in determining whether to grant or refuse advances, rediscounts, or other credit accommodations, the Federal reserve bank shall give consideration to such information. The chairman of the Federal reserve bank shall report to the Board of Governors of the Federal Reserve System any such undue use of bank credit by any member bank, together with his recommendation. Whenever, in the judgment of the Board of Governors of the Federal Reserve System, any member bank is making such undue use of bank credit, the Board may, in its discretion, after reasonable notice and an opportunity for a hearing, suspend such bank from the use of the credit facilities of the Federal Reserve System and may terminate such suspension or may renew it from time to time.

The punishment for making false statements or reports that overvalue an asset is also stated in the U.S. Code [229]:

Whoever knowingly makes any false statement or report, or willfully overvalues any land, property or security, for the purpose of influencing in any way...shall be fined not more than $1,000,000 or imprisoned not more than 30 years, or both.

These aspects of the Federal Reserve System are the parts intended to prevent or minimize speculative asset bubbles, which ultimately lead to severe market corrections. The recent bubbles and corrections in energies, grains, equity and debt products and real estate cast doubt on the efficacy of these controls.

228. "U.S. Code Title 12, Chapter 3, Subchapter 7, Section 301. Powers and duties of board of directors; suspension of member bank for undue use of bank credit" (http://www.law.cornell.edu/uscode/html/uscode12/usc_sec_12_00000301----000-.html). Law.cornell.edu. 2010-06-22. Retrieved 2011-08-29.
229. "U.S. Code: Title 18, Part 1, Chapter 47, section 1014. Loan and credit applications generally; renewals and discounts; crop insurance" (http://www.law.cornell.edu/uscode/18/1014.html). Law.cornell.edu. 2010-06-28. Retrieved 2011-08-29.

3.7.2.4 National payments system

The Federal Reserve plays an important role in the U.S. payments system. The twelve Federal Reserve Banks provide banking services to depository institutions and to the federal government. For depository institutions, they maintain accounts and provide various payment services, including collecting checks, electronically transferring funds, and distributing and receiving currency and coin. For the federal government, the Reserve Banks act as fiscal agents, paying Treasury checks; processing electronic payments; and issuing, transferring, and redeeming U.S. government securities [230].

In passing the Depository Institutions Deregulation and Monetary Control Act of 1980, Congress reaffirmed its intention that the Federal Reserve should promote an efficient nationwide payments system. The act subjects all depository institutions, not just member commercial banks, to reserve requirements and grants them equal access to Reserve Bank payment services. It also encourages competition between the Reserve Banks and private-sector providers of payment services by requiring the Reserve Banks to charge fees for certain payments services listed in the act and to recover the costs of providing these services over the long run.

The Federal Reserve plays a vital role in both the nation's retail and wholesale payments systems, providing a variety of financial services to depository institutions. Retail payments are generally for relatively small-dollar amounts and often involve a depository institution's retail clients—individuals and smaller businesses. The Reserve Banks' retail services include distributing currency and coin, collecting checks, and electronically transferring funds through the automated clearinghouse system. By contrast, wholesale payments are generally for large-dollar amounts and often involve a depository institution's large corporate customers or counterparties, including other financial institutions. The Reserve Banks' wholesale services include electronically transferring funds through the Fedwire Funds Service and transferring securities issued by the U.S. government, its agencies, and certain other entities through the Fedwire Securities Service. Because of the large amounts of funds that move through the Reserve Banks every day, the System has policies and procedures to limit the risk to the Reserve Banks from a depository institution's failure to make or settle its payments.

The Federal Reserve Banks began a multi-year restructuring of their check operations in 2003 as part of a long-term strategy to respond to the declining use of checks by consumers and businesses and the greater use of electronics in check processing. The Reserve Banks will have reduced the number of full-service check processing locations from 45 in 2003 to 4 by early 2011 [231].

230. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. 83–85
231. "Federal Reserve Board: Payments Systems" (http://www.federalreserve.gov/paymentsystems/default.htm). Federalreserve.gov. 2011-07-21. Retrieved 2011-08-29.

3.7.3 Structure

The Federal Reserve System has a "unique structure that is both public and private", and is described as operating "independently within the government, but independent of it" [232]. The System does not require public funding, and derives its authority and purpose from the Federal Reserve Act, which was passed by Congress in 1913 and is subject to Congressional modification or repeal [233]. The four main components of the Federal Reserve System are (1) the Board of Governors, (2) the Federal Open Market Committee, (3) the twelve regional Federal Reserve Banks, and (4) the member banks throughout the country.

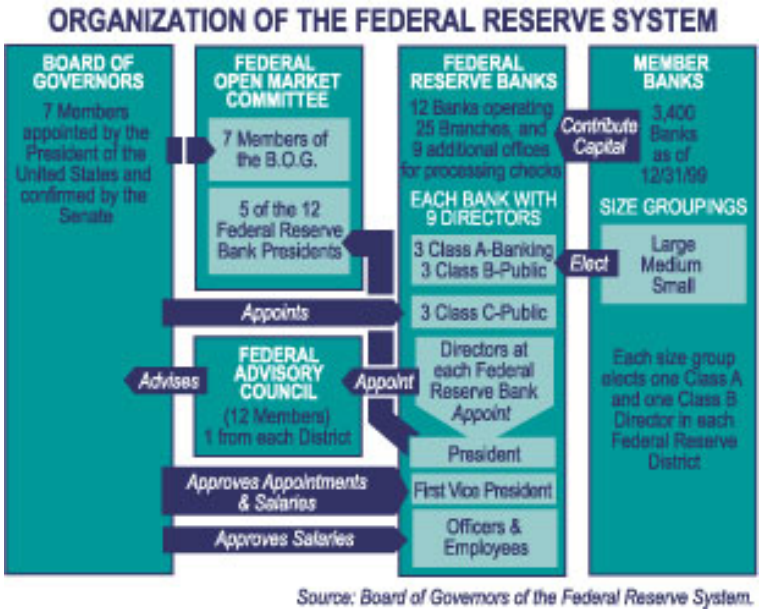


Figure 3.15 Organization of the Federal Reserve System

3.7.3.1 Board of Governors

The seven-member Board of Governors is a federal agency. It is charged with the overseeing of the 12 District Reserve Banks and setting national monetary policy. It also supervises and regulates the U.S. banking system in general. Governors are appointed by the President of the United States and confirmed by the Senate for staggered 14-year terms [234]. One term begins every two years, on February 1 of even-numbered years, and members serving a full term cannot be renominated for a second term [235]. "Upon the expiration of their terms of office, members of the Board shall continue to serve until their successors are appointed and have qualified." The

232. "Is The Fed Public Or Private?" (http://www.philadelphiafed.org/education/teachers/resources/fed-today/fed-today_lesson-3.pdf) Federal Reserve Bank of Philadelphia. Retrieved June 29, 2012.
233. "Is The Fed Public Or Private?" (http://www.philadelphiafed.org/education/teachers/resources/fed-today/fed-today_lesson-3.pdf) Federal Reserve Bank of Philadelphia. Retrieved June 29, 2012.
234. "The Federal Reserve, Monetary Policy and the Economy—Everyday Economics—FRB Dallas" (http://www.dallasfed.org/educate/everyday/ev4.html). Dallasfed.org. Retrieved 2011-08-29.
235. "FRB: Board Members" (http://www.federalreserve.gov/aboutthefed/bios/board/default.htm). Federalreserve.gov. 2011-07-20. Retrieved 2011-08-29.

law provides for the removal of a member of the Board by the President "for cause". The Board is required to make an annual report of operations to the Speaker of the U.S. House of Representatives.

The Chairman and Vice Chairman of the Board of Governors are appointed by the President from among the sitting Governors. They both serve a four year term and they can be renominated as many times as the President chooses, until their terms on the Board of Governors expire.

3.7.3.1.1 List of members of the Board of Governors

The current members of the Board of Governors are as follows [236]:

Commissioner	Entered office [237]	Term expires
Ben Bernanke (Chairman)	February 1, 2006	January 31, 2020 January 31, 2014 (as Chairman)
Janet Yellen (Vice Chairman)	October 4, 2010	January 31, 2024 October 4, 2014 (as Vice Chairman)
Daniel Tarullo	January 28, 2009	January 31, 2022
Sarah Bloom Raskin	October 4, 2010	January 31, 2016
Jerome H. Powell	May, 2012	January 31, 2014
Jeremy C. Stein	May 30, 2012	January 31, 2018
Elizabeth A. Duke	August 5, 2008	January 31, 2012

3.7.3.1.2 Nominations and confirmations

In late December 2011, President Barack Obama nominated Stein, a Harvard University finance professor and Democrat, and Powell, formerly of Dillon Read,

236. "FRB: Board Members" (http://www.federalreserve.gov/aboutthefed/bios/board/default.htm). Federalreserve.gov. 2011-07-20. Retrieved 2011-08-29.
237. "Membership of the Board of Governors of the Federal Reserve System, 1914–Present" (http://www.federalreserve.gov/bios/boardmembership.htm). Federalreserve.gov. 2011-08-12. Retrieved 2011-08-29.

Bankers Trust [238] and The Carlyle Group [239] and a Republican. Both candidates also have Treasury Department experience in the Obama and George H.W. Bush administrations respectively [240].

"Obama administration officials [had] regrouped to identify Fed candidates after Peter Diamond, a Nobel Prize-winning economist, withdrew his nomination to the board in June [2011] in the face of Republican opposition. Richard Clarida, a potential nominee who was a Treasury official under George W. Bush, pulled out of consideration in August [2011]", one account of the December nominations noted [241] . The two other Obama nominees in 2011, Yellen and Raskin [242], were confirmed in September [243]. One of the vacancies was created in 2011 with the resignation of Kevin Warsh, who took office in 2006 to fill the unexpired term ending January 31, 2018, and resigned his position effective March 31, 2011 [244], [245]. In March 2012, U.S. Senator David Vitter (Republican Party of the United States|R, Louisiana|LA) said he would oppose Obama's Stein and Powell nominations, dampening near-term hopes for approval [246]. However Senate leaders reached a deal, paving the way for affirmative votes on the two nominees in May 2012 and bringing the board to full strength for the first time since 2006 [247] with Duke's service after term end.

3.7.3.2 Federal Open Market Committee

The Federal Open Market Committee (FOMC) consists of 12 members, seven from the Board of Governors and 5 of the regional Federal Reserve Bank presidents. The FOMC oversees open market operations, the principal tool of national monetary policy. These operations affect the amount of Federal Reserve balances available to depository institutions, thereby influencing overall monetary and credit conditions. The FOMC also directs operations undertaken by the Federal Reserve in foreign exchange markets. The president of the Federal Reserve Bank of New York is a

238. Goldstein, Steve (December 27, 2011). "Obama to nominate Stein, Powell to Fed board" (http://www.marketwatch.com/story/obama-to-nominate-stein-powell-to-fed-board-2011-12-27?link=MW_home_latest_news). MarketWatch. Retrieved December 27, 2011.
239. "Jerome Powell: Visiting Scholar" (http://www.bipartisanpolicy.org/about/economic-policy-project/jerome-powell). Bipartisan Policy Center. Retrieved December 27, 2011.
240. Goldstein, Steve (December 27, 2011). "Obama to nominate Stein, Powell to Fed board" (http://www.marketwatch.com/story/obama-to-nominate-stein-powell-to-fed-board-2011-12-27?link=MW_home_latest_news). MarketWatch. Retrieved December 27, 2011.
241. Lanman, Scott; Runningen, Roger (December 27, 2011). "Obama to Choose Powell, Stein for Fed Board" (http://www.bloomberg.com/news/2011-12-27/obama-to-nominate-jerome-powell-jeremy-stein-to-fed-s-board-of-governors.html).
242. Robb, Greg (April 29, 2010). "Obama nominates 3 to Federal Reserve board" (http://www.marketwatch.com/story/obama-nominates-3-to-federal-reserve-board-2010-04-29). MarketWatch. Retrieved April 29, 2010.
243. Lanman, Scott (September 30, 2010). "Yellen, Raskin Win Senate Approval for Fed Board of Governors" (http://www.bloomberg.com/news/2010-09-30/yellen-raskin-win-fed-board-confirmation-as-vote-on-monetary-easing-nears.html). Bloomberg LP. Retrieved December 27, 2011.
244. Censky, Annalyn (February 10, 2011). "Fed inflation hawk Warsh resigns" (http://money.cnn.com/2011/02/10/news/economy/fed_official_warsh_resigns/index.htm). CNNMoney. Retrieved December 27, 2011.
245. Chan, Sewell (February 10, 2011). "Sole Fed Governor With Close Ties to Conservatives Resigns" (http://www.nytimes.com/2011/02/11/business/economy/11fed.html). The New York Times. Retrieved December 27, 2011.
246. Robb, Greg (March 28, 2012). "Senator to block quick vote on Fed picks: report" (http://www.marketwatch.com/story/senator-to-block-quick-vote-on-fed-picks-report-2012-03-28?link=MW_latest_news). MarketWatch. Retrieved March 28, 2012.
247. Robb, Greg, "Stein sworn in as Fed governor" (http://www.marketwatch.com/story/stein-sworn-in-as-fed-governor-2012-05-30), MarketWatch, May 30, 2012. Retrieved 2012-05-30.

permanent member of the FOMC, while the rest of the bank presidents rotate at two- and three-year intervals. All Regional Reserve Bank presidents contribute to the committee's assessment of the economy and of policy options, but only the five presidents who are then members of the FOMC vote on policy decisions. The FOMC determines its own internal organization and, by tradition, elects the Chairman of the Board of Governors as its chairman and the president of the Federal Reserve Bank of New York as its vice chairman. It is informal policy within the FOMC for the Board of Governors and the New York Federal Reserve Bank president to vote with the Chairman of the FOMC; anyone who is not an expert on monetary policy traditionally votes with the chairman as well; and in any vote no more than two FOMC members can dissent [248]. Formal meetings typically are held eight times each year in Washington, D.C. Nonvoting Reserve Bank presidents also participate in Committee deliberations and discussion. The FOMC generally meets eight times a year in telephone consultations and other meetings are held when needed [249].

3.7.3.2.1 Federal Reserve Banks

There are 12 Federal Reserve Banks located in Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St Louis, Minneapolis, Kansas City, Dallas, and San Francisco. Each reserve Bank is responsible for member banks located in its district. The size of each district was set based upon the population distribution of the United States when the Federal Reserve Act was passed. Each regional Bank has a president, who is the chief executive officer of their Bank. Each regional Reserve Bank's president is nominated by their Bank's board of directors, but the nomination is contingent upon approval by the Board of Governors. Presidents serve five year terms and may be reappointed [250].

Each regional Bank's board consists of nine members. Members are broken down into three classes: A, B, and C. There are three board members in each class. Class A members are chosen by the regional Bank's shareholders, and are intended to represent member banks' interests. Member banks are divided into three categories large, medium, and small. Each category elects one of the three class A board members. Class B board members are also nominated by the region's member banks, but class B board members are supposed to represent the interests of the public. Lastly, class C board members are nominated by the Board of Governors, and are also intended to represent the interests of the public [251].

248. "Laws of the Fed" (http://blogs.ft.com/money-supply/2010/07/07/laws-of-the-fed/). Retrieved July, 14 2010.
249. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. 11–12
250. "FRB: Federal Reserve Bank Presidents" (http://www.federalreserve.gov/aboutthefed/bios/banks/default.htm). Federalreserve.gov. 2011-07-20. Retrieved 2011-08-29.
251. "US CODE: Title 12, Subchapter VII—Directors of Federal Reserve Banks; Reserve Agents and Assistants" (http://www.law.cornell.edu/uscode/html/uscode12/usc_sup_01_12_10_3_20_VII.html). Law.cornell.edu. 2010-06-22. Retrieved 2011-08-29.

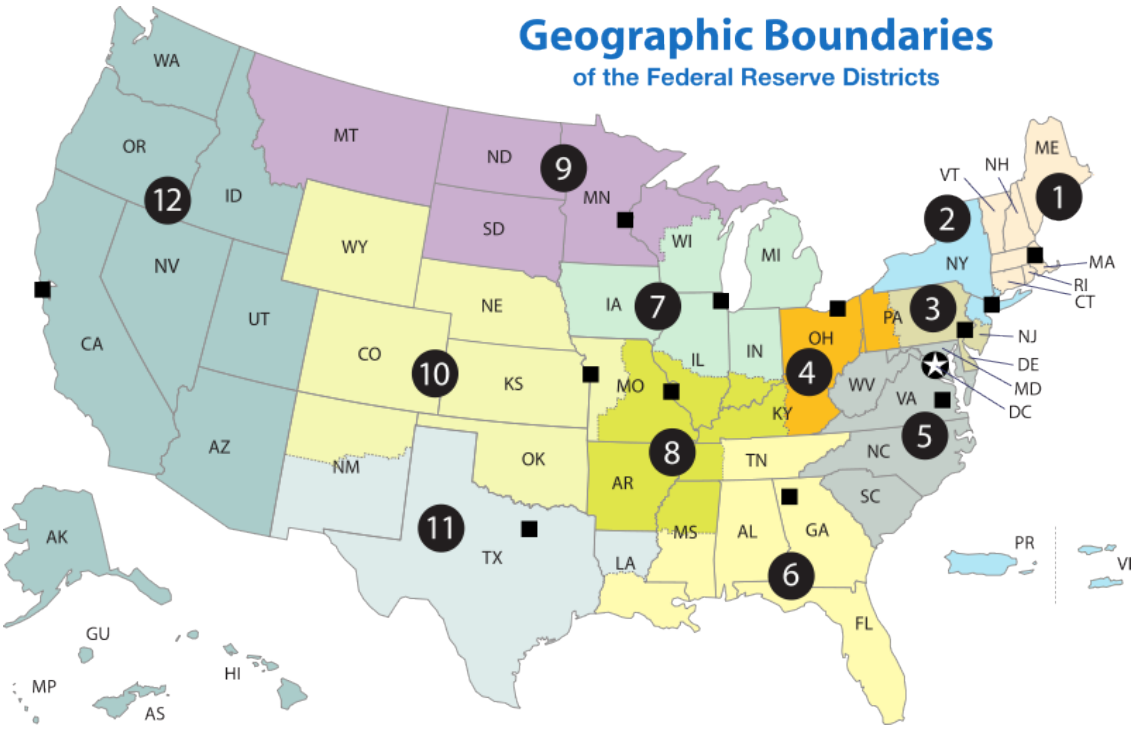


Figure 3.16 Federal Reserve Districts

A member bank is a private institution and owns stock in its regional Federal Reserve Bank. All nationally chartered banks hold stock in one of the Federal Reserve Banks. State chartered banks may choose to be members (and hold stock in their regional Federal Reserve bank), upon meeting certain standards. About 38% of U.S. banks are members of their regional Federal Reserve Bank [252]. The amount of stock a member bank must own is equal to 3% of its combined capital and surplus [253], [254]. However, holding stock in a Federal Reserve bank is not like owning stock in a publicly traded company. These stocks cannot be sold or traded, and member banks do not control the Federal Reserve Bank as a result of owning this stock. The charter and organization of each Federal Reserve Bank is established by law and cannot be altered by the member banks. Member banks, do however, elect six of the nine members of the Federal Reserve Banks' boards of directors [255], [256]. From the profits of the Regional Bank of which it is a member, a member bank receives a dividend equal to 6% of their purchased stock [257]. The remainder of the regional Federal Reserve Banks' profits is given over to the United States Treasury Department. In 2009, the Federal Reserve Banks distributed $1.4 billion in dividends to member banks and returned $47 billion to the U.S. Treasury [258].

252. "Who owns the Federal Reserve Bank?" (http://www.factcheck.org/askfactcheck/who_owns_the_federal_reserve_bank.html). Retrieved October, 16 2010.
253. "Section 2.3 Subscription to Stock by National Banks" (http://www.federalreserve.gov/aboutthefed/section2.htm). Federal Reserve Act. Board of Governors of the Federal Reserve System. December 14, 2010. Retrieved February 6, 2011.
254. "Section 5.1 Amount of Shares; Increase and Decrease of Capital; Surrender and Cancellation of Stock" (http://www.federalreserve.gov/aboutthefed/section5.htm). Federal Reserve Act. Board of Governors of the Federal Reserve System. December 14, 2010. Retrieved February 6, 2011.
255. "The Federal Reserve, Monetary Policy and the Economy—Everyday Economics—FRB Dallas" (http://www.dallasfed.org/educate/everyday/ev4.html). Dallasfed.org. Retrieved 2011-08-29.
256. Woodward, G. Thomas (1996-07-31). "Money and the Federal Reserve System: Myth and Reality – CRS Report for Congress, No. 96-672 E" (http://home.hiwaay.net/~becraft/FRS-myth.htm). Congressional Research Service Library of Congress. Retrieved 2008-11-23.
257. "FAQ - Who owns the Federal Reserve?" (http://www.federalreserve.gov/faqs/about_14986.htm). Federal Reserve website.
258. "The Federal Reserve Board 2009 Annual Report – Federal Reserve Banks Combined Financial Statements" (http://www.federalreserve.gov/boarddocs/rptcongress/annual09/sec6/c3.htm). Federalreserve.gov. 2011-07-22. Retrieved 2011-08-29.

3.7.3.2.2 Legal status of regional Federal Reserve Banks

The Federal Reserve Banks have an intermediate legal status, with some features of private corporations and some features of public federal agencies. The United States has an interest in the Federal Reserve Banks as tax-exempt federally-created instrumentalities whose profits belong to the federal government, but this interest is not proprietary [259]. In Lewis v. United States [260], the United States Court of Appeals for the Ninth Circuit stated that: "The Reserve Banks are not federal instrumentalities for purposes of the FTCA the Federal Tort Claims Act], but are independent, privately owned and locally controlled corporations." The opinion went on to say, however, that: "The Reserve Banks have properly been held to be federal instrumentalities for some purposes." Another relevant decision is Scott v. Federal Reserve Bank of Kansas City [261], in which the distinction is made between Federal Reserve Banks, which are federally-created instrumentalities, and the Board of Governors, which is a federal agency.

Regarding the structural relationship between the twelve Federal Reserve banks and the various commercial (member) banks, political science professor Michael D. Reagan has written that [262]:

... the "ownership" of the Reserve Banks by the commercial banks is symbolic; they do not exercise the proprietary control associated with the concept of ownership nor share, beyond the statutory dividend, in Reserve Bank "profits." ... Bank ownership and election at the base are therefore devoid of substantive significance, despite the superficial appearance of private bank control that the formal arrangement creates.

3.7.3.3 Member banks

According to the web site for the Federal Reserve Bank of Richmond, "[m]ore than one-third of U.S. commercial banks are members of the Federal Reserve System. National banks must be members; state chartered banks may join by meeting certain requirements." [263]

259. Kennedy C. Scott v. Federal Reserve Bank of Kansas City, et al. (http://www.ca8.uscourts.gov/opndir/05/04/042357P.pdf), 406 F.3d 532 (8th Cir. 2005).
260. 680 F.2d 1239 (http://bulk.resource.org/courts.gov/c/F2/680/680.F2d.1239.80-5905.html) (9th Cir. 1982).
261. Kennedy C. Scott v. Federal Reserve Bank of Kansas City, et al. (http://www.ca8.uscourts.gov/opndir/05/04/042357P.pdf), 406 F.3d 532 (8th Cir. 2005).
262. Michael D. Reagan, "The Political Structure of the Federal Reserve System," American Political Science Review, Vol. 55 (March 1961), pp. 64-76, as reprinted in Money and Banking: Theory, Analysis, and Policy, p. 153, ed. by S. Mittra (Random House, New York 1970).
263. "Federal Reserve Membership" (http://www.richmondfed.org/banking/federal_reserve_membership/). Federal Reserve Bank of Richmond. Retrieved 2012-04-30.

3.7.3.4 Accountability

The Board of Governors of the Federal Reserve System, the Federal Reserve banks, and the individual member banks undergo regular audits by the GAO and an outside auditor. GAO audits are limited and do not cover "most of the Fed's monetary policy actions or decisions, including discount window lending (direct loans to financial institutions), open-market operations and any other transactions made under the direction of the Federal Open Market Committee" ...nor may the GAO audit] "dealings with foreign governments and other central banks." [264]. Various statutory changes, including the Federal Reserve Transparency Act, have been proposed to broaden the scope of the audits.

November 7, 2008, Bloomberg L.P. News brought a lawsuit (Bloomberg L.P. v. Board of Governors of the Federal Reserve System) against the Board of Governors of the Federal Reserve System to force the Board to reveal the identities of firms for which it has provided guarantees during the Late-2000s financial crisis [265]. Bloomberg, L.P. won at the trial court [266] and the Fed's appeals were rejected at both the United States Court of Appeals for the Second Circuit and the U.S. Supreme Court. The data [267] was released March 31, 2011 [268].

3.7.4 Monetary policy

The term "monetary policy" refers to the actions undertaken by a central bank, such as the Federal Reserve, to influence the availability and cost of money and credit to help promote national economic goals. What happens to money and credit affects interest rates (the cost of credit) and the performance of an economy. The Federal Reserve Act of 1913 gave the Federal Reserve authority to set monetary policy in the United States [269], [270].

264. Reddy, Sudeep (2009-08-31 August 31, 2009). "What would a federal reserve audit show" (http://blogs.wsj.com/economics/2009/08/31/what-would-a-federal-reserve-audit-show/tab/article/). The Wall Street Journal. Retrieved 2011-08-29.
265. [1] (http://www.cjr.org/the_audit/bloomberg_wins_its_lawsuit_aga.php)
266. Docket entry 31, Bloomberg, L.P. v. Board of Governors of the Federal Reserve System, case no. 1:08-cv-09595-LAP, U.S. District Court for the District of New York.
267. Keoun,Kuntz,Benedetti-Valentini,Buhayar,Campbell,Condon,Finch,Frye,Griffin,Harper,Hyuga,Ivry,Kirchfeld,Kopecki,Layne,Logutenkova,Martens,Moore,Mustoe,Son,Sterngold. "The Fed's Secret Liquidity Lifelines" (http://www.bloomberg.com/data-visualization/federal-reserve-emergency-lending/#/overview/?sort=nomPeakValue&group=none&view=peak&position=0&comparelist=&search=). Bloomberg. Retrieved 17 March 2012.
268. Torres, Craig (March 31, 2011). "Fed Releases Discount-Window Loan Records Under Court Order" (http://www.businessweek.com/news/2011-03-31/fed-releases-discount-window-loan-records-under-court-order.html). Businessweek. Retrieved 19 March 2012.
269. "FRB: Federal Open Market Committee" (http://www.federalreserve.gov/monetarypolicy/fomc.htm). Federalreserve.gov. 2011-08-22. Retrieved 2011-08-29.
270. Federal Reserve Education—Monetary Policy Basics (http://www.federalreserveeducation.org/fed101_html/policy/basics_print.htm)

3.7.4.1 Interbank lending is the basis of policy

The Federal Reserve sets monetary policy by influencing the Federal funds rate, which is the rate of interbank lending of excess reserves. The rate that banks charge each other for these loans is determined in the interbank market but the Federal Reserve influences this rate through the three "tools" of monetary policy described in the Tools section below.

The Federal Funds rate is a short-term interest rate the FOMC focuses on directly. This rate ultimately affects the longer-term interest rates throughout the economy. A summary of the basis and implementation of monetary policy is stated by the Federal Reserve:

The Federal Reserve implements U.S. monetary policy by affecting conditions in the market for balances that depository institutions hold at the Federal Reserve Banks...By conducting open market operations, imposing reserve requirements, permitting depository institutions to hold contractual clearing balances, and extending credit through its discount window facility, the Federal Reserve exercises considerable control over the demand for and supply of Federal Reserve balances and the federal funds rate. Through its control of the federal funds rate, the Federal Reserve is able to foster financial and monetary conditions consistent with its monetary policy objectives [271].

This influences the economy through its effect on the quantity of reserves that banks use to make loans. Policy actions that add reserves to the banking system encourage lending at lower interest rates thus stimulating growth in money, credit, and the economy. Policy actions that absorb reserves work in the opposite direction. The Fed's task is to supply enough reserves to support an adequate amount of money and credit, avoiding the excesses that result in inflation and the shortages that stifle economic growth [272].

3.7.4.2 Tools

There are three main tools of monetary policy that the Federal Reserve uses to influence the amount of reserves in private banks [273]:

Tool	Description
Open market operations	Purchases and sales of U.S. Treasury and federal agency securities—the Federal Reserve's principal tool for implementing monetary policy. The Federal Reserve's

271. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. 27
272. The Federal Reserve System In Action—Federal Reserve Bank of Richmond (http://www.richmondfed.org/publications/educator_resources/the_federal_reserve_system_in_action/index.cfm)
273. "FRB: Federal Open Market Committee" (http://www.federalreserve.gov/monetarypolicy/fomc.htm).

Tool	Description
	objective for open market operations has varied over the years. During the 1980s, the focus gradually shifted toward attaining a specified level of the federal funds rate (the rate that banks charge each other for overnight loans of federal funds, which are the reserves held by banks at the Fed), a process that was largely complete by the end of the decade [274].
Discount rate	The interest rate charged to commercial banks and other depository institutions on loans they receive from their regional Federal Reserve Bank's lending facility—the discount window [275].
Reserve requirements	The amount of funds that a depository institution must hold in reserve against specified deposit liabilities [276].

3.7.4.2.1 Federal funds rate and open market operations

The Federal Reserve System implements monetary policy largely by targeting the federal funds rate. This is the rate that banks charge each other for overnight loans of federal funds, which are the reserves held by banks at the Fed. This rate is actually determined by the market and is not explicitly mandated by the Fed. The Fed therefore tries to align the effective federal funds rate with the targeted rate by adding or subtracting from the money supply through open market operations. The Federal Reserve System usually adjusts the federal funds rate target by 0.25% or 0.50% at a time.

Open market operations allow the Federal Reserve to increase or decrease the amount of money in the banking system as necessary to balance the Federal Reserve's dual mandates. Open market operations are done through the sale and purchase of United States Treasury security, sometimes called "Treasury bills" or more informally "T-bills" or "Treasuries". The Federal Reserve buys Treasury bills from its primary dealers. The purchase of these securities affects the federal funds rate, because primary dealers have accounts at depository institutions [277].

274. "FRB: Monetary Policy, Open Market Operations" (http://www.federalreserve.gov/fomc/fundsrate.htm). Federalreserve.gov. 2010-01-26. Retrieved 2011-08-29.
275. "FRB: Monetary Policy, the Discount Rate" (http://www.federalreserve.gov/monetarypolicy/discountrate.htm). Federalreserve.gov. 2011-07-19. Retrieved 2011-08-29.
276. "FRB: Monetary Policy, Reserve Requirements" (http://www.federalreserve.gov/monetarypolicy/reservereq.htm). Federalreserve.gov. 2010-10-26. Retrieved 2011-08-29.
277. "Open Market Operations" (http://www.newyorkfed.org/aboutthefed/fedpoint/fed32.html). New York Federal Reserve Bank. August 2007. Retrieved 2011-10-29.

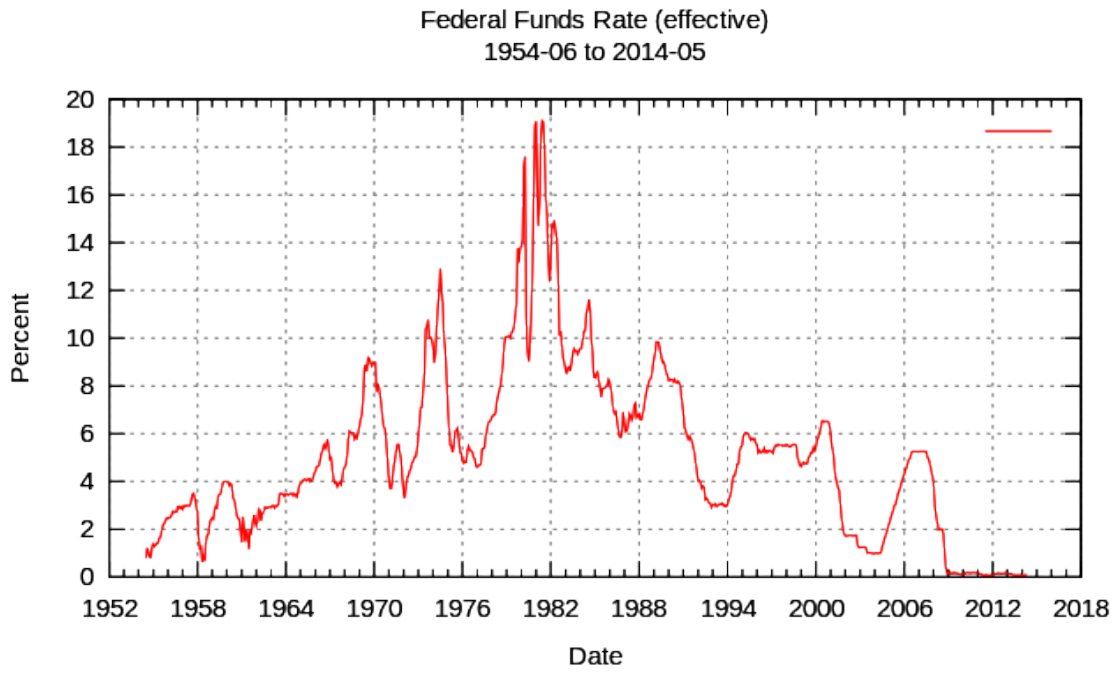


Figure 3.17

The effective federal funds rate charted over more than fifty years.

The Federal Reserve education website describes open market operations as follows [278]:

Open market operations involve the buying and selling of U.S. government securities (federal agency and mortgage-backed). The term 'open market' means that the Fed doesn't decide on its own which securities dealers it will do business with on a particular day. Rather, the choice emerges from an 'open market' in which the various securities dealers that the Fed does business with—the primary dealers—compete on the basis of price. Open market operations are flexible and thus, the most frequently used tool of monetary policy.

Open market operations are the primary tool used to regulate the supply of bank reserves. This tool consists of Federal Reserve purchases and sales of financial instruments, usually securities issued by the U.S. Treasury, Federal agencies and government-sponsored enterprises. Open market operations are carried out by the Domestic Trading Desk of the Federal Reserve Bank of New York under direction from the FOMC. The transactions are undertaken with primary dealers.

The Fed's goal in trading the securities is to affect the federal funds rate, the rate at which banks borrow reserves from each other. When the Fed wants to increase reserves, it buys securities and pays for them by making a deposit to the account maintained at the Fed by the primary dealer's bank. When the Fed wants to reduce reserves, it sells securities and collects from those accounts. Most days, the Fed does not want to increase or decrease reserves permanently so it usually engages in transactions reversed within a day or two. That means that a reserve injection today could be withdrawn tomorrow morning, only to be renewed at some level several hours later. These short-term transactions are called repurchase agreements (repos) – the dealer sells the Fed a security and agrees to buy it back at a later date.

278. Federal Reserve Education—Monetary Policy Basics (http://www.federalreserveeducation.org/fed101_html/policy/basics_print.htm)

3.7.4.2.2 Repurchase agreements

To smooth temporary or cyclical changes in the money supply, the desk engages in repurchase agreements (repos) with its primary dealers. Repos are essentially secured, short-term lending by the Fed. On the day of the transaction, the Fed deposits money in a primary dealer's reserve account, and receives the promised securities as collateral. When the transaction matures, the process unwinds: the Fed returns the collateral and charges the primary dealer's reserve account for the principal and accrued interest. The term of the repo (the time between settlement and maturity) can vary from 1 day (called an overnight repo) to 65 days [279].

3.7.4.2.3 Discount rate

The Federal Reserve System also directly sets the "discount rate", which is the interest rate for "discount window lending", overnight loans that member banks borrow directly from the Fed. This rate is generally set at a rate close to 100 basis points above the target federal funds rate. The idea is to encourage banks to seek alternative funding before using the "discount rate" option [280]. The equivalent operation by the European Central Bank is referred to as the "marginal lending facility" [281].

Both the discount rate and the federal funds rate influence the prime rate, which is usually about 3 percent higher than the federal funds rate.

3.7.4.2.4 Reserve requirements

Another instrument of monetary policy adjustment employed by the Federal Reserve System is the fractional reserve requirement, also known as the required reserve ratio [282]. The required reserve ratio sets the balance that the Federal Reserve System requires a depository institution to hold in the Federal Reserve Banks [283], which depository institutions trade in the federal funds market discussed above [284]. The required reserve ratio is set by the Board of Governors of the Federal Reserve System

279. "Repurchase and Reverse Repurchase Transactions—Fedpoints—Federal Reserve Bank of New York" (http://www.ny.frb.org/aboutthefed/fedpoint/fed04.html). Ny.frb.org. August 2007. Retrieved 2011-08-29.
280. Federal Reserve Bank San Francisco(2004)
281. Patricia S. Pollard (February 2003). "A Look Inside Two Central Banks: The European Central Bank And The Federal Reserve". Review (Federal Reserve Bank of St. Louis) 85 (2): 11–30. doi:10.3886/ICPSR01278. OCLC 1569030.
282. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. 30
283. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. 27
284. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. 29–30

[285]. The reserve requirements have changed over time and some of the history of these changes is published by the Federal Reserve [286].

Reserve Requirements in the U.S. Federal Reserve System[287]

Liability Type	Requirement	
	Percentage of liabilities	Effective date
Net transaction accounts		
$0 to $11.5 million	0	12/29/11
More than $11.5 million to $71 million	3	12/29/11
More than $71 million	10	12/29/11
Nonpersonal time deposits	0	12/27/90
Eurocurrency liabilities	0	12/27/90

As a response to the financial crisis of 2008, the Federal Reserve now makes interest payments on depository institutions' required and excess reserve balances. The payment of interest on excess reserves gives the central bank greater opportunity to address credit market conditions while maintaining the federal funds rate close to the target rate set by the FOMC [288].

3.7.4.2.5 New facilities

In order to address problems related to the subprime mortgage crisis and United States housing bubble, several new tools have been created. The first new tool, called the Term Auction Facility, was added on December 12, 2007. It was first announced as a temporary tool [289] but there have been suggestions that this new tool may remain in

285. BoG 2005 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2005), pp. 31
286. Feinman, Joshua N. (June 1993). "Reserve Requirements: History, Current Practice, and Potential Reform" (PDF) (http://www.federalreserve.gov/monetarypolicy/0693lead.pdf). Federal Reserve Bulletin: 569–589. Retrieved 2011-08-29.
287. "FRB: Monetary Policy, Reserve Requirements" (http://www.federalreserve.gov/monetarypolicy/reservereq.htm). Federalreserve.gov. 2010-10-26. Retrieved 2011-08-29.
288. "FRB: Press Release-Board announces that it will begin to pay interest on depository institutions required and excess reserve balances-October 6, 2008" (http://www.federalreserve.gov/monetarypolicy/20081006a.htm). Federal Reserve. 2008-10-06. Retrieved 2011-08-29.
289. "FRB: Temporary Auction Facility FAQ" (http://www.federalreserve.gov/monetarypolicy/taffaq.htm). Federalreserve.gov. 2009-01-12. Retrieved 2011-08-29.

place for a prolonged period of time [290]. Creation of the second new tool, called the Term Securities Lending Facility, was announced on March 11, 2008 [291]. The main difference between these two facilities is that the Term Auction Facility is used to inject cash into the banking system whereas the Term Securities Lending Facility is used to inject treasury securities into the banking system [292]. Creation of the third tool, called the Primary Dealer Credit Facility (PDCF), was announced on March 16, 2008 [293]. The PDCF was a fundamental change in Federal Reserve policy because now the Fed is able to lend directly to primary dealers, which was previously against Fed policy [294]. The differences between these 3 new facilities is described by the Federal Reserve [295]:

The Term Auction Facility program offers term funding to depository institutions via a bi-weekly auction, for fixed amounts of credit. The Term Securities Lending Facility will be an auction for a fixed amount of lending of Treasury general collateral in exchange for OMO-eligible and AAA/Aaa rated private-label residential mortgage-backed securities. The Primary Dealer Credit Facility now allows eligible primary dealers to borrow at the existing Discount Rate for up to 120 days.

Some of the measures taken by the Federal Reserve to address this mortgage crisis have not been used since The Great Depression [296]. The Federal Reserve gives a brief summary of these new facilities [297]:

As the economy has slowed in the last nine months and credit markets have become unstable, the Federal Reserve has taken a number of steps to help address the situation. These steps have included the use of traditional monetary policy tools at the macroeconomic level as well as measures at the level of specific markets to provide additional liquidity.

The Federal Reserve's response has continued to evolve since pressure on credit markets began to surface last summer, but all these measures derive from the Fed's traditional open market operations and discount window tools by extending the term of transactions, the type of collateral, or eligible borrowers.

290. "FRB: Press Release-Federal Reserve intends to continue term TAF auctions as necessary" (http://www.federalreserve.gov/newsevents/press/monetary/20071221b.htm). Federalreserve.gov. 2007-12-21. Retrieved 2011-08-29.
291. "FRB press release: Announcement of the creation of the Term Securities Lending Facility" (http://federalreserve.gov/newsevents/press/monetary/20080311a.htm). Federal Reserve. 2008-03-11. Retrieved 2011-08-29.
292. "Fed Seeks to Limit Slump by Taking Mortgage Debt" (http://www.bloomberg.com/apps/news?pid=20601103&sid=a6aFI7RKVhEA&refer=news). bloomberg.com. 12 March 2008. "The step goes beyond past initiatives because the Fed can now inject liquidity without flooding the banking system with cash...Unlike the newest tool, the past steps added cash to the banking system, which affects the Fed's benchmark interest rate...By contrast, the TSLF injects liquidity by lending Treasuries, which doesn't affect the federal funds rate. That leaves the Fed free to address the mortgage crisis directly without concern about adding more cash to the system than it wants"
293. "Federal Reserve Announces Establishment of Primary Dealer Credit Facility—Federal Reserve Bank of New York" (http://www.newyorkfed.org/newsevents/news/markets/2008/rp080316.html). Newyorkfed.org. 2008-03-16. Retrieved 2011-08-29.
294. Lanman, Scott (2008-03-20). "Fed Says Securities Firms Borrow $28.8 Bln With New Financing" (http://www.bloomberg.com/apps/news?pid=20601068&sid=a7VHAq.o6kwU). Bloomberg.com. Retrieved 2011-08-29.
295. "Primary Dealer Credit Facility: Frequently Asked Questions—Federal Reserve Bank of New York" (http://www.newyorkfed.org/markets/pdcf_faq.html). Newyorkfed.org. 2009-02-03. Retrieved 2011-08-29.
296. "Fed Announces Emergency Steps to Ease Credit Crisis – Economy" (http://www.cnbc.com/id/23664032/). Reuters. Cnbc.com. 2008-03-17. Retrieved 2011-08-29.
297. "Federal Reserve Bank of Atlanta—Examining the Federal Reserve's New Liquidity Measures" (http://www.frbatlanta.org/invoke.cfm?objectid=526AFBC6-5056-9F12-120FEABD6D2ADA91&method=display_body). Frbatlanta.org. 2008-04-15. Retrieved 2011-08-29.

A fourth facility, the Term Deposit Facility, was announced December 9, 2009, and approved April 30, 2010, with an effective date of Jun 4, 2010 [298]. The Term Deposit Facility allows Reserve Banks to offer term deposits to institutions that are eligible to receive earnings on their balances at Reserve Banks. Term deposits are intended to facilitate the implementation of monetary policy by providing a tool by which the Federal Reserve can manage the aggregate quantity of reserve balances held by depository institutions. Funds placed in term deposits are removed from the accounts of participating institutions for the life of the term deposit and thus drain reserve balances from the banking system.

3.7.4.2.6 Term auction facility

The Term Auction Facility is a program in which the Federal Reserve auctions term funds to depository institutions [299]. The creation of this facility was announced by the Federal Reserve on December 12, 2007 and was done in conjunction with the Bank of Canada, the Bank of England, the European Central Bank, and the Swiss National Bank to address elevated pressures in short-term funding markets [300]. The reason it was created is because banks were not lending funds to one another and banks in need of funds were refusing to go to the discount window. Banks were not lending money to each other because there was a fear that the loans would not be paid back. Banks refused to go to the discount window because it is usually associated with the stigma of bank failure [301], [302], [303], [304]. Under the Term Auction Facility, the identity of the banks in need of funds is protected in order to avoid the stigma of bank failure [305]. Foreign

298. "Reserve Requirements of Depository Institutions Policy on Payment System Risk," 75 Federal Register 86 (5 May 2010), pp. 24384 – 24389. (http://www.gpo.gov/fdsys/pkg/FR-2010-05-05/pdf/2010-10483.pdf)
299. "FRB: Temporary Auction Facility FAQ" (http://www.federalreserve.gov/monetarypolicy/taffaq.htm). Federalreserve.gov. 2009-01-12. Retrieved 2011-08-29.
300. "Announcement of the creation of the Term Auction Facility—FRB: Press Release—Federal Reserve and other central banks announce measures designed to address elevated pressures in short-term funding markets" (http://www.federalreserve.gov/newsevents/press/monetary/20071212a.htm). federalreserve.gov. 12 December 2007.
301. "US banks borrow $50bn via new Fed facility" (http://www.ft.com/cms/s/66db756a-de5d-11dc-9de3-0000779fd2ac.html). Financial Times. 18 February 2008. "Before its introduction, banks either had to raise money in the open market or use the so-called "discount window" for emergencies. However, last year many banks refused to use the discount window, even though they found it hard to raise funds in the market, because it was associated with the stigma of bank failure"
302. "Fed Boosts Next Two Special Auctions to $30 Billion" (http://www.bloomberg.com/apps/news?pid=20601103&refer=news&sid=aBPbErlft9cI). Bloomberg. January 4, 2008. "The Board of Governors of the Federal Reserve System established the temporary Term Auction Facility, dubbed TAF, in December to provide cash after interest-rate cuts failed to break banks' reluctance to lend amid concern about losses related to subprime mortgage securities. The program will make funding from the Fed available beyond the 20 authorized primary dealers that trade with the central bank"
303. "A dirty job, but someone has to do it" (http://www.economist.com/displaystory.cfm?story_id=10286586). economist.com. 2007-12-13. Retrieved 2011-08-29. "The Fed's discount window, for instance, through which it lends direct to banks, has barely been approached, despite the soaring spreads in the interbank market. The quarter-point cuts in its federal funds rate and discount rate on December 11 were followed by a steep sell-off in the stockmarket...The hope is that by extending the maturity of central-bank money, broadening the range of collateral against which banks can borrow and shifting from direct lending to an auction, the central bankers will bring down spreads in the one- and three-month money markets. There will be no net addition of liquidity. What the central bankers add at longer-term maturities, they will take out in the overnight market. But there are risks. The first is that, for all the fanfare, the central banks' plan will make little difference. After all, it does nothing to remove the fundamental reason why investors are worried about lending to banks. This is the uncertainty about potential losses from subprime mortgages and the products based on them, and—given that uncertainty—the banks' own desire to hoard capital against the chance that they will have to strengthen their balance sheets."
304. "Unclogging the system" (http://www.economist.com/daily/news/displaystory.cfm?story_id=10278482&top_story=1). economist.com. 2007-12-13. Retrieved 2011-08-29.
305. Robb, Greg (2007-12-12). "Fed, top central banks to flood markets with cash" (http://www.marketwatch.com/news/story/fed-top-central-banks-flood/

exchange swap lines with the European Central Bank and Swiss National Bank were opened so the banks in Europe could have access to U.S. dollars [306]. Federal Reserve Chairman Ben Bernanke briefly described this facility to the U.S. House of Representatives on January 17, 2008:

the Federal Reserve recently unveiled a term auction facility, or TAF, through which prespecified amounts of discount window credit can be auctioned to eligible borrowers. The goal of the TAF is to reduce the incentive for banks to hoard cash and increase their willingness to provide credit to households and firms...TAF auctions will continue as long as necessary to address elevated pressures in short-term funding markets, and we will continue to work closely and cooperatively with other central banks to address market strains that could hamper the achievement of our broader economic objectives [307].

It is also described in the Term Auction Facility FAQ [308]

The TAF is a credit facility that allows a depository institution to place a bid for an advance from its local Federal Reserve Bank at an interest rate that is determined as the result of an auction. By allowing the Federal Reserve to inject term funds through a broader range of counterparties and against a broader range of collateral than open market operations, this facility could help ensure that liquidity provisions can be disseminated efficiently even when the unsecured interbank markets are under stress.

In short, the TAF will auction term funds of approximately one-month maturity. All depository institutions that are judged to be in sound financial condition by their local Reserve Bank and that are eligible to borrow at the discount window are also eligible to participate in TAF auctions. All TAF credit must be fully collateralized. Depositories may pledge the broad range of collateral that is accepted for other Federal Reserve lending programs to secure TAF credit. The same collateral values and margins applicable for other Federal Reserve lending programs will also apply for the TAF.

3.7.4.2.7 Term securities lending facility

The Term Securities Lending Facility is a 28-day facility that will offer Treasury general collateral to the Federal Reserve Bank of New York's primary dealers in exchange for other program-eligible collateral. It is intended to promote liquidity in the financing markets for Treasury and other collateral and thus to foster the functioning of financial markets more generally [309]. Like the Term Auction Facility, the TSLF was done in conjunction with the Bank of Canada, the Bank of England, the European Central

story.aspx?guid=%7b6FAFC482-F8E4-4F23-A021-52DC7DE8938C%7d&print=true&dist=printTop). Marketwatch.com. Retrieved 2011-08-29.

306. Robb, Greg (2007-12-12). "Fed, top central banks to flood markets with cash" (http://www.marketwatch.com/news/story/fed-top-central-banks-flood/story.aspx?guid=%7b6FAFC482-F8E4-4F23-A021-52DC7DE8938C%7d&print=true&dist=printTop). Marketwatch.com. Retrieved 2011-08-29.
307. Chairman Ben S. Bernanke—The economic outlook Before the Committee on the Budget, U.S. House of Representatives January 17, 2008: http://www.federalreserve.gov/newsevents/testimony/bernanke20080117a.htm
308. "FRB: Temporary Auction Facility FAQ" (http://www.federalreserve.gov/monetarypolicy/taffaq.htm). Federalreserve.gov. 2009-01-12. Retrieved 2011-08-29.
309. Term Securities Lending Facility: Frequently Asked Questions: http://www.newyorkfed.org/markets/tslf_faq.html

Bank, and the Swiss National Bank. The resource allows dealers to switch debt that is less liquid for U.S. government securities that are easily tradable. It is anticipated by Federal Reserve officials that the primary dealers, which include Goldman Sachs Group. Inc., J.P. Morgan Chase, and Morgan Stanley, will lend the Treasuries on to other firms in return for cash. That will help the dealers finance their balance sheets. The currency swap lines with the European Central Bank and Swiss National Bank were increased.

3.7.4.2.8 Primary dealer credit facility

The Primary Dealer Credit Facility (PDCF) is an overnight loan facility that will provide funding to primary dealers in exchange for a specified range of eligible collateral and is intended to foster the functioning of financial markets more generally [310]. This new facility marks a fundamental change in Federal Reserve policy because now primary dealers can borrow directly from the Fed when this previously was not permitted.

3.7.4.2.9 Interest on reserves

The Federal Reserve banks will pay interest on reserve balances (required & excess) held by depository institutions. The rate is set at the lowest federal funds rate during the reserve maintenance period of an institution, less 75bp [311]. As of October 23, 2008, the Fed has lowered the spread to a mere 35 bp [312].

3.7.4.2.10 Term deposit facility

The Term Deposit Facility is a program through which the Federal Reserve Banks will offer interest-bearing term deposits to eligible institutions. By removing "excess deposits" from participating banks, the overall level of reserves available for lending is reduced, which should result in increased market interest rates, acting as a brake on economic activity and inflation. The Federal Reserve has stated that:

Term deposits will be one of several tools that the Federal Reserve could employ to drain reserves when policymakers judge that it is appropriate to begin moving to a less accommodative stance of monetary policy. The development of the TDF is a

310. "Primary Dealer Credit Facility: Frequently Asked Questions—Federal Reserve Bank of New York" (http://www.newyorkfed.org/markets/pdcf_faq.html). Newyorkfed.org. 2009-02-03. Retrieved 2011-08-29.
311. "Interest on Required Reserve Balances and Excess Balances" (http://www.federalreserve.gov/monetarypolicy/reqresbalances.htm). Federal Reserve Board. 2008-10-06. Retrieved 2008-10-14.
312. "Press Release – October 22, 2008" (http://www.federalreserve.gov/newsevents/press/monetary/20081022a.htm). Federal Reserve Board. 2008-10-22. Retrieved 2008-10-22.

matter of prudent planning and has no implication for the near-term conduct of monetary policy [313].

The Federal Reserve initially authorized up to five "small-value offerings are designed to ensure the effectiveness of TDF operations and to provide eligible institutions with an opportunity to gain familiarity with term deposit procedures." [314] After three of the offering auctions were successfully completed, it was announced that small-value auctions would continue on an on-going basis [315].

The Term Deposit Facility is essentially a tool available to reverse the efforts that have been employed to provide liquidity to the financial markets and to reduce the amount of capital available to the economy. As stated in Bloomberg News:

Policy makers led by Chairman Ben S. Bernanke are preparing for the day when they will have to start siphoning off more than $1 trillion in excess reserves from the banking system to contain inflation. The Fed is charting an eventual return to normal monetary policy, even as a weakening near-term outlook has raised the possibility it may expand its balance sheet [316].

Chairman Ben S. Bernanke, testifying before House Committee on Financial Services, described the Term Deposit Facility and other facilities to Congress in the following terms:

Most importantly, in October 2008 the Congress gave the Federal Reserve statutory authority to pay interest on balances that banks hold at the Federal Reserve Banks. By increasing the interest rate on banks' reserves, the Federal Reserve will be able to put significant upward pressure on all short-term interest rates, as banks will not supply short-term funds to the money markets at rates significantly below what they can earn by holding reserves at the Federal Reserve Banks. Actual and prospective increases in short-term interest rates will be reflected in turn in higher longer-term interest rates and in tighter financial conditions more generally....

As an additional means of draining reserves, the Federal Reserve is also developing plans to offer to depository institutions term deposits, which are roughly analogous to certificates of deposit that the institutions offer to their customers. A proposal describing a term deposit facility was recently published in the Federal Register, and the Federal Reserve is finalizing a revised proposal in light of the public comments that have been received. After a revised proposal is reviewed by the Board, we expect to be able to conduct test transactions this spring and to have the facility available if necessary thereafter. The use of reverse repos and the deposit facility would together allow the Federal Reserve to drain hundreds of billions of dollars of reserves from the banking system quite quickly, should it choose to do so.

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313. "Federal Reserve Board approves amendments to Regulation D authorizing Reserve Banks to offer term deposits" (http://www.federalreserve.gov/newsevents/press/monetary/20100430a.htm). Federalreserve.gov. 2010-04-30. Retrieved 2011-08-29.
314. "Board authorizes small-value offerings of term deposits under the Term Deposit Facility" (http://www.federalreserve.gov/newsevents/press/monetary/20100510b.htm). Federalreserve.gov. 2010-05-10. Retrieved 2011-08-29.
315. "Board authorizes ongoing small-value offerings of term deposits under the Term Deposit Facility" (http://www.federalreserve.gov/newsevents/press/monetary/20100908a.htm). Federalreserve.gov. 2010-09-08. Retrieved 2011-08-29.
316. Zumbrun, Joshua (September 8, 2010). "Fed to Sell Term Deposits to Ensure Exit 'Readiness'" (http://www.bloomberg.com/news/2010-09-08/fed-to-sell-5-billion-of-term-deposits-to-ensure-readiness-.html). Bloomberg. Retrieved September 10, 2010.

When these tools are used to drain reserves from the banking system, they do so by replacing bank reserves with other liabilities; the asset side and the overall size of the Federal Reserve's balance sheet remain unchanged. If necessary, as a means of applying monetary restraint, the Federal Reserve also has the option of redeeming or selling securities. The redemption or sale of securities would have the effect of reducing the size of the Federal Reserve's balance sheet as well as further reducing the quantity of reserves in the banking system. Restoring the size and composition of the balance sheet to a more normal configuration is a longer-term objective of our policies. In any case, the sequencing of steps and the combination of tools that the Federal Reserve uses as it exits from its currently very accommodative policy stance will depend on economic and financial developments and on our best judgments about how to meet the Federal Reserve's dual mandate of maximum employment and price stability.

In sum, in response to severe threats to our economy, the Federal Reserve created a series of special lending facilities to stabilize the financial system and encourage the resumption of private credit flows to American families and businesses. As market conditions and the economic outlook have improved, these programs have been terminated or are being phased out. The Federal Reserve also promoted economic recovery through sharp reductions in its target for the federal funds rate and through large-scale purchases of securities. The economy continues to require the support of accommodative monetary policies. However, we have been working to ensure that we have the tools to reverse, at the appropriate time, the currently very high degree of monetary stimulus. We have full confidence that, when the time comes, we will be ready to do so [317].

3.7.4.2.11 Asset Backed Commercial Paper Money Market Mutual Fund Liquidity Facility

The Asset Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (ABCPMMMFLF) was also called the AMLF. The Facility began operations on September 22, 2008, and was closed on February 1, 2010.

All U.S. depository institutions, bank holding companies (parent companies or U.S. broker-dealer affiliates), or U.S. branches and agencies of foreign banks were eligible to borrow under this facility pursuant to the discretion of the FRBB.

Collateral eligible for pledge under the Facility was required to meet the following criteria:

was purchased by Borrower on or after September 19, 2008 from a registered investment company that held itself out as a money market mutual fund;

317. Testimony before the House Committee on Financial Services regarding "Unwinding Emergency Federal Reserve Liquidity Programs and Implications for Economic Recovery." March 25, 2010. (http://financialservices.house.gov/Hearings/hearingDetails.aspx?NewsID=1087), also at GPO Access Serial No. 111–118 (http://frwebgate.access.gpo.gov/cgi-bin/useftp.cgi?IPaddress=162.140.64.184&filename=56764.pdf&directory=/diska/wais/data/111_house_hearings) Retrieved September 10, 2010

was purchased by Borrower at the Fund's acquisition cost as adjusted for amortization of premium or accretion of discount on the ABCP through the date of its purchase by Borrower;

was rated at the time pledged to FRBB, not lower than A1, F1, or P1 by at least two major rating agencies or, if rated by only one major rating agency, the ABCP must have been rated within the top rating category by that agency;

was issued by an entity organized under the laws of the United States or a political subdivision thereof under a program that was in existence on September 18, 2008; and

had a stated maturity that did not exceed 120 days if the Borrower was a bank or 270 days for non-bank Borrowers.

3.7.4.2.12 Commercial Paper Funding Facility

The Commercial Paper Funding Facility (CPFF): on October 7, 2008 the Federal Reserve further expanded the collateral it will loan against, to include commercial paper. The action made the Fed a crucial source of credit for non-financial businesses in addition to commercial banks and investment firms. Fed officials said they'll buy as much of the debt as necessary to get the market functioning again. They refused to say how much that might be, but they noted that around $1.3 trillion worth of commercial paper would qualify. There was $1.61 trillion in outstanding commercial paper, seasonally adjusted, on the market as of October 1, 2008, according to the most recent data from the Fed. That was down from $1.70 trillion in the previous week. Since the summer of 2007, the market has shrunk from more than $2.2 trillion [318]. This program lent out a total $738 billion before it was closed. Forty-five out of 81 of the companies participating in this program were foreign firms. Research shows that Troubled Asset Relief Program (TARP) recipients were twice as likely to participate in the program than other commercial paper issuers who did not take advantage of the TARP bailout. The Fed incurred no losses from the CPFF [319].

3.7.4.2.13 Quantitative policy

A little-used tool of the Federal Reserve is the quantitative policy. With that the Federal Reserve actually buys back corporate bonds and mortgage backed securities held by banks or other financial institutions. This in effect puts money back into the financial institutions and allows them to make loans and conduct normal business. The Federal Reserve Board used this policy in the early 1990s when the U.S. economy experienced the savings and loan crisis.

318. Fed Action (http://biz.yahoo.com/ap/081007/financial_meltdown.html)
319. Wilson, Linus; Wu, Yan (August 22, 2011). Does Receiving TARP Funds Make it Easier to Roll Your Commercial Paper Onto the Fed?. Social Science Electronic Publishing.

The bursting of the United States housing bubble prompted the Fed to buy mortgage-backed securities for the first time in November 2008. Over six weeks, a total of $1.25 trillion were purchased in order stabilize the housing market, about one-fifth of all U.S. government-backed mortgages [320].

3.7.5 Measurement of economic variables

The Federal Reserve records and publishes large amounts of data. A few websites where data is published are at the Board of Governors Economic Data and Research page [321], the Board of Governors statistical releases and historical data page [322], and at the St. Louis Fed's FRED (Federal Reserve Economic Data) page [323]. The Federal Open Market Committee (FOMC) examines many economic indicators prior to determining monetary policy [324].

Some criticism involves economic data compiled by the Fed. The Fed sponsors much of the monetary economics research in the U.S., and Lawrence H. White objects that this makes it less likely for researchers to publish findings challenging the status quo [325].

3.7.5.1 Net worth of households and nonprofit organizations

The net worth of households and nonprofit organizations in the United States is published by the Federal Reserve in a report titled, Flow of Funds [326]. At the end of fiscal year 2008, this value was $51.5 trillion.

3.7.5.2 Money supply

The most common measures are named M0 (narrowest), M1, M2, and M3. In the United States they are defined by the Federal Reserve as follows:

320. Heard on All Things Considered (2010-08-26). "Federal Reserve Mortgage Purchase Program : Planet Money" (http://www.npr.org/templates/transcript/transcript.php?storyId=129451895). NPR. Retrieved 2011-08-29.
321. "FRB: Economic Research & Data" (http://federalreserve.gov/econresdata/default.htm). Federalreserve.gov. 2011-08-24. Retrieved 2011-08-29.
322. "Federal Reserve Board – Statistics: Releases and Historical Data" (http://www.federalreserve.gov/releases/). Federalreserve.gov. 2010-05-10. Retrieved 2011-08-29.
323. "St. Louis Fed: Economic Data – FRED" (http://research.stlouisfed.org/fred2/). Research.stlouisfed.org. 2011-08-20. Retrieved 2011-08-29.
324. Federal Reserve Education – Economic Indicators (http://www.federalreserveeducation.org/fed101_html/policy/indicators_print.htm)
325. White, Lawrence H. (August 2005). "The Federal Reserve System's Influence on Research in Monetary Economics" (http://econjwatch.org/articles/the-federal-reserve-system-s-influence-on-research-in-monetary-economics). Econ Journal Watch 2 (2): 325–354. Retrieved 2011-08-29.
326. FRB: Z.1 Release—Flow of Funds Accounts of the United States, Release Dates (http://www.federalreserve.gov/RELEASES/z1/) See the pdf documents from 1945 to 2007. The value for each year is on page 94 of each document (the 99th page in a pdf viewer) and duplicated on page 104 (109th page in pdf viewer). It gives the total assets, total liabilities, and net worth. This chart is of the net worth.

Measure	Definition
M0	The total of all physical currency, plus accounts at the central bank that can be exchanged for physical currency.
M1	M0 + those portions of M0 held as reserves or vault cash + the amount in demand accounts ("checking" or "current" accounts).
M2	M1 + most savings accounts, money market accounts, and small denomination time deposits (certificates of deposit of under $100,000).
M3	M2 + all other CDs, deposits of eurodollars and repurchase agreements.

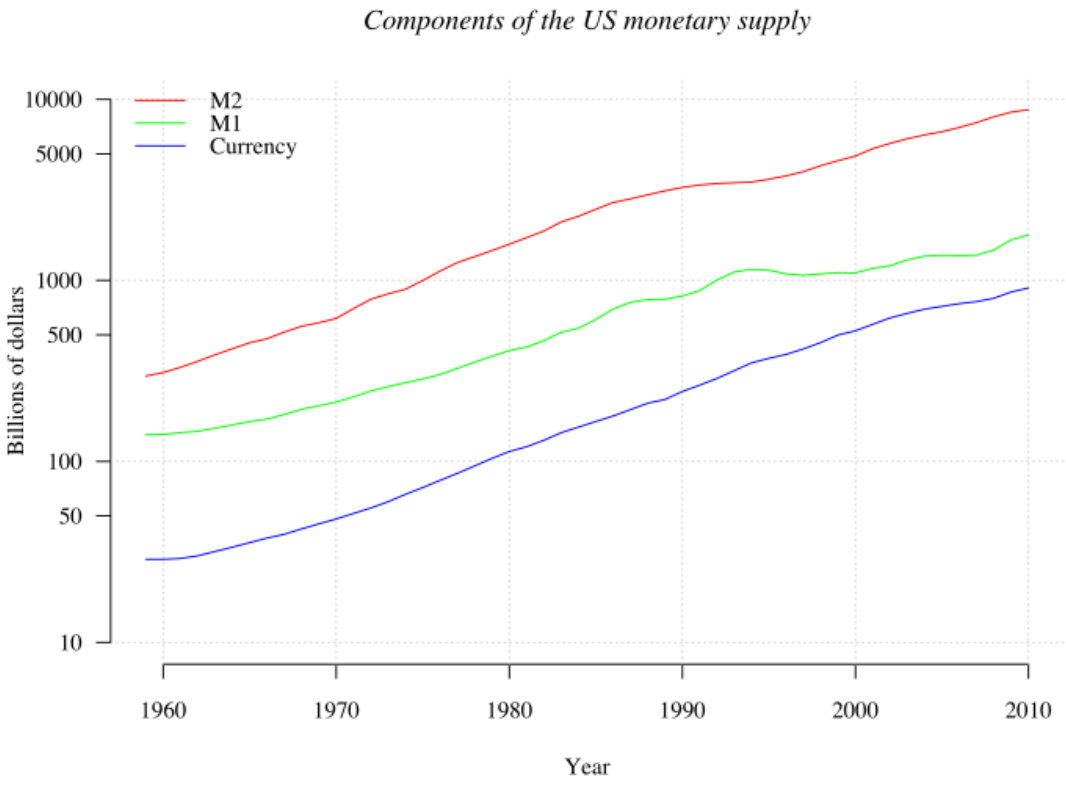

Figure 3.18 Components the U.S. money supply (currency, M1 and M2), 1960–2010

The Federal Reserve stopped publishing M3 statistics in March 2006, saying that the data cost a lot to collect but did not provide significantly useful information [327]. The other three money supply measures continue to be provided in detail.

327. "Discontinuance of M3" (http://www.federalreserve.gov/Releases/h6/discm3.htm). Federalreserve.gov. 2005-11-10. Retrieved 2011-08-29.

3.7.5.3 Personal consumption expenditures price index

The Personal consumption expenditures price index, also referred to as simply the PCE price index, is used as one measure of the value of money. It is a United States-wide indicator of the average increase in prices for all domestic personal consumption. Using a variety of data including U.S. Consumer Price Index and Producer Price Index prices, it is derived from the largest component of the Gross Domestic Product in the BEA's National Income and Product Accounts, personal consumption expenditures.

One of the Fed's main roles is to maintain price stability, which means that the Fed's ability to keep a low inflation rate is a long-term measure of the their success [328]. Although the Fed is not required to maintain inflation within a specific range, their long run target for the growth of the PCE price index is between 1.5 and 2 percent [329]. There has been debate among policy makers as to whether or not the Federal Reserve should have a specific inflation targeting policy [330], [331], [332].

3.7.5.3.1 Inflation and the economy

There are two types of inflation that are closely tied to each other. Monetary inflation is an increase in the money supply. Price inflation is a sustained increase in the general level of prices, which is equivalent to a decline in the value or purchasing power of money. If the supply of money and credit increases too rapidly over many months (monetary inflation), the result will usually be price inflation. Price inflation does not always increase in direct proportion to monetary inflation; it is also affected by the velocity of money and other factors. With price inflation, a dollar buys less and less over time.

The second way that inflation can occur and the more frequent way is by an increase in the velocity of money. This has only been measured since the mid 50's. A healthy economy usually has a velocity of 1.8 to 2.3. If the velocity is too high, then this means that people are not holding on to their money and spending it as fast as they get it. Inflation happens when too many dollars are chasing too few goods. If people are spending as soon as they get it, then there are more "active" dollars in the

328. BoG 2006 (http://en.wikibooks.org/wiki/Principles_of_Finance/Section_1/Chapter/Financial_Markets_and_Institutions/Federal_Reserve#CITEREFBoG2006), pp. 10
329. "Is the Fed's Definition of Price Stability Evolving?" (http://research.stlouisfed.org/publications/es/10/ES1033.pdf). Federal Reserve Bank of St. Louis. November 9, 2010. Retrieved February 13, 2011.
330. "Remarks by Governor Ben S. Bernanke - A perspective on inflation targeting" (http://www.federalreserve.gov/Boarddocs/Speeches/2003/20030325/default.htm). Federalreserve.gov. 2003-03-25. Retrieved 2011-08-29.
331. "What's The Fuss Over Inflation Targeting?" (http://www.businessweek.com/magazine/content/05_45/b3958607.htm). Businessweek.com. 2005-11-07. Retrieved 2011-08-29.
332. Bernanke, Ben S. (2005). The Inflation-Targeting Debate (http://www.press.uchicago.edu/cgi-bin/hfs.cgi/00/16485.ctl). University of Chicago Press. ISBN 978-0-226-04471-2. Retrieved 2011-08-29.

marketplace, as opposed to sitting in a bank account. This will also cause a price increase [333].

The effects of monetary and price inflation include [334]:

- Price inflation makes workers worse off if their incomes don't rise as rapidly as prices.
- Pensioners living on a fixed income are worse off if their savings do not increase more rapidly than prices.
- Lenders lose because they will be repaid with dollars that aren't worth as much.
- Savers lose because the dollar they save today will not buy as much when they are ready to spend it.
- Debtors win because the dollar they borrow today will be repaid with dollars that aren't worth as much.
- Businesses and people will find it harder to plan and therefore may decrease investment in future projects.
- Owners of financial assets suffer.
- Interest rate-sensitive industries, like mortgage companies, suffer as monetary inflation drives up long-term interest rates and Federal Reserve tightening raises short-term rates.
- Developed-market currencies become weaker against emerging markets [335].

In his 1995 book The Case Against the Fed, economist Murray N. Rothbard argues that price inflation is caused only by an increase in the money supply, and only banks increase the money supply, then banks, including the Federal Reserve, are the only source of inflation.

Adherents of the Austrian School of economic theory blame the economic crisis in the late 2000s [336] on the Federal Reserve's policy, particularly under the leadership of Alan Greenspan, of credit expansion through historically low interest rates starting in 2001, which they claim enabled the United States housing bubble.

Most mainstream economists favor a low, steady rate of inflation [337]. Low (as opposed to zero or negative) inflation may reduce the severity of economic recessions by enabling the labor market to adjust more quickly in a downturn, and reduce the risk that a liquidity trap prevents monetary policy from stabilizing the economy [338]. The task of keeping the rate of inflation low and stable is usually given to monetary authorities.

333. Federal Reserve Education—Monetary Policy Basics (http://www.federalreserveeducation.org/fed101_html/policy/basics_print.htm)
334. Federal Reserve Education—Monetary Policy Basics (http://www.federalreserveeducation.org/fed101_html/policy/basics_print.htm)
335. Lanman, S. and Kennedy, S. (2011-09-19). "Bernanke Joins King Tolerating Inflation" (http://www.bloomberg.com/news/2011-09-18/bernanke-joins-king-tolerating-more-inflation-as-economies-fail-to-revive.html). Bloomberg. Retrieved 2011-09-21.
336. O'Driscoll, Gerald P. Jr. (April 20, 2010). "An Economy of Liars" (http://online.wsj.com/article/SB10001424052748704508904575192430373566758.html). The Wall Street Journal. Retrieved June 23, 2010.
337. Hummel, Jeffrey Rogers. "Death and Taxes, Including Inflation: the Public versus Economists" (January 2007).[2] p.56
338. "Escaping from a Liquidity Trap and Deflation: The Foolproof Way and Others" (http://www.atypon-link.com/AEAP/doi/abs/10.1257/089533003772034934) Lars E.O. Svensson, Journal of Economic Perspectives, Volume 17, Issue 4 Fall 2003, p145-166

3.7.5.4 Unemployment rate

One of the stated goals of monetary policy is maximum employment. The unemployment rate statistics are collected by the Bureau of Labor Statistics, and like the PCE price index are used as a barometer of the nation's economic health, and thus as a measure of the success of an administration's economic policies. Since 1980, both parties have made progressive changes in the basis for calculating unemployment, so that the numbers now quoted cannot be compared directly to the corresponding rates from earlier administrations, or to the rest of the world [339].

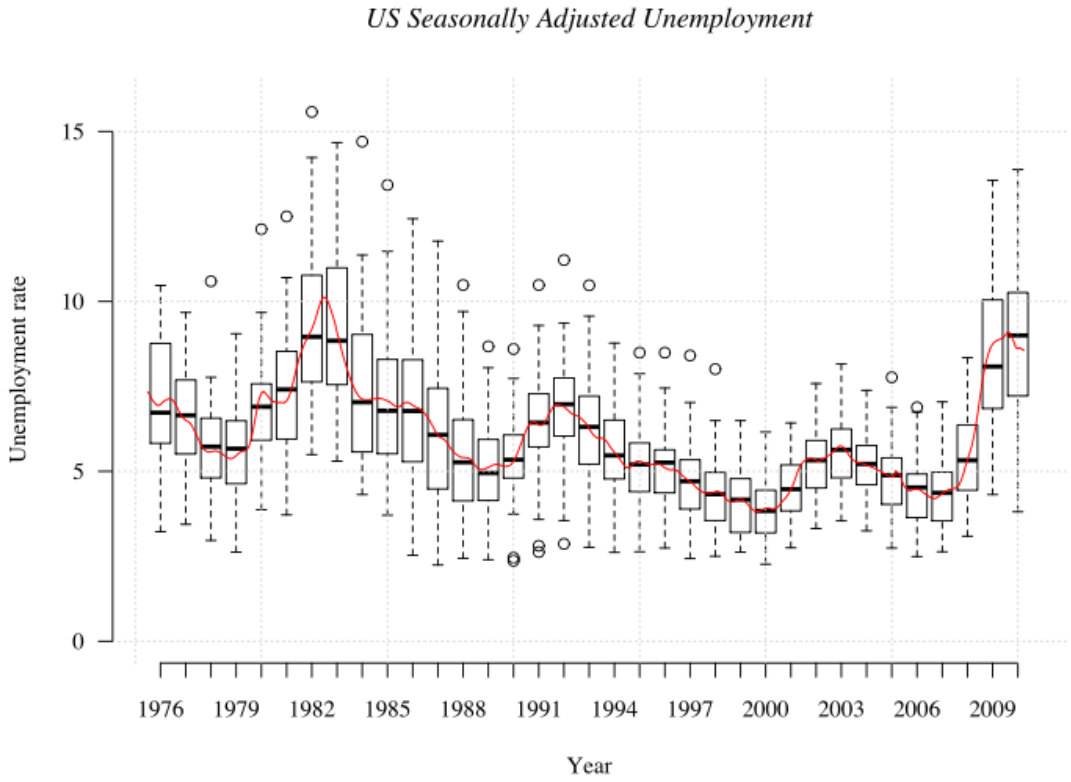

Figure 3.19 United States unemployment rates 1975–2010 showing variance between the fifty states

3.7.6 Budget

The Federal Reserve is self-funded. The vast majority (90%+) of Fed revenues come from open market operations, specifically the interest on the portfolio of Treasury securities as well as "capital gains/losses" that may arise from the buying/selling of the securities and their derivatives as part of Open Market Operations. The balance of revenues come from sales of financial services (check and electronic payment processing) and discount window loans [340]. The Board of Governors (Federal Reserve

339. Phillips, Kevin (May 2008). "Numbers Racket – Why the Economy is Worse than We Know" (http://mathforum.org/~josh/articles/KevinPhillips-NumbersRacket.pdf). Harper's Magazine: 43–47. Retrieved 2011-08-29.
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Board) creates a budget report once per year for Congress. There are two reports with budget information. The one that lists the complete balance statements with income and expenses as well as the net profit or loss is the large report simply titled, "Annual Report". It also includes data about employment throughout the system. The other report, which explains in more detail the expenses of the different aspects of the whole system, is called "Annual Report: Budget Review". These are comprehensive reports with many details and can be found at the Board of Governors' website under the section "Reports to Congress" [341]

3.7.7 Net worth

3.7.7.1 Balance sheet

One of the keys to understanding the Federal Reserve is the Federal Reserve balance sheet (or balance statement). In accordance with Section 11 of the Federal Reserve Act, the Board of Governors of the Federal Reserve System publishes once each week the "Consolidated Statement of Condition of All Federal Reserve Banks" showing the condition of each Federal Reserve bank and a consolidated statement for all Federal Reserve banks. The Board of Governors requires that excess earnings of the Reserve Banks be transferred to the Treasury as interest on Federal Reserve notes [342], [343].

Below is the balance sheet as of July 6, 2011 (in billions of dollars):

NOTE: The Fed balance sheet shown in this article has assets, liabilities and net equity that do not add up correctly. The Fed balance sheet is missing the item "Reserve Balances with Federal Reserve Banks" which would make the balance sheet balance.

341. "Federal Reserve Board—A-Z Listing of Board Publications" (http://www.federalreserve.gov/boarddocs/rptcongress/default.htm). Federalreserve.gov. 2011-08-10. Retrieved 2011-08-29.
342. "96th Annual Report 2008 Federal Reserve" (PDF) (http://www.federalreserve.gov/boarddocs/rptcongress/annual08/pdf/AR08.pdf). Board of Governors of the Federal Reserve System. June 2009. Retrieved 2011-08-29.
343. "Factors Affecting Reserve Balances of Depository Institutions and Condition Statement of Federal Reserve Banks" (http://www.federalreserve.gov/releases/h41/Current/). Federal Reserve. Retrieved 2008-03-20.

ASSETS:
Gold Stock 11.04 Special Drawing Rights Certificate Acct. 5.20 Treasury Currency Outstanding (Coin) 43.98 Securities Held Outright 2647.94 U.S. Treasury Securities 1623.78 Bills 18.42 Notes and Bonds, nominal 1530.79 Notes and Bonds, inflation-indexed 65.52 Inflation Compensation 9.04 Federal Agency Debt Securities 115.30 Mortgage-Backed Securities 908.85 Repurchase Agreements 0 Loans 12.74 Primary Credit 12 Secondary Credit 0 Seasonal Credit 53 Credit Extended to AIG Inc. 0 Term Asset-Backed Securities Loan Facility 12.67 Other Credit Extended 0 Commercial Paper Funding Facility LLC 0 Net portfolio holdings of Maiden Lane LLC, Maiden Lane II LLC, and Maiden Lane III LLC 60.32 Preferred Interest in AIG Life-Insurance Subsidiaries 0 Net Holdings of TALF LLC 0.75 Float -1.05 Central Bank Liquidity Swaps 0 Other Assets 133.56 Total Assets 2914.51

LIABILITIES:
Currency in Circulation 1031.30 Reverse repurchase agreements 68.09 Deposits 91.12 Term Deposits 0 U.S. Treasury, general account 76.56 U.S. Treasury, supplementary financing account 5 Foreign official 0.17 Service Related 2.53 Other Deposits 6.85 Funds from AIG, held as agent 0 Other Liabilities 73.06 Total liabilities 1263.73

CAPITAL (AKA Net Equity)
Capital Paid In 26.71 Surplus 25.91 Other Capital 4.16 Total Capital 56.78
MEMO (off-balance-sheet items)
Marketable securities held in custody for foreign official and international accounts 3445.42 U.S. Treasury Securities 2708 Federal Agency Securities 737.31 Securities lent to dealers 30.46 Overnight 30.46 Term 0

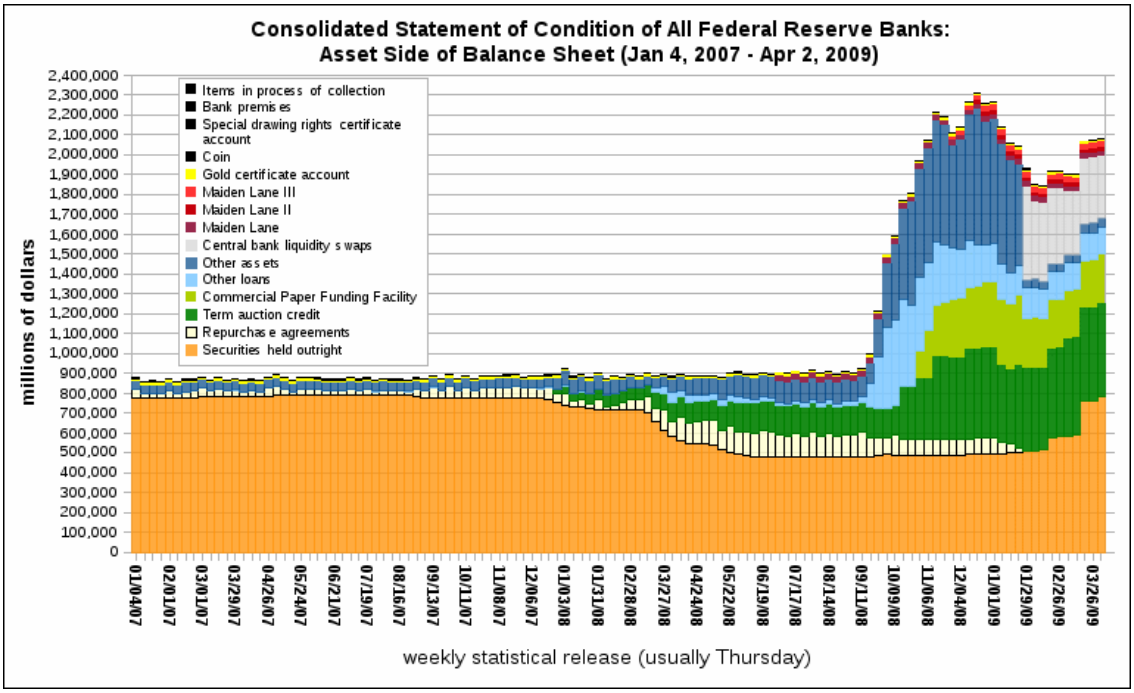

Figure 3.20 Total combined assets for all 12 Federal Reserve Banks

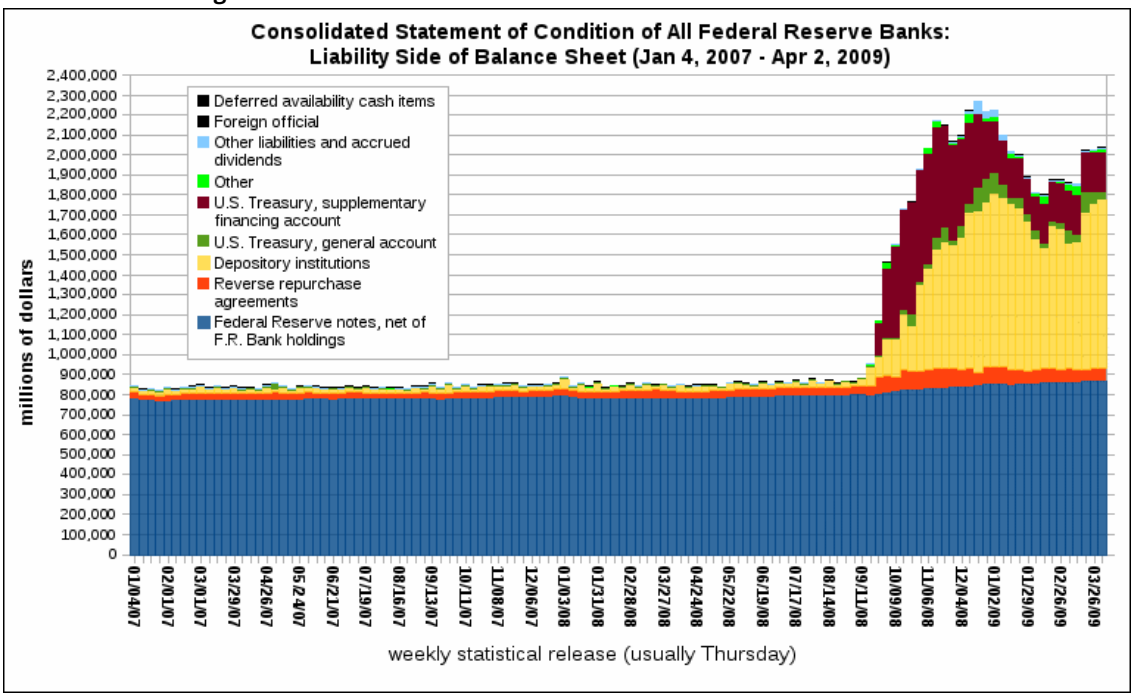

Figure 3.21 Total combined liabilities for all 12 Federal Reserve Banks

Analyzing the Federal Reserve's balance sheet reveals a number of facts:

- The Fed has over $11 billion in gold stock (certificates), which represents the Fed's financial interest in the statutory-determined value of gold turned over to the U.S. Treasury in accordance with the Gold Reserve Act on January 30, 1934 [344]. The value reported here is based on a statutory valuation of $42 2/9 per fine troy ounce. As of March 2009, the market value of that gold is around $247.8 billion.
- The Fed holds more than $1.8 billion in coinage, not as a liability but as an asset. The Treasury Department is actually in charge of creating coins and U.S. Notes. The Fed then buys coinage from the Treasury by increasing the liability assigned to the Treasury's account.

344. "The Federal Reserve Does Not Own Any Gold at All" (http://goldnews.com/2011/06/02/fed-lawyer-alvarez-the-federal-reserve-does-not-own-any-gold-at-all/). Gold News. 2011-06-02. Retrieved 2011-08-29.

- The Fed holds at least $534 billion of the national debt. The "securities held outright" value used to directly represent the Fed's share of the national debt, but after the creation of new facilities in the winter of 2007–2008, this number has been reduced and the difference is shown with values from some of the new facilities.
- The Fed has no assets from overnight repurchase agreements. Repurchase agreements are the primary asset of choice for the Fed in dealing in the open market. Repo assets are bought by creating depository institution liabilities and directed to the bank the primary dealer uses when they sell into the open market.
- The more than $1 trillion in Federal Reserve Note liabilities represents nearly the total value of all dollar bills in existence; over $176 billion is held by the Fed (not in circulation); and the "net" figure of $863 billion represents the total face value of Federal Reserve Notes in circulation.
- The $916 billion in deposit liabilities of depository institutions shows that dollar bills are not the only source of government money. Banks can swap deposit liabilities of the Fed for Federal Reserve Notes back and forth as needed to match demand from customers, and the Fed can have the Bureau of Engraving and Printing create the paper bills as needed to match demand from banks for paper money. The amount of money printed has no relation to the growth of the monetary base (M0).
- The $93.5 billion in Treasury liabilities shows that the Treasury Department does not use private banks but rather uses the Fed directly (the lone exception to this rule is Treasury Tax and Loan because the government worries that pulling too much money out of the private banking system during tax time could be disruptive).
- The $1.6 billion foreign liability represents the amount of foreign central bank deposits with the Federal Reserve.
- The $9.7 billion in 'other liabilities and accrued dividends' represents partly the amount of money owed so far in the year to member banks for the 6% dividend on the 3% of their net capital they are required to contribute in exchange for nonvoting stock their regional Reserve Bank in order to become a member. Member banks are also subscribed for an additional 3% of their net capital, which can be called at the Federal Reserve's discretion. All nationally chartered banks must be members of a Federal Reserve Bank, and state-chartered banks have the choice to become members or not.
- Total capital represents the profit the Fed has earned, which comes mostly from assets they purchase with the deposit and note liabilities they create. Excess capital is then turned over to the Treasury Department and Congress to be included into the Federal Budget as "Miscellaneous Revenue".

In addition, the balance sheet also indicates which assets are held as collateral against Federal Reserve Notes.

Federal Reserve Notes and Collateral
Federal Reserve Notes and Collateral Federal Reserve Notes Outstanding 1128.63 Less: Notes held by F.R. Banks 200.90 Federal Reserve notes to be collateralized 927.73 Collateral held against Federal Reserve notes 927.73 Gold certificate account 11.04 Special drawing rights certificate account 5.20 U.S. Treasury, agency debt, and mortgage-backed securities pledged 911.50 Other assets pledged

3.7.8 Criticisms

The Federal Reserve System has faced various criticisms since its inception in 1913. These criticisms include the assertions that the Federal Reserve System violates the United States Constitution and that it impedes economic prosperity.

3.7.9 See also

- Consumer Leverage Ratio
- Core inflation
- List of economic reports by U.S. government agencies
- Fed model
- Federal Reserve 800 billion dollar Consumer Loan and bond plan
- Federal Reserve Police
- Federal Reserve Statistical Release
- Free banking
- Gold standard
- Government debt
- Greenspan put
- History of Federal Open Market Committee actions
- Independent Treasury
- Legal Tender Cases
- United States Bullion Depository - known as Fort Knox

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raced to their banks to withdraw their deposits. A particularly severe panic in 1907 resulted in bank runs that wreaked havoc on the fragile banking system and ultimately led Congress in 1913 to write the Federal Reserve Act. Initially created to address these banking panics, the Federal Reserve is now charged with a number of broader responsibilities, including fostering a sound banking system and a healthy economy."

3. BoG 2005, pp. 1–2
4. Panic of 1907: J.P. Morgan Saves the Day
5. Born of a Panic: Forming the Fed System
6. The Financial Panic of 1907: Running from History
7. BoG 2005, pp. 1 "It was founded by Congress in 1913 to provide the nation with a safer, more flexible, and more stable monetary and financial system. Over the years, its role in banking and the economy has expanded."
8. Patrick, Sue C. (1993). Reform of the Federal Reserve System in the Early 1930's: The Politics of Money and Banking. Garland. ISBN 978-0-8153-0970-3.
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26. ""Mr. Govr. MORRIS moved to strike out "and emit bills on the credit of the U. States"-If the United States had credit such bills would be unnecessary: if they had not, unjust & useless. ... On the motion for striking out N. H. ay. Mas. ay. Ct ay. N. J. no. Pa. ay. Del. ay. Md. no. Va. ay. N. C. ay. S. C. ay. Geo. ay."". Avalon.law.yale.edu. Retrieved 2012-04-30.
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134. "Fed Boosts Next Two Special Auctions to $30 Billion". Bloomberg. January 4, 2008. "The Board of Governors of the Federal Reserve System established the temporary Term Auction Facility, dubbed TAF, in December to provide cash after interest-rate cuts failed to break banks' reluctance to lend amid concern about losses related to subprime mortgage securities. The program will make funding from the Fed available beyond the 20 authorized primary dealers that trade with the central bank"
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3.7.12 External links

Template:External links

Template:EB1922 Poster

3.7.12.1 Official Federal Reserve websites and information

- Federal Reserve Reports to Congress
- The Federal Reserve in Plain English—An easy-to-read guide to the structure and functions of the Federal Reserve System
- ebook: The Federal Reserve System—Purposes and Functions
- Ask Dr. Econ – An educational resource from the Federal Reserve Bank of San Francisco
- Board of Governors of the Federal Reserve — Official website
- "The Federal Reserve System in Brief" — at the Federal Reserve Bank of San Francisco
- "What is the Fed?" — at the Federal Reserve Bank of San Francisco.
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- Federal Reserve Districts and Banks
- Federal Reserve Education
- Federal Reserve Financial Services
- The Federal Reserve and the Financial Crisis Chairman Bernanke's College Lecture Series to an undergraduate class at The George Washington University School of Business March, 2012
- Related readings
- "Origins and Mission of the Federal Reserve" includes small fast video
- "Chairman Ben Bernanke Lecture Series Part 1"includes large slow video Recorded live on March 20, 2012 10:35am MST
- Lecture materials
- "The Federal Reserve after World War II" includes small fast video

- "Chairman Ben Bernanke Lecture Series Part 2" includes large slow video
  Recorded live on March 22, 2012 10:37am MST
- Lecture materials
- "The Federal Reserve's Response to the Financial Crisis" includes small fast video
- "Chairman Ben Bernanke Lecture Series Part 3" includes large slow video
  Recorded live on March 27, 2012 10:38am MST
- Lecture materials
- "The Aftermath of the Crisis" includes small fast video
- Lecture materials
- Board membership

3.7.12.1.1 Historical Resources

- FRASER (Federal Reserve Archival System for Economic Research)

3.7.12.1.2 Open Market operations

- NY FED: Open Market Operations

3.7.12.1.3 Repurchase agreements

- NY FED: Repurchase and Reverse Repurchase Transactions

3.7.12.1.4 Discount window

- The Official FED Discount Window information website

3.7.12.1.5 Economic indicators

- Consumer Price Index Calculator

3.7.12.1.6 Federal Reserve publications

- Modern Money Mechanics (out of print)
- Publications Catalog
- Federal Funds Rate Changes(Base Deposit Rate)

3.7.12.2 Other websites describing the Federal Reserve

- "How 'The Fed' Works" — at HowStuffWorks.com
- "Federal Reserve Update" — money-rates.com
- Macroeconomic Effects of Interest Rate Cuts, by Jason Cawley, Wolfram Demonstrations Project, 2007.
- All 12 Federal Reserve Banks on a Google Map

3.8 Commercial Banks

A **commercial bank** (or **business bank**) is a type of financial institution and financial intermediary. It is a bank that lends money and provides transactional, savings, and money market accounts and that accepts time deposits [345].

3.8.1 Origin of the word

The name bank derives from the Italian word banco "desk/bench", used during the Renaissance era by Florentine bankers, who used to make their transactions above a desk covered by a green tablecloth [346]. However, traces of banking activity can be found even in ancient times.

In fact, the word traces its origins back to the Ancient Roman Empire, where moneylenders would set up their stalls in the middle of enclosed courtyards called macella on a long bench called a bancu, from which the words banco and bank are derived. As a moneychanger, the merchant at the bancu did not so much invest money as merely convert the foreign currency into the only legal tender in Rome – that of the Imperial Mint [347].

3.8.2 The role of commercial banks

Commercial banks engage in the following activities:

345. Sullivan, arthur; Steven M. Sheffrin (2003). Economics: k (http://www.pearsonschool.com/index.cfm?locator=PSZ3R9&PMDbSiteId=2781&PMDbSolutionId=6724&PMDbCategoryId=&PMDbProgramId=12881&level=4). Upper Saddle River, New Jersey 07458: Pearson Prentice Hall. pp. 511. ISBN 0-13-063085-3.
346. de Albuquerque, Martim (1855). Notes and Queries (http://books.google.com/?id=ulrWLegNZxUC&pg=PA431&lpg=PA431&dq=bank+italian+bench). London: George Bell. pp. 431.
347. Matyszak, Philip (2007). Ancient Rome on Five Denarii a Day (http://www.amazon.com/Ancient-Rome-Five-Denarii-Day/dp/050005147X). New York: Thames & Hudson. pp. 144. ISBN 0-500-05147-X.

- processing of payments by way of telegraphic transfer, EFTPOS, internet banking, or other means
- issuing bank drafts and bank cheques
- accepting money on term deposit
- lending money by overdraft, installment loan, or other means
- providing documentary and standby letter of credit, guarantees, performance bonds, securities underwriting commitments and other forms of off balance sheet exposures
- safekeeping of documents and other items in safe deposit boxes
- sales, distribution or brokerage, with or without advice, of: insurance, unit trusts and similar financial products as a “financial supermarket”
- cash management and treasury
- merchant banking and private equity financing
- traditionally, large commercial banks also underwrite bonds, and make markets in currency, interest rates, and credit-related securities, but today large commercial banks usually have an investment bank arm that is involved in the activities.

3.8.3 Types of loans granted by commercial banks

3.8.3.1 Secured loan

A secured loan is a loan in which the borrower pledges some asset (e.g. a car or property) as collateral for the loan, which then becomes a secured debt owed to the creditor who gives the loan. The debt is thus secured against the collateral — in the event that the borrower defaults, the creditor takes possession of the asset used as collateral and may sell it to regain some or all of the amount originally lent to the borrower, for example, foreclosure of a home. From the creditor's perspective this is a category of debt in which a lender has been granted a portion of the bundle of rights to specified property. If the sale of the collateral does not raise enough money to pay off the debt, the creditor can often obtain a deficiency judgment against the borrower for the remaining amount. The opposite of secured debt/loan is unsecured debt, which is not connected to any specific piece of property and instead the creditor may only satisfy the debt against the borrower rather than the borrower's collateral and the borrower.

A mortgage loan is a very common type of debt instrument, used to purchase real estate. Under this arrangement, the money is used to purchase the property. Commercial banks, however, are given security - a lien on the title to the house - until the mortgage is paid off in full. If the borrower defaults on the loan, the bank would have the legal right to repossess the house and sell it, to recover sums owing to it.

In the past, commercial banks have not been greatly interested in real estate loans and have placed only a relatively small percentage of assets in mortgages. As their name implies, such financial institutions secured their earning primarily from commercial and consumer loans and left the major task of home financing to others.

However, due to changes in banking laws and policies, commercial banks are increasingly active in home financing.

Changes in banking laws now allow commercial banks to make home mortgage loans on a more liberal basis than ever before. In acquiring mortgages on real estate, these institutions follow two main practices. First, some of the banks maintain active and well-organized departments whose primary function is to compete actively for real estate loans. In areas lacking specialized real estate financial institutions, these banks become the source for residential and farm mortgage loans. Second, the banks acquire mortgages by simply purchasing them from mortgage bankers or dealers.

In addition, dealer service companies, which were originally used to obtain car loans for permanent lenders such as commercial banks, wanted to broaden their activity beyond their local area. In recent years, however, such companies have concentrated on acquiring mobile home loans in volume for both commercial banks and savings and loan associations. Service companies obtain these loans from retail dealers, usually on a nonrecourse basis. Almost all bank/service company agreements contain a credit insurance policy that protects the lender if the consumer defaults.

3.8.3.2 Unsecured loan

Unsecured loans are monetary loans that are not secured against the borrower's assets (i.e., no collateral is involved). There are small businesss unsecured loans such as credit cards and credit lines to large corporate credit lines. These may be available from financial institutions under many different guises or marketing packages:

- bank overdrafts

An overdraft occurs when money is withdrawn from a bank account and the available balance goes below zero. In this situation the account is said to be "overdrawn". If there is a prior agreement with the account provider for an overdraft, and the amount overdrawn is within the authorized overdraft limit, then interest is normally charged at the agreed rate. If the POSITIVE balance exceeds the agreed terms, then additional fees may be charged and higher interest rates may apply.

- corporate bonds
- credit card debt
- credit facilities or lines of credit
- personal loans

What makes a bank limited liability company

A corporate bond is a bond issued by a corporation. It is a bond that a corporation issues to raise money in order to expand its business [348]. The term is usually applied to longer-term debt instruments, generally with a maturity date falling at least a year after their issue date. (The term "commercial paper" is sometimes used for

348. Sullivan, arthur; Steven M. Sheffrin (2003). Economics: k (http://www.pearsonschool.com/index.cfm?locator=PSZ3R9&PMDbSiteId=2781&PMDbSolutionId=6724&PMDbCategoryId=&PMDbProgramId=12881&level=4). Upper Saddle River, New Jersey 07458: Pearson Prentice Hall. pp. 511. ISBN 0-13-063085-3.

instruments with a shorter maturity.) Sometimes, the term "corporate bonds" is used to include all bonds except those issued by governments in their own currencies. Strictly speaking, however, it only applies to those issued by corporations. The bonds of local authorities and supranational organizations do not fit in either category. Corporate bonds are often listed on major exchanges (bonds there are called "listed" bonds) and ECNs like Bonds.com and MarketAxess, and the coupon (i.e. interest payment) is usually taxable. Sometimes this coupon can be zero with a high redemption value. However, despite being listed on exchanges, the vast majority of trading volume in corporate bonds in most developed markets takes place in decentralized, dealer-based, over-the-counter markets. Some corporate bonds have an embedded call option that allows the issuer to redeem the debt before its maturity date. Other bonds, known as convertible bonds, allow investors to convert the bond into equity. Corporate Credit spreads may alternatively be earned in exchange for default risk through the mechanism of Credit Default Swaps which give an unfunded synthetic exposure to similar risks on the same 'Reference Entities'. However, owing to quite volatile CDS 'basis' the spreads on CDS and the credit spreads on corporate bonds can be significantly different.

- Assets and Liabilities of Commercial Banks in the United States
- Glass-Steagall Act
- Mortgage constant

3.8.4 References

1. Sullivan, arthur; Steven M. Sheffrin (2003). Economics: k. Upper Saddle River, New Jersey 07458: Pearson Prentice Hall. pp. 511. ISBN 0-13-063085-3.
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3.8.5 Further reading

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- Commercial Banks directory and guidelines Commercial Banks

3.9 Regulation of Commercial Banks

Bank regulations are a form of government regulation which subject banks to certain requirements, restrictions and guidelines. This regulatory structure creates transparency between banking institutions and the individuals and corporations with whom they conduct business, among other things. Given the interconnectedness of the banking industry and the reliance that the national (and global) economy hold on banks, it is important for regulatory agencies to maintain control over the standardized practices of these institutions. Supporters of such regulation often hinge their arguments on the "too big to fail" notion. This holds that many financial institutions (particularly investment banks with a commercial arm) hold too much control over the economy to fail without enormous consequences. This is the premise for government bailouts, in which federal financial assistance is provided to banks or other financial institutions who appear to be on the brink of collapse. The belief is that without this aid, the crippled banks would not only become bankrupt, but would create rippling effects throughout the economy. Others advocate deregulation, or free banking, whereby banks are given extended liberties as to how they operate the institution.

3.9.1 Objectives of bank regulation

The objectives of bank regulation, and the emphasis, vary between jurisdictions. The most common objectives are:

1. Prudential—to reduce the level of risk to which bank creditors are exposed (i.e. to protect depositors) [349]
2. Systemic risk reduction—to reduce the risk of disruption resulting from adverse trading conditions for banks causing multiple or major bank failures [350]
3. Avoid misuse of banks—to reduce the risk of banks being used for criminal purposes, e.g. laundering the proceeds of crime
4. To protect banking confidentiality
5. Credit allocation—to direct credit to favored sectors

3.9.2 General principles of bank regulation

Banking regulations can vary widely across nations and jurisdictions. This section of the article describes general principles of bank regulation throughout the world.

349. Federal Deposit Insurance Corporation. "Risk Management Manual of Exam Policies, Section 1.1" (http://www.fdic.gov/regulations/safety/manual/section1-1.html#rationale). Retrieved 17 August 2011.
350. Section 115, Dodd-Frank Wall Street Reform and Consumer Protection Act. "Pub. L. 111-203" (http://www.gpo.gov/fdsys/pkg/BILLS-111hr4173enr/pdf/BILLS-111hr4173enr.pdf). Retrieved 17 August 2011.

3.9.2.1 Minimum requirements

Requirements are imposed on banks in order to promote the objectives of the regulator. Often, these requirements are closely tied to the level of risk exposure for a certain sector of the bank. The most important minimum requirement in banking regulation is maintaining minimum capital ratios [351].

3.9.2.2 Supervisory review

Banks are required to be issued with a bank license by the regulator in order to carry on business as a bank, and the regulator supervises licensed banks for compliance with the requirements and responds to breaches of the requirements through obtaining undertakings, giving directions, imposing penalties or revoking the bank's license.

3.9.2.3 Market discipline

The regulator requires banks to publicly disclose financial and other information, and depositors and other creditors are able to use this information to assess the level of risk and to make investment decisions. As a result of this, the bank is subject to market discipline and the regulator can also use market pricing information as an indicator of the bank's financial health.

3.9.3 Instruments and requirements of bank regulation

3.9.3.1 Capital requirement

The capital requirement sets a framework on how banks must handle their capital in relation to their assets. Internationally, the Bank for International Settlements' Basel Committee on Banking Supervision influences each country's capital requirements. In 1988, the Committee decided to introduce a capital measurement system commonly referred to as the Basel Capital Accords. The latest capital adequacy framework is commonly known as Basel III [352]. This updated framework is intended to be more risk sensitive than the original one, but is also a lot more complex.

351. Investopedia:Capital Requirement (http://www.investopedia.com/terms/c/capitalrequirement.asp#axzz1VlEWDmPf)
352. "Basel II Comprehensive version part 2: The First Pillar – Minimum Capital Requirements" (pdf) (http://www.bis.org/publ/bcbs128b.pdf). November 2005. p. 86.

3.9.3.2 Reserve requirement

The reserve requirement sets the minimum reserves each bank must hold to demand deposits and banknotes. This type of regulation has lost the role it once had, as the emphasis has moved toward capital adequacy, and in many countries there is no minimum reserve ratio. The purpose of minimum reserve ratios is liquidity rather than safety. An example of a country with a contemporary minimum reserve ratio is Hong Kong, where banks are required to maintain 25% of their liabilities that are due on demand or within 1 month as qualifying liquefiable assets.

Reserve requirements have also been used in the past to control the stock of banknotes and/or bank deposits. Required reserves have at times been gold coin, central bank banknotes or deposits, and foreign currency.

3.9.3.3 Corporate governance

Corporate governance requirements are intended to encourage the bank to be well managed, and is an indirect way of achieving other objectives. As many banks are relatively large, with many divisions, it is important for management to maintain a close watch on all operations. Investors and clients will often hold higher management accountable for missteps, as these individuals are expected to be aware of all activities of the institution. Some of these requirements may include:

1. To be a body corporate (i.e. not an individual, a partnership, trust or other unincorporated entity)
2. To be incorporated locally, and/or to be incorporated under as a particular type of body corporate, rather than being incorporated in a foreign jurisdiction.
3. To have a minimum number of directors
4. To have an organisational structure that includes various offices and officers, e.g. corporate secretary, treasurer/CFO, auditor, Asset Liability Management Committee, Privacy Officer etc. Also the officers for those offices may need to be approved persons, or from an approved class of persons.
5. To have a constitution or articles of association that is approved, or contains or does not contain particular clauses, e.g. clauses that enable directors to act other than in the best interests of the company (e.g. in the interests of a parent company) may not be allowed.

3.9.3.4 Financial reporting and disclosure requirements

Among the most important regulations that are placed on banking institutions is the requirement for disclosure of the bank's finances. Particularly for banks that trade on

the public market, the Securities and Exchange Commission (SEC) requires management to prepare annual financial statements according to a financial reporting standard, have them audited, and to register or publish them. Often, these banks are even required to prepare more frequent financial disclosures, such as Quarterly Disclosure Statements. The Sarbanes-Oxley Act of 2002 outlines in detail the exact structure of the reports that the SEC requires.

In addition to preparing these statements, the SEC also stipulates that directors of the bank must attest to the accuracy of such financial disclosures. Thus, included in their annual reports must be a report of management on the company's internal control over financial reporting. The internal control report must include: a statement of management's responsibility for establishing and maintaining adequate internal control over financial reporting for the company; management's assessment of the effectiveness of the company's internal control over financial reporting as of the end of the company's most recent fiscal year; a statement identifying the framework used by management to evaluate the effectiveness of the company's internal control over financial reporting; and a statement that the registered public accounting firm that audited the company's financial statements included in the annual report has issued an attestation report on management's assessment of the company's internal control over financial reporting. Under the new rules, a company is required to file the registered public accounting firm's attestation report as part of the annual report. Furthermore, the SEC added a requirement that management evaluate any change in the company's internal control over financial reporting that occurred during a fiscal quarter that has materially affected, or is reasonably likely to materially affect, the company's internal control over financial reporting [353].

3.9.3.5 Credit rating requirement

Banks may be required to obtain and maintain a current credit rating from an approved credit rating agency, and to disclose it to investors and prospective investors. Also, banks may be required to maintain a minimum credit rating. These ratings are designed to provide color for prospective clients or investors regarding the relative risk that one assumes when engaging in business with the bank. The ratings reflect the tendencies of the bank to take on high risk endeavors, in addition to the likelihood of succeeding in such deals or initiatives. The rating agencies that banks are most strictly governed by, referred to as the "Big Three" are the Fitch Group, Standard and Poor's and Moody's. These agencies hold the most influence over how banks (and all public companies) are viewed by those engaged in the public market. In recent years, following the Great Recession, many economists have argued that these agencies face a serious conflict of interest in their core business model [354]. Clients pay these agencies to rate their company based on their relative riskiness in the market.

353. Section 404, Management's Report on Internal Control Over Financial Reporting and Certification of Disclosure in Exchange Act Periodic Reports. "Final Rule" (http://www.sec.gov/rules/final/33-8238.htm). Retrieved 18 October 2011.
354. The Guardian. "Ratings agencies suffer 'conflict of interest', says former Moody's bos" (http://www.guardian.co.uk/business/2011/aug/22/ratings-agencies-conflict-of-interest). Retrieved 19 February 2012.

The question then is, to whom is the agency providing its service: the company or the market?

European financial economics experts- notably the World Pensions Council (WPC) have argued that European powers such as France and Germany pushed dogmatically and naively for the adoption of the so-called “Basel II recommendations”, adopted in 2005, transposed in European Union law through the Capital Requirements Directive (CRD). In essence, they forced European banks, and, more importantly, the European Central Bank itself, to rely more than ever on the standardized assessments of “credit risk” marketed aggressively by two US credit rating agencies- Moody’s and S&P, thus using public policy and ultimately taxpayers’ money to strengthen anti-competitive duopolistic practices akin to exclusive dealing. Ironically, European governments have abdicated most of their regulatory authority in favor of a non-European, highly deregulated] private cartel [355].

3.9.3.6 Large exposures restrictions

Banks may be restricted from having imprudently large exposures to individual counterparties or groups of connected counterparties. Such limitation may be expressed as a proportion of the bank's assets or equity, and different limits may apply based on the security held and/or the credit rating of the counterparty. Restricting disproportionate exposure to high-risk investment prevents financial institutions from placing equity holders' (as well as the firm's) capital at an unnecessary risk.

3.9.3.7 Activity and affiliation restrictions

In 1933, during the first 100 days of President Franklin D. Roosevelt’s New Deal, the Securities Act of 1933 and the Glass-Steagall Act (GSA) were enacted, setting up a pervasive regulatory scheme for the public offering of securities and generally prohibiting commercial banks from underwriting and dealing in those securities. GSA prohibited affiliations between banks (which means bank-chartered depository institutions, that is, financial institutions that hold federally insured consumer deposits) and securities firms (which are commonly referred to as “investment banks” even though they are not technically banks and do not hold federally insured consumer deposits); further restrictions on bank affiliations with non- banking firms were enacted in Bank Holding Company Act of 1956 (BHCA) and its subsequent amendments, eliminating the possibility that companies owning banks would be permitted to take ownership or controlling interest in insurance companies, manufacturing companies, real estate companies, securities firms, or any other non-

355. M. Nicolas J. Firzli, "A Critique of the Basel Committee on Banking Supervision" Revue Analyse Financière, Nov. 10 2011 & Q2 2012

banking company. As a result, distinct regulatory systems developed in the United States for regulating banks, on the one hand, and securities firms on the other [356].

3.9.4 Too Big To Fail and Moral Hazard

Among the reasons for maintaining close regulation of banking institutions is the aforementioned concern over the global repercussions that could result from a bank's failure; the idea that these bulge bracket banks are "too big to fail". The objective of federal agencies is to avoid situations in which the government must decide whether to support a struggling bank or to let it fail. The issue, as many argue, is that providing aid to crippled banks creates a situation of moral hazard. The general premise is that while the government may have prevented a financial catastrophe for the time being, they have reinforced confidence for high risk taking and provided an invisible safety net. This can lead to a vicious cycle, wherein banks take risks, fail, receive a bailout and then continue to take risks once again.

3.9.5 By country

- See Bank regulation in the United States
- United Kingdom banking law

3.9.6 See also

- Anti-money laundering
- Bank condition
- Bank failure
- Bank run
- Business process management
- Credit rating agency
- Data Loss Prevention
- Financial regulation
- Financial repression
- Know your customer
- Late-2000s financial crisis
- Monetary policy
- Money market
- Moral hazard
- Too big to fail
- **Standards**

356. Carpenter, David H. and M. Maureen Murphy. "The “Volcker Rule”: Proposals to Limit “Speculative” Proprietary Trading by Banks". Congressional Research Service, 2010.

- ISO 4217 - Standard for unique 3 digit currency code
- ISO 6166 - Standard for unique identifier for securities ISIN
- ISO 8109 - Standard for format and unique identifiers for Eurobonds
- ISO 9362 - Standard format of Business Identifier Codes to identify Banks also known as BIC
- ISO 10962 - Standard for financial instrument classification codes
- ISO/IEC 15944 - Standard that provides a consolidated vocabulary of eBusiness concepts
- ISO 19092-1 - Standard for biometric security in financial applications

3.9.7 External links

- Middle East Banking & Finance News —

.com

- Banking & Finance News — BankingInsuranceSecurities.Com

3.9.7.1 Reserve requirements

- Reserve Requirements - Fedpoints - Federal Reserve Bank of New York

3.9.7.2 Capital requirements

- Basel II: Revised international capital framework
- FDIC: Risk - Based Assessment System

3.9.7.3 Agenda from ISO

- ISO/TR 17944

3.9.7.4 Various Countries

3.9.7.4.1 Israel

- Israeli Banking Law

3.9.7.4.2 References

1. Federal Deposit Insurance Corporation. "Risk Management Manual of Exam Policies, Section 1.1". Retrieved 17 August 2011.
2. Section 115, Dodd-Frank Wall Street Reform and Consumer Protection Act. "Pub. L. 111-203". Retrieved 17 August 2011.
3. Investopedia:Capital Requirement
4. "Basel II Comprehensive version part 2: The First Pillar – Minimum Capital Requirements" (pdf). November 2005. p. 86.
5. Section 404, Management's Report on Internal Control Over Financial Reporting and Certification of Disclosure in Exchange Act Periodic Reports. "Final Rule". Retrieved 18 October 2011.
6. The Guardian. "Ratings agencies suffer 'conflict of interest', says former Moody's bos". Retrieved 19 February 2012.
7. M. Nicolas J. Firzli, "A Critique of the Basel Committee on Banking Supervision" Revue Analyse Financière, Nov. 10 2011 & Q2 2012
8. Carpenter, David H. and M. Maureen Murphy. "The “Volcker Rule”: Proposals to Limit “Speculative” Proprietary Trading by Banks". Congressional Research Service, 2010.

Chapter 4 The Time Value of Money

4.1 Introduction to Time Value of Money

4.1.1 Introduction

The time value of money is the premise that a fixed amount of money available today is more valuable/desired than the same amount of money available in the future. This premise can be generalized for economic resources (of which money is an embodiment by social contract). We can state two reasons to justify the premise for all resources: 1) We prefer to have in our control a resource today rather than in the future, because of the inherent uncertainty that characterizes any future event. We cannot be certain that we will acquire the resource in the future. 2) We prefer to have in our control a resource today rather than in the future, because we could use to our favor this resource in the meantime (this is a temporal version of the notion of "opportunity cost").

Especially for money, there is a third reason, namely the existence of inflation: given inflation, the same amount of money will buy tomorrow fewer goods than today. It must be noted however that while Uncertainty of the Future and Opportunity Cost, are rooted in the very foundations of human existence, inflation is a historical event that may change direction. In the case of "negative inflation", ie where money increases rather than loses its value as time passes, then "money tomorrow" tends to be more valuable than "money today" (or at least, it partially offsets the pull of the other two fundamental reasons given above towards the opposite direction). Nevertheless, in modern market economies, a consistent trend of negative inflation is absent for almost a century.

A fourth reason is the belief that maybe the money might not be around in the future. The borrower might not be around or the repayment contract could be lost. The currency could be abolished or a catastrophy could occur rendering money valueless.

4.1.2 The Discount Rate

The time value of money can be easily quantified at a personal level. A person can ask herself, "What do I prefer, 100 euros today or XXX euros in a year from now?" When she finds the amount that makes her "indifferent", then she can calculate easily her Personal Discount Rate. Assume that given the question, "100 euros now or 120 euros in one year from now," a person replies, "it's all the same to me". Then this person's Yearly Personal Discount Rate (YPDR) is calculated as

$$YPDR = (120/100) - 1 = 1,2 - 1 = 0,2 = 20\%$$

and in general terms

YPDR = (Equally preferred value in a year / Value today)-1

Note that YPDR quantifies together the effects of all the reasons given above that lead to "money tomorrow" being worth less than "money today".

If a person has calculated his own YPDR honestly, carefully, and rationally, and has tested it over a period of time for stability of preferences, he can then use it as a tool to assist him in taking economic decisions than involve different amounts and timings of money (to be given or to be received). Essentially, by using the discount rate, we can calculate what amount of money received or given today is -for us- equivalent with an amount of money to be received (or to be given) in the future.

4.2 The Present Value of Money, Net Present Value and Discounting

4.2.1 Net Present Value

Net present value (**NPV**) or **net present worth** (**NPW**) [1] is defined as the total present value (PV) of a time series of cash flows. It is a standard method for using the time value of money to appraise long-term projects. Used for capital budgeting, and widely throughout economics, it measures the excess or shortfall of cash flows, in present value terms, once financing charges are met.

See discounted cash flow

4.2.2 Formula

Each cash inflow/outflow is discounted back to its present value (PV). Then they are summed. Therefore NPV is the sum of all terms

$$\frac{R_t}{(1+i)^t}$$

, where

t - the time of the cash flow

i - the discount rate (the rate of return that could be earned on an investment in the financial markets with similar risk.)

$$R_t$$

1. Lin, Grier C. I.; Nagalingam, Sev V. (2000). CIM justification and optimisation. London: Taylor & Francis. pp. 36. ISBN 0-7484-0858-4.

- the net cash flow (the amount of cash, inflow minus outflow) at time *t* (for educational purposes,

$$R_0$$

is commonly placed to the left of the sum to emphasize its role as (minus the) investment.

4.2.3 The discount rate

The rate used to discount future cash flows to their present values is a key variable of this process. A firm's weighted average cost of capital (after tax) is often used, but many people believe that it is appropriate to use higher discount rates to adjust for risk for riskier projects or other factors. A variable discount rate with higher rates applied to cash flows occurring further along the time span might be used to reflect the yield curve premium for long-term debt.

Another approach to choosing the discount rate factor is to decide the rate which the capital needed for the project could return if invested in an alternative venture. If, for example, the capital required for Project A can earn five percent elsewhere, use this discount rate in the NPV calculation to allow a direct comparison to be made between Project A and the alternative. Related to this concept is to use the firm's Reinvestment Rate. Reinvestment rate can be defined as the rate of return for the firm's investments on average. When analyzing projects in a capital constrained environment, it may be appropriate to use the reinvestment rate rather than the firm's weighted average cost of capital (WACC) as the discount factor. It reflects opportunity cost of investment, rather than the possibly lower cost of capital.

A NPV amount obtained using variable discount rates (if they are known for the duration of the investment) better reflects the real situation than that calculated from a constant discount rate for the entire investment duration. Refer to the tutorial article written by Samuel Baker [2] for more detailed relationship between the NPV value and the discount rate.

For some professional investors, their investment funds are committed to target a specified rate of return. In such cases, that rate of should be selected as the discount rate for the NPV calculation. In this way, a direct comparison can be made between the profitability of the project and the desired rate of return.

To some extent, the selection of the discount rate is dependent on the use to which it will be put. If the intent is simply to determine whether a project will add value to the company, using the firm's weighted average cost of capital may be appropriate. If trying to decide between alternative investments in order to maximize the value of the firm, the corporate reinvestment rate would probably be a better choice.

Using variable rates over time, or discounting "guaranteed" cash flows differently from "at risk" cash flows may be a superior methodology, but is seldom used in practice. Using the discount rate to adjust for risk is often difficult to do in practice (especially

2. Baker, Samuel L. (2000). "Perils of the Internal Rate of Return" (http://hspm.sph.sc.edu/COURSES/ECON/invest/invest.html). Retrieved January 12, 2007.

internationally), and is really difficult to do well. An alternative to using discount factor to adjust for risk is to explicitly correct the cash flows for the risk elements using NPV or a similar method, then discount at the firm's rate.

4.2.4 What NPV Means

NPV is an indicator of how much value an investment or project adds to the firm. With a particular project, if

$$R_t$$

is a positive value, the project is in the status of discounted cash inflow in the time of *t*. If

$$R_t$$

is a negative value, the project is in the status of discounted cash outflow in the time of *t*. Appropriately risked projects with a positive NPV could be accepted. This does not necessarily mean that they should be undertaken since NPV at the cost of capital may not account for opportunity cost, i.e. comparison with other available investments. In financial theory, if there is a choice between two mutually exclusive alternatives, the one yielding the higher NPV should be selected. The following sums up the NPVs in various situations.

If…	It means…	Then…
NPV > 0	the investment would add value to the firm	the project may be accepted
NPV < 0	the investment would subtract value from the firm	the project should be rejected
NPV = 0	the investment would neither gain nor lose value for the firm	We should be indifferent in the decision whether to accept or reject the project. This project adds no monetary value. Decision should be based on other criteria, e.g. strategic positioning or other factors not explicitly included in the calculation.

4.2.5 Example

A corporation must decide whether to introduce a new product line. The new product will have startup costs, operational costs, and incoming cash flows over six years. This project will have an immediate (t=0) cash outflow of $100,000 (which might include machinery, and employee training costs). Other cash outflows for years 1-6 are expected to be $5,000 per year. Cash inflows are expected to be $30,000 each for years 1-6. All cash flows are after-tax, and there are no cash flows expected after year 6. The required rate of return is 10%. The present value (PV) can be calculated for each year:

Year	Cashflow	Present Value
T=0	$\frac{-100,000}{(1+0.10)^0}$	-$100,000
T=1	$\frac{30,000-5,000}{(1+0.10)^1}$	$22,727
T=2	$\frac{30,000-5,000}{(1+0.10)^2}$	$20,661
T=3	$\frac{30,000-5,000}{(1+0.10)^3}$	$18,783
T=4	$\frac{30,000-5,000}{(1+0.10)^4}$	$17,075
T=5	$\frac{30,000-5,000}{(1+0.10)^5}$	$15,523
T=6	$\frac{30,000-5,000}{(1+0.10)^6}$	$14,112

The sum of all these present values is the net present value, which equals $8,881.52. Since the NPV is greater than zero, it would be better to invest in the project than to do nothing, and the corporation should invest in this project if there is no alternative with a higher NPV.

More realistic problems would need to consider other factors, generally including the calculation of taxes, uneven cash flows, and salvage values as well as the availability of alternate investment opportunities.

4.2.6 Common pitfalls

- If for example the

R_t

are generally negative late in the project (*e.g.*, an industrial or mining project might have clean-up and restoration costs), then at that stage the company owes money, so a high discount rate is not cautious but too optimistic. Some people see this as a problem with NPV. A way to avoid this problem is to include explicit provision for financing any losses after the initial investment, that is, explicitly calculate the cost of financing such losses.

- Another common pitfall is to adjust for risk by adding a premium to the discount rate. Whilst a bank might charge a higher rate of interest for a risky project, that does not mean that this is a valid approach to adjusting a net present value for risk, although it can be a reasonable approximation in some specific cases. One reason such an approach may not work well can be seen from the foregoing: if some risk is incurred resulting in some losses, then a discount rate in the NPV will reduce the impact of such losses below their true financial cost. A rigorous approach to risk requires identifying and valuing risks explicitly, e.g. by actuarial or Monte Carlo techniques, and explicitly calculating the cost of financing any losses incurred.
- Yet another issue can result from the compounding of the risk premium. R is a composite of the risk free rate and the risk premium. As a result, future cash flows are discounted by both the risk-free rate as well as the risk premium and this effect is compounded by each subsequent cash flow. This compounding results in a much lower NPV than might be otherwise calculated. The certainty equivalent model can be used to account for the risk premium without compounding its effect on present value.
- If NPV is less than 0, which is to say, negative, the project should not be immediately rejected. Sometimes companies have to execute an NPV-negative project if not executing it creates even more value destruction.
- Another issue with relying on NPV is that it does not provide an overall picture of the gain or loss of executing a certain project. To see a percentage gain relative to the investments for the project, usually, Internal rate of return is used complimented to the NPV method.

4.2.7 Alternative capital budgeting methods

- Payback period: which measures the time required for the cash inflows to equal the original outlay. It measures risk, not return.
- Cost-benefit analysis: which includes issues other than cash, such as time savings.
- Real option method: which attempts to value managerial flexibility that is assumed away in NPV.
- Internal rate of return: which calculates the rate of return of a project while disregarding the absolute amount of money to be gained.
- Modified Internal Rate of Return|Modified internal rate of return (MIRR): similar to IRR, but it makes explicit assumptions about the reinvestment of the cash flows. Sometimes it is called Growth Rate of Return.
- Accounting rate of return (ARR): a ratio similar to IRR and MIRR

4.2.8 References

1. Lin, Grier C. I.; Nagalingam, Sev V. (2000). CIM justification and optimisation. London: Taylor & Francis. pp. 36. ISBN 0-7484-0858-4.
2. Baker, Samuel L. (2000). "Perils of the Internal Rate of Return". Retrieved January 12, 2007.

4.3 The Opportunity Cost of Capital

The opportunity cost of capital is the amount of money you forego by investing money in one asset compared to another. For eg. If you have only two alternatives

a) Invest in an asset which gives 5% return
b) Invest in another asset which gives 6% return

If you choose the first option, you wont be able to take advantage of the second option. The difference between what you are earning and what you could be earning is the opportunity cost of capital. In this scenario it is 1% (6%-1%). Take another example: say you have a piece of land kept idle. If you make a warehouse over it ,then you cannot use it for any other purpose. So, you miss the earning possibility from any alternative use. That is your opportunity cost.

4.4 The effect of compounding and Future Value

Due to the effect of compounding interest, large gains on principle can be achieved over a period of many years. For example, suppose one were to invest $100 at an interest rate of 7% for 20 years. Without compound interest, the total at the end of 20 years would be $240.

$$FV_{\text{simple interest}} = C + t(C * r)$$

However, when the interest earnings from one year are reinvested the next, the following formula is used:

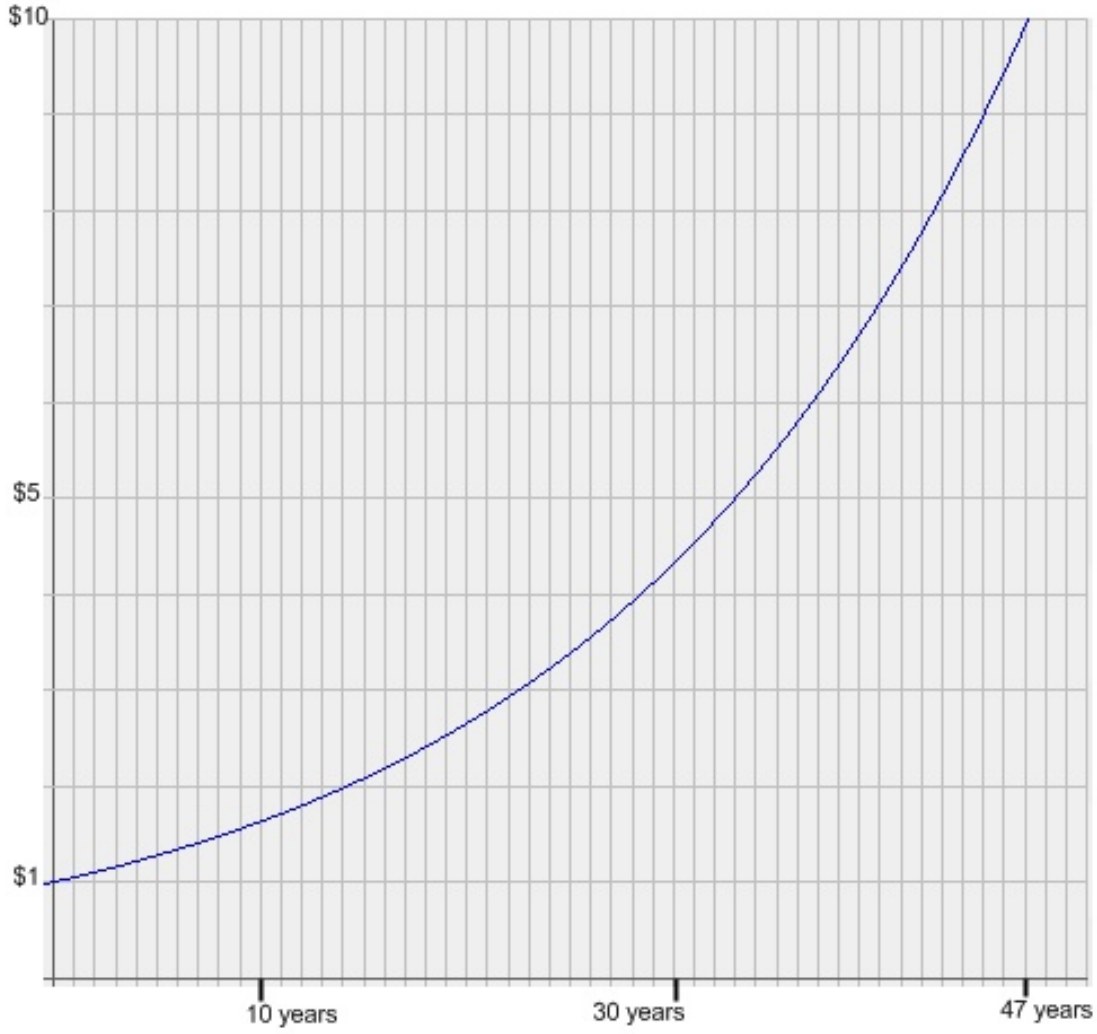
$$FV_{\text{compound interest}} = C(1+r)^t$$

Substituting 100 for C, 0.07 for r, and 20 for t, we see that

$$FV_{\text{compound interest}} = \$100\,(1.07)^{20} = \$386.97$$

Clearly, compound interest enables significant gains over a period of many years.

The following diagram shows how $1 will become $10 after 47 years of 5% compound interest:



Chapter 5 Applications of Time Value of Money

5.1 All about Perpetuities

A "perpetuity" is a theoretical bond which makes payment during its entire life. One realizable example of this is a company issued stock which always pays dividends each year. The lifetime is defined from the time of issuance until buy back or potential bankruptcy.

A perpetuity, such as preferred stock, can be valued by simply dividing the payment by the applicable discount rate.

$PV_{Perpetuity}$ =

$$\frac{C}{r}$$

Example:

XYZ Corp. preferred stock pays a $2 dividend every year. This dividend is expected to remain constant for the forseeable future. If investors are requiring a 10% return, what is the stock selling for?

$$PV = \frac{\$2}{.10} = \$20$$

Therefore, XYZ Co. stock should sell for $20 per share.

5.1.1 Growing Perpetuities

A growing perpetuity is one whose payments increase at a certain rate forever. They can be valued by the following formula, where C1 is the payment during the upcoming payment period, r is the discount rate, and g is the growth rate:

$PV_{Growing\ Perpetuity}$ =

$$\frac{C}{r-g}$$

Example:

Madeline and Thurgood Johnson wish to set up a trust fund for their grandson which will begin paying $5,000 next year. They wish to have the payments grow at 5% per year to keep pace with inflation. If the current discount rate is 8%, what should they pay for the perpetuity?

$PV_{\text{Growing Perpetuity}}$ =

$$\frac{\$5,000}{.08-.05} = \$166,666.67$$

5.2 Annuity

The term annuity is used in finance theory to refer to any terminating stream of fixed payments over a specified period of time. This usage is most commonly seen in academic discussions of finance, usually in connection with the valuation of the stream of payments, taking into account time value of money concepts.

An annuity can be valued with the following formula, where C is the amount of the payment, r is the discount rate, and t is the number of periods for which the payment will be received.

PV_{annuity} =

$$C\left[\frac{1}{r}-\frac{1}{r\left(1+r\right)^{t}}\right]$$

Thus, we can see that a 10 year, $100 per year annuity would be worth $614.46 with a 10% discount rate.

We can also find the present value of an annuity whose payments grow by a fixed rate g.

$PV_{\text{growing annuity}}$ =

$$\frac{C}{(r-g)}\left[1-\left(\frac{1+g}{1+r}\right)^{t}\right]$$

Solving a similar problem, with a payment of $100 that grows at a rate of 5% for 10 years, with a 10% discount rate, we get a present value of $743.98.

Note that the preceding two formulas assume that the payment will be made at the end of each period. If the payment is to be received at the beginning of each period, it is called an **Annuity Due**. The preceding two formulas can still be used in the case of an annuity due, with some modification. Simply subtract 1 from the number of periods, and then add the amount of the payment to the resulting answer. For example, if the first problem we did were an annuity due, it would look like this:

$PV_{\text{annuity due}}$ =

$$100\left[\frac{1}{0.1}-\frac{1}{0.1\left(1.1\right)^{9}}\right]+100$$

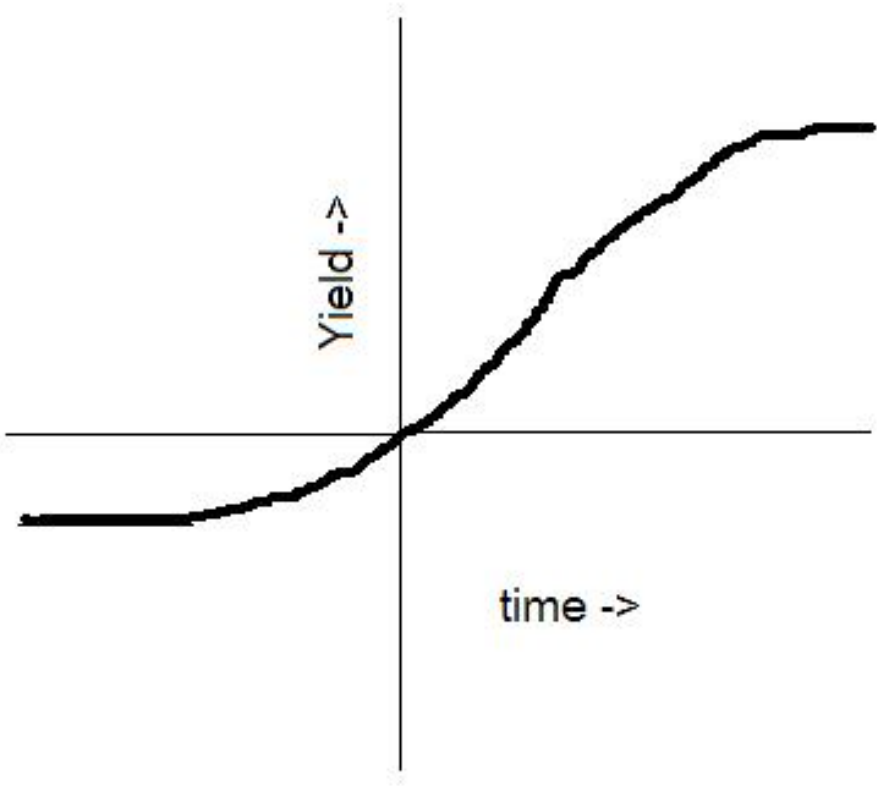
The answer, of course, is $675.90. Note that an annuity due will always have a higher present value than an equivalent standard annuity, due to the time value of money. That is, a dollar received at an earlier date is more valuable than a dollar received at a later date.

Chapter 6 Bonds

6.1 The Yield Curve

The "Yield curve" plots the yield (return) of a financial instrument [e.g. bond] as a function of time. Usually, the yield curve has an "S" shape and sometimes refered to as the "S curve" (which helps junior students to remember its shape). This emphasizes two characteristics, namely as time increases, diminishing returns sets in, indicated by the asympotic shape. The other influencing factor is that the curve is monotonically non-decreasing, indicating that one expects a better return on an investment the longer the investment is held [under non-Giffen market conditions]. Given that consumers behave rationally and that there are no other influencing factors, the yield curve reflects the status that consumers prefer to get a better return on an investment. If the curve was not increasing, then a consumer is expected to pull out his money at the peak and then reinvest at some later time.

According to Keynesian economics, a "Giffen market condition" is one in which demand increases as price decreases and interest rates are positive. Historically, there are times when this supply-demand curve was not followed, e.g. during the Irish potatoe famine. During that time, prices of potatoes went up as the demand decreased. However, there were many government induced factors in the economy going on during those times. A negative interest rates implies that one would get less money back at the return than at the time of the investment.



6.2 Valuing Bonds

The valuation of a bond can be broken down into two basic tasks: the valuation of the stream of coupon payments, and the valuation of the repayment of the face value of the bond.

Valuing the stream of coupon payments is no different than valuing any other basic annuity.

$PV_{coupons}$ =

$$C\left[\frac{1}{r}-\frac{1}{r\left(1+r\right)^{t}}\right]$$

where C = coupon payment, t = years to maturity, and r = required rate of return.

Valuing the principle is even simpler, just use a basic present value formula:

$PV_{principle}$ =

$$\frac{F}{(1+r)^t}$$

where F is the face value, r is the discount rate, and t is the number of years to maturity.

And so, to find the present value of the entire bond, we put these two formulae together to get:

PV_{bond} =

$$C\left[\frac{1}{r}-\frac{1}{r\left(1+r\right)^t}\right]+\frac{F}{(1+r)^t}$$

Now, let's suppose we are given the following problem: A $1000 8% annual bond matures in 7 years and is yielding 5%. Find the price of the bond.

The first thing we see is $1000. This is the face value of the bond, which is the amount of money the issuing party will pay on maturity. The next thing we see is 8% annual. This means that the company is paying 8% of $1000 every year as interest, which comes out to $80. Therefore, we shall use 80 in place of C in our equation. The time to maturity is 7, which is self explanatory. Finally, we see that the bond is "yielding 5%". This means that we should use 5% as the discount rate in our equation. So, plugging in this information we see that:

$$80\left[\frac{1}{.05}-\frac{1}{.05\left(1.05\right)^7}\right]+\frac{1000}{(1.05)^7}=\$1,173.59$$

It is important to note that the price of this bond, $1,173.59, is higher than the face value of $1000. This means that the bond is selling at a **Premium**. If the price were lower than the face value, the bond would sell at a **Discount**, and if the bond were selling for exactly the face value, the bond is said to be selling at **Par**. You can determine if a bond is selling at a discount, a premium, or par without actually valuing the bond. If the coupon rate is higher than the yield, the bond will sell for a premium. If the coupon rate is lower than the yield, the bond will sell for a discount. And, of course, if the yield equals the coupon, the bond will sell at par.

It is also possible to determine the price of a bond using a financial calculator, such as the Texas Instruments BA-II.

Button	Value	Explanation
PMT	80	the coupon rate
I%	5	the bond's yield to maturity
FV	1000	the bond's face value
N	7	the time to maturity
PV	???	the current price of the bond

By pressing **CPT** followed by **PV**, the calculator will compute the price of the bond. Given any 4 of the TVM variables, the calculator can compute the remaining variable.

Note that in order to make the calculation work, the PV must be negative (since purchasing the bond is a negative cash flow to the buyer).

Most bonds in the real world pay semi-annual coupons, and this must be taken into account when valuing a bond. In the example above, let's suppose the bond paid semi-annual interest. In order to calculate the correct price, we divide the coupon payment in half to get $40, and double the time to maturity, to get 14. In order to find the appropriate yield, we must use the following formula:

$$EffectiveRate = \left[1 + \frac{Annual\,Rate}{m}\right]^m - 1$$

Where m is the number of compounding periods per year. In this case, it is two. So:

$$0.05 = \left[1 + \frac{x}{2}\right]^2 - 1$$

In this case, x = 0.04939, and so by dividing this in two we can get the effective per period interest rate of 2.4695%.

Then we simply plug in the values into the bond valuation formula:

$$40\left[\frac{1}{.024695} - \frac{1}{.024695\,(1.024695)^{14}}\right] + \frac{1000}{(1.024695)^{14}} = \$1,179.31$$

All other things being equal, a bond will be worth more the more times per year interest is paid.

6.3 The Yield to Market Curve

Yield to Market refers to the following calculation:

$$CurrentYield = \frac{AnnualInterestPayment}{CurrentPrice}$$

Yield to market is also called **Current Yield**.

So, for example, if you had a bond that payed $40 semiannually, and the current price of the bond was $940, the Yield to Market would be 8.51%.

Yield to Maturity is not a very good measure of a bond's value. It does not take into consideration the price paid for the bond, nor the prevailing interest rates, nor the credit rating of the bond.

Chapter 7 Risk and Return

7.1 Types of Risk

7.1.1 Systematic Risk

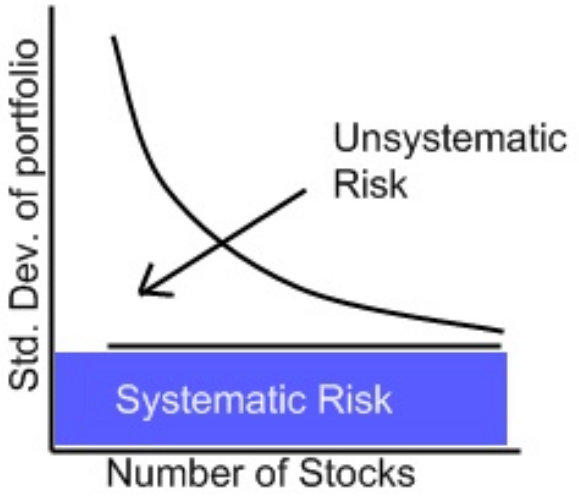
Systematic risk refers to the portion of risk in a stock that is impossible to avoid, it is also called the market risk, or undiversifiable risk. In the Capital Asset Pricing Model, systematic risk is represented by beta.

$$E(R_i) = R_f + \beta_{im}(E(R_m) - R_f).$$

Systematic risk is called undiversifiable risk because no matter how many securities are in a portfolio, there will always be some element of risk. This is due to the possibility of macroeconomic factors causing the entire market to decrease in value. Beta is a measure of how sensitive a particular security is to these market conditions. A stock with a high beta is more sensitive to market conditions; and, conversely, a stock with a low beta is less sensitive.

7.1.2 Unsystematic Risk

Unsystematic risk is also called idiosyncratic risk, or diversifiable risk. It represents the risk of a security that is unrelated to the market in general. Unsystematic risk can be reduced by holding a diversified portfolio. A diversified portfolio eliminates the likelihood of one isolated event causing a large decrease in portfolio value.



As you can see from the above image, as the number of stocks in a portfolio increase, the amount of unsystematic risk approaches zero. However, it is impossible to remove systematic risk, as it concerns the economy in general.

Chapter 8 Corporate Finance

8.1 Weighted Average Cost of Capital

When valuing a new venture by a company, it is necessary to use an appropriate discount rate. However, since corporations can be structured very differently, it is important to reflect that in the respective costs of capital. Let's say there are two similar companies in the same industry. Company A is financed 90% by equity (that is, stock) and 10% by debt (long term corporate bonds). Company B is financed by 25% equity, and 75% debt. These two companies would have to be valued according to their respective risk levels and required returns.

One common way to determine the cost of capital is to use the Weighted Average Cost of Capital, or WACC.

$$WACC = r_D(1-T)\frac{D}{V} + r_E\frac{E}{V}$$

In this formula, V is equal to the value of the firm, or Debt (D) plus Equity (E) Example:

AKL corporation is currently financed with $1,000,000 of 7% bonds, and $2,000,000 of common stock. The stock has a beta of 1.5, and the risk free rate is 4%, and the market risk premium is 3.5%. The marginal tax rate for a corporation of AKL's size is 35%. What is AKL's WACC?

The first thing we must do in this problem is determine the required rate on equity (Re) for AKL. We can plug the Beta given and the risk free rate into the CAPM as follows:

$$E(R_i) = R_f + \beta_{im}(E(R_m) - R_f).$$

where:

$$E(R_i) = 4.5 + 1.5(3.5). \ = 9.75\%$$

Now, we have all of the necessary information to solve for WACC:

$$WACC = .07(1-.35)\frac{1,000,000}{3,000,000} + .0975\frac{2,000,000}{3,000,000} = 8\%$$

8.2 Beta and its Uses

A corporations Beta is a measurement of its volatility. A high beta has high volatility in response to the market. A low beta company has low volatility, such as utilities companies.

8.2.1 Asset Beta and Equity Beta

Since companies are structured differently, it becomes necessary to distinguish between Asset, or Unlevered Beta, and Equity, or Levered Beta. The Equity beta is what is commonly reported on financial websites, such as finance.yahoo.com. However, to perform certain financial functions, such as valuing a company, the use of the Unlevered, or Asset Beta is necessary. This is the company's beta if one were to assume it were financed entirely by equity.

$$\beta_L = \beta_U \left[1 + (1 - T)\frac{D}{E}\right]$$

8.2.2 Return on Equity

Return on Equity is an important financial ratio used to compare companies. It is also commonly used as a target for executive compensation. For example, a CEO might have to earn a 15% ROE for the year in order to get his bonus. Targets like these are designed to help shareholders by giving management an incentive to perform better.

ROE is defined as Net Income divided by Shareholder's Equity. However, there are other ways to calculate it. One common way is by using Return on Assets (ROA = Net Income/Assets), which may be easier to calculate, and the debt to equity ratio, in addition to information about tax and interest rates.

$$ROE = (1 - T)\left[ROA + (ROA - I)\frac{D}{E}\right]$$

8.2.3 DuPont Identity

The DuPont Identity is a financial tool that can be used to see how three main factors affect ROE:

Profit Margin - Net Profit/Sales

Asset Turnover - Sales/Assets

Leverage Ratio - Assets/Equity

$$ROE = \frac{NetProfits}{Sales} * \frac{Sales}{Assets} * \frac{Assets}{Equity}$$

Suppose XYZ Corp. has a profit margin of 20%, asset turnover of 300%, and a leverage ratio of 50%. What would their return on equity be?

We can see that this relatively simple calculation is:

$$ROE = .2 * 3 * .5 = 30\%$$

The DuPont Identity allows us to see that ROE is a complex measure. A company with a low profit margin may have a strong ROE if it is not levered up very much. The equation can be rearranged to solve for missing values, as in the following example:

Suppose ABC Corp. has a 10% profit margin, an ROE of 30%, sales of $2000, and equity of $1000. What is the value of its assets?

By plugging in the values given, we can solve for assets = $500

$$.3 = .15 * \frac{2000}{x} * \frac{x}{1000}$$
$$x = 500$$

8.3 Project Valuation

8.3.1 Discounted Cash Flow

In Corporate Finance, it is often necessary to determine if a project is worthwhile to undertake. Sometimes, there will only be enough investment capital to undertake some projects, in which case, one must determine which project to do.

The standard approach is to use the **Net Present Value**, or NPV. The NPV is calculated by finding all of the cash flows which will occur, and discount them back to the present time. This also includes expenses, hence, net present value.

For example:

STDs Unlimited is trying to determine whether to purchase a new piece of machinery. This machine will cost $1,000,000, and save $170,000 per year for 10 years, at which point it will be sold for $50,000. After 5 years, the machine will require an overhaul which will cost $100,000. If the company uses a 7% discount rate for projects of this type, what is the NPV of purchasing the machine? Should the company do it?

The first thing we must do is find the total cost savings of this project. Each year there will be a positive cash flow of $170,000, which must be discounted each year back to the present time:

$$\sum_{t=1}^{10} \frac{170,000}{(1.07)^t} = 1,194,009$$

So we can see that this project will bring in $1,194,009 worth of savings. In addition, it will bring in $50,000 in year 10 when it is sold, so we find the present value of that:

$$\frac{50,000}{(1.07)^{10}} = 25,417$$

So we add those up to get the total positive cash flow of $1,219,426.

From this amount, we must subtract the costs. We know the initially cash outlay is $1,000,000, but we must find the present value of the overhaul which will occur at year 5:

$$\frac{100,000}{(1.07)^5} = \$71,299$$

So now we can calculate the present value of all costs: 1,000,000 + 71,299 = 1,071,299.

Then we simply subtract the negative cash flows from the positive and see that

$$NPV = 1,219,426 - 1,071,299 = \$148,127$$

So, since this project has a positive NPV, the company should go ahead and do it.

8.3.2 Depreciation Tax Shield

In the previous example, we did not calculate an important benefit which must be considered in real life examples: taxes. When a company purchases a piece of equipment, they will **depreciate** it. This means that they do not have to pay taxes on an amount of income equivalent to what they are spending on capital investment.

Let's consider our example above. We arrived at the NPV of $148,127 without taxes, so lets look at what happens when we depreciate the initial investment:

Assume STDs unlimited decides to depreciate the $1,000,000 machine using straight line depreciation for 10 years. What is the value of the depreciation tax shield? What is the new NPV?

Straight line depreciation means an equivalent amount is depreciated each year, for 10 years. So in this example, depreciation is $100,000 per year. This means that on the books, the company will spend $100,000 per year on the machine, instead of $1,000,000 up front. This makes more sense logically, since the company will be using the machine for 10 full years. The tax shield is equal to the following:

$$\sum_{t=1}^{n} \frac{Annual\,Depreciation * Taxrate}{(1+r)^t}$$

In this case it will be:

$$\frac{(100,000 * .35)}{1.07} + \frac{(100,000 * .35)}{1.07^2} + \frac{(100,000 * .35)}{1.07^3} + ... + \frac{(100,000 * .35)}{1.07^{10}} = \$245,825$$

As we can see, this is a significant savings.

There is one more step we must take in this example. Since we depreciated the entire value of the machine, we are basically telling the government that it is worthless at the end of 10 years. However, since we sell at at the end of year 10 for $50,000, it is clearly not worthless. In order to make this right (and avoid an audit and costly fines), we must pay taxes on that $50,000 in year 10. This amount is clearly .35 * 50,000 = 17,500. Since we don't pay this until year 10, we discount this amount by ten years

(17,500/(1.07^10)) to get $8,896. We then subtract this amount from the $245,825 tax shield to get $236,929.

So we see that our total tax savings from depreciation is $236,929, which we add to our NPV of 148,127 to get a final NPV on this project of $385,056.

8.3.3 Equivalent Annual Costs

When a company is considering two machines which will be used for a long period of time, it is sometimes necessary to use equivalent annual costs to determine which machine is a better investment.

For example:

Suppose an upscale vodka company is looking to purchase one of the two distilling machines. Machine A costs $45,000, lasts for 5 years before replacement, and costs $10,000 per year to operate. Machine B costs $50,000, lasts for 7 years, and costs $11,000 per year to operate. Now, if we were to take the NPV of the costs, it looks quite obvious that machine B's NPV will be lower (meaning it costs more). We shall use an 8% discount rate.

NPV_A=-$84,927

NPV_B=-$107,270

Now, if we were to just look at NPV, we would choose machine A, as it has lower costs. However, this fails to take into account that machine B has to be replaced less often. In order to correctly evaluate these options, we must use **Equivalent Annual Cost**.

$$EAC = \frac{NPV}{n - year\,annuity\,factor}$$

An **annuity factor** is defined as the present value of $1 received every year for n years, at a discount rate of r.The formula to find the n-year annuity factor is as follows:

$$\frac{1}{r} - \frac{1}{r(1+r)^n}$$

Using this formula, we can see that the 5 year annuity factor at 8% is 3.99, and the 7 year annuity factor is 5.2.

So, in order to find the equivalent annual costs of these projects, we shall divide their respective NPVs by their respective annuity factors:

Machine A	Machine B
$EAC_A = \frac{84,927}{3.99} = \$21,284$	$EAC_B = \frac{107,270}{5.2} = \$20,628$

And so, we can see that although machine A appears to have lower costs, machine B is actually cheaper in the long run, since it must be replaced less frequently.

8.3.4 Synergy/Cannibalism

When valuing a project, it is necessary to take into consideration how it will affect other parts of your business. For example, say you are the CFO of a computer store that sells X1000 high end computers, and X500 budget computers. If you are considering introducing a new line of X750 mid-range computers, you must consider that this may **cannibalize** some business from the high end line. That is, some customers who might have otherwise purchased a more expensive X1000 may now settle for the X750.

On the other hand, some new projects may create **synergies**, or benefits, to other product lines. For example, if you are in the oil refining business, and you are considering opening up you own oil well, this may reduce the costs for your refinery. So this too, must be added in as an additional benefit in your NPV calculation.

8.3.5 Sunk Costs

Sunk Costs are expenditures which a company has already spent on a project. It is important to realize that sunk costs are already spent, and are not factored into an NPV equation. For example, if your corporation hires a consulting firm to evaluate customer reaction to a new product line, that is not included in the NPV calculation. Whether or not you decide to initiate the new product line, you already spend money on the consultants.

It is also important to understand the difference between opportunity cost and sunk costs. Lets suppose XYZ Corp. buys a parcel of land for $100,000. They do not do anything with this land for a number of years, and then decide to build a factory on it. When calculating the NPV of the factory, the cost of the land is NOT a sunk cost. It is still possible to sell the land or do something else with it, and it therefore must be included.

8.3.6 Internal Rate of Return

Another common yardstick of valuing projects is **Internal Rate of Return**, or IRR. IRR is the discount rate which, when applied to a project, will cause the NPV to be zero. Let us use a simple example:

Say you are going to lay out $100,000 for a project. This project will produce cash flows of $15,000 in year 1, and $50,000 in year 2, and $70,000 in year 3. What is the IRR?

In order to solve this problem, we must set up an equation for NPV and set it to zero:

$$0 = -100,000 + \frac{15,000}{1+r} + \frac{50,000}{(1+r)^2} + \frac{70,000}{(1+r)^3}$$

Then we simply solve for r. Of course, as there are 3 variables in this equation, we cannot solve it algebraically, and must use either a financial calculator, Excel, or some type of graphing program or calculator. Using a financial calculator, the answer can be found as 13.454%. So, if the company's cost of capital is 13%, then this project is good to take. However, if the company requires a 13.5% return, the project would not be wise.

There is one caveat to using IRR to evaluate projects. IRR is a rate, not an amount. So if your company must choose between two projects, one with an IRR of 8%, and another with an IRR of 11%, the 11% IRR project is not always the best choice.

	Project A	**Project B**
Initial Investment	$100,000	$1,000
Return after 1 yr	$108,000	$1,110
Total Profit	$8,000	$110
IRR	8%	11%

So you see, the project with the higher IRR ends up netting the company far less money, as the projects are mutually exclusive. An example of resource allocation maybe that 70 project Bs can be undertaken, vs 1 project A. Project B has a higher IRR and would result in $7700 with an outlay of $70000 , not accounting for administrative costs, whereas 1 Project A would result in 8000 for $100000 outlay, and be likely less costly administratively. For the effort, work or taking on risk, the rate of return would be 7.7% or 8% on capital vs 3% from term deposit with no effort, (assuming tax deductions, e.g. for depreciation of capital plant/equipment/property , are already accounted for by reduction in tax payment cash outflow, which are included in annual cash flow calculations).

8.3.6.1 addendum: algorithm for irr calculation

irr is a guessing algorithm similiar to binary searching for bugs in a program. For a project with a positive IRR, then two **relatively prime** factors could be used , one to increase the irr (multiple by factor > 1) if the npv is still positive and the other to decrease the irr when npv negative (divide by factor > 1), so that the tried values of the irr are unlikely to cycle, due to the lack of common factors in multiply and divide.

Below is a python algorithm for irr calculation, which also deals with going to a negative IRR when the guessing shows the irr is approaching zero.

```
# copyright GNU license, sjt,2014
```

```
def irr(cashflows):
#print cashflows
r = 10.
lim =0.1
sign = 1
while True:
npv = reduce( lambda x,(i,cf): x + cf / pow(1 + r/100, i ) , \
enumerate(cashflows), 0.)
print npv
#cf= []
#for i,x in enumerate(cashflows):
# lr = pow((1 + r/100), i)
# y = x / lr
# print "lr", lr, "y", y
# cf.append(y)
#print reduce( lambda x, y: x + y, cf)
if abs(npv) < lim:
    break
if npv * sign > 0:
r = r * 1.9
else:
r = r / 1.3
if sign > 0 and r < 0.0001:
r = - 20.
sign = -1
print "irr = ", r
cashflows=[-60000, 7000,9000,6000,5000,8000]
irr(cashflows)
```

This is a rather randomised algorithm; **Newton's method** has been mentioned as being used in open source spreadsheet programs.

Newton's method relies on the differentiation , or finding a derivative function to tell the slope of the graph of another function. The basic rule is that if there is a term which is $\mathbf{ax^n}$ then the derivative has a term , $\mathbf{n.ax^{n-1}}$.

The npv function is a function of R the rate of return, such that npv is y, and R is x in the general function y = f(x) . Hence the derivative of the npv function is dy/dx = d(npv)/d(R) , which then requires finding the derivatives of all the terms in the npv function.

In Newton's method, an arbitrary R which is x, gives a NPV , which is a y value , when divided by the gradient which is delta-y/delta-x , gives delta-x , which is subtracted from R (substitute x) to give another R' that is closer to the IRR, when NPV = 0 (or the x value where y is zero, or where the function crosses the x-axis). Using R' as the next R, this is repeated until a good approximation of IRR is achieved. The gradient is always recalculated at the start of each iteration , using the derivative function.

So if npv = $CF_0 / R^0 + CF_1 / R^1 + .. + CF_n / R^n$,

or npv = $CF_0 + CF_1 \times R^{-1} + CF_2 \times R^{-2} + .. + CF_n \times R^{-n}$,

then d(npv)/dR = $0 + - CF_1 \times R^{-2} + - 2\ CF_2 \times R^{-3} ... + -n \times CF_n \times R^{-n-1}$.

See

1. REDIRECT Computation instead of Table Lookup

8.4 Growth Opportunity

When valuing a company's stock, there is an important distinction which must be made between that and an ordinary perpetuity. A company has the capacity to grow, which must be reflected in the current price.

If a stock price were to valued using a standard annuity formula, it would look something like this:

$$P_0 = \frac{D_1}{r}$$

(*edit* it should be

$$P_0 = \frac{D_1}{r - g}$$

)

Where P0, is the price at time 0, D1 is the dividend at time 1, and r is the required rate of return. However, this clearly does not reflect the level at which a company is expected to grow. This is especially pertinent to start up companies, who may not pay any dividends for a long time, but are expected to become highly profitable in the future. A formula which takes this into consideration is as follows:

$$P_0 = \frac{D_1}{r} + PVGO$$

(*edit* it should be

$$P_0 = \frac{EPS_1}{r} + PVGO$$

)

$$g = plowback * ROE$$

8.5 Computation or Table Lookup

8.5.1 IRR , computation , Newton's Method

Project valuation may require finding the Internal Rate of Return, or the discount rate at which a project's present value of future cash flows equals to zero. This is the maximum rate of return achievable, and should be greater than the inflation rate. a simple converging guessing method has been illustrated under the Project Valuation chapter. The use of Newton's method was left as an exercise, and a possible solution is shown below. Newton's method finds the x-axis intersection of the gradient line found at an approximate IRR, which will give a better rate to try for IRR, and iterations will find an acceptable IRR where the NPV is small enough to be equal to zero.

background for derivative function of npv:

Axiom: for bx^a ,

$d (bx^a) / dx = ab\ x^{a-1}$

Hence, if,

$npv = CF0 / R^0 + CF1 / R^1 + .. + CFn / R^n$,

or $npv = CF0 + CF1 \times R^{-1} + CF2 \times R^{-2} + .. + CFn \times R^{-n}$,

then ,

$d(npv)/dR = 0 \times CF0 \times R^{-1} + - CF1x\ R^{-2} + - 2\ CF2x\ R^{-3} ... + -n \times CFn \times R^{-n-1}$.

#copyright SJT, GNU 2014.

Newton's method

graph is y-axis NPV and x-axis is rate, so find where NPV = 0, or the project rate function crosses the x-axis.

Do this by finding where the slope line of the function curve at any given R crosses the x-axis, which gives a

better R' which is closer to where the function curve crosses the x-axis, and this is done iteratively until

a close enough R' is found where the npv is practically 0.

```
def irr(cfs):

def npv(cfs, r):

R = 1. + r/100.

return reduce( lambda x,(i,y): x + y * R**-i , enumerate(cfs), 0)
```

```
def deriv_npv( cfs, r):
R = 1. + r/ 100.
return reduce ( lambda x, (i,y): x - i * y * R **(-i-1) , enumerate( cfs), 0)
r = 10.
lim = 0.1 # ten cents is practically zero
while True:
np_v = npv( cfs, r)
print "np_v", np_v
if abs(np_v ) < lim:
break
dnpv = deriv_npv( cfs, r)
r = r - np_v / dnpv
return r
print irr( [ -30000, 3000, 4000, 16000, 15000, 5000] )
```

Chapter 9 Portfolio Theory

9.1 Efficient-Market Hypothesis

In finance, the **efficient-market hypothesis** (**EMH**) asserts that financial markets are "informationally efficient". In consequence of this, one cannot consistently achieve returns in excess of average market returns on a risk-adjusted basis, given the information available at the time the investment is made.

There are three major versions of the hypothesis: "weak", "semi-strong", and "strong". The weak-form EMH claims that prices on traded assets (e.g., stocks, bonds, or property) already reflect all past publicly available information. The semi-strong-form EMH claims both that prices reflect all publicly available information and that prices instantly change to reflect new public information. The strong-form EMH additionally claims that prices instantly reflect even hidden or "insider" information. Critics have blamed the belief in rational markets for much of the late-2000s financial crisis [1], [2], [3]. In response, proponents of the hypothesis have stated that market efficiency does not mean having no uncertainty about the future, that market efficiency is a simplification of the world which may not always hold true, and that the market is practically efficient for investment purposes for most individuals [4].

9.1.1 Historical background

Historically, there was a very close link between EMH and the random-walk model and then the Martingale model. The random character of stock market prices was first modelled by Jules Regnault, a French broker, in 1863 and then by Louis Bachelier, a French mathematician, in his 1900 PhD thesis, "The Theory of Speculation" [5]. His work was largely ignored until the 1950s; however beginning in the 1930s scattered, independent work corroborated his thesis. A small number of studies indicated that US stock prices and related financial series followed a random walk model [6]. Research by Alfred Cowles in the '30s and '40s suggested that professional investors were in general unable to outperform the market.

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6. See Working (1934), Cowles and Jones (1937), and Kendall (1953), and later Brealey, Dryden and Cunningham.

The efficient-market hypothesis was developed by Professor Eugene Fama at the University of Chicago Booth School of Business as an academic concept of study through his published Ph.D. thesis in the early 1960s at the same school. It was widely accepted up until the 1990s, when behavioral finance economists, who had been a fringe element, became mainstream [7]. Empirical analyses have consistently found problems with the efficient-market hypothesis, the most consistent being that stocks with low price to earnings (and similarly, low price to cash-flow or book value) outperform other stocks [8], [9]. Alternative theories have proposed that cognitive biases cause these inefficiencies, leading investors to purchase overpriced growth stocks rather than value stocks [10]. Although the efficient-market hypothesis has become controversial because substantial and lasting inefficiencies are observed, Beechey et al. (2000) consider that it remains a worthwhile starting point [11].

The efficient-market hypothesis emerged as a prominent theory in the mid-1960s. Paul Samuelson had begun to circulate Bachelier's work among economists. In 1964 Bachelier's dissertation along with the empirical studies mentioned above were published in an anthology edited by Paul Cootner [12]. In 1965 Eugene Fama published his dissertation arguing for the random walk hypothesis [13], and Samuelson published a proof for a version of the efficient-market hypothesis [14]. In 1970 Fama published a review of both the theory and the evidence for the hypothesis. The paper extended and refined the theory, included the definitions for three forms of financial market efficiency: weak, semi-strong and strong (see below) [15].

It has been argued that the stock market is “micro efficient” but not “macro inefficient”. The main proponent of this view was Samuelson, who asserted that the EMH is much better suited for individual stocks than it is for the aggregate stock market. Research based on regression and scatter diagrams has strongly supported Samuelson's dictum [16].

Further to this evidence that the UK stock market is weak-form efficient, other studies of capital markets have pointed toward their being semi-strong-form efficient. A study by Khan of the grain futures market indicated semi-strong form efficiency following the release of large trader position information (Khan, 1986). Studies by Firth (1976, 1979, and 1980) in the United Kingdom have compared the share prices existing after a takeover announcement with the bid offer. Firth found that the share prices were fully and instantaneously adjusted to their correct levels, thus concluding that the UK

7. Fox J. (2002). Is The Market Rational? No, say the experts. But neither are you--so don't go thinking you can outsmart it (http://money.cnn.com/magazines/fortune/fortune_archive/2002/12/09/333473/index.htm). Fortune.
8. Empirical papers questioning EMH: Francis Nicholson. Price-Earnings Ratios in Relation to Investment Results. Financial Analysts Journal. Jan/Feb 1968:105-109. Sanjoy Basu. (1977). Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A test of the Efficient Markets Hypothesis. Journal of Finance 32:663-682. Rosenberg B, Reid K, Lanstein R. (1985). Persuasive Evidence of Market Inefficiency. Journal of Portfolio Management 13:9-17.
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15. Fama, Eugene (1970). "Efficient Capital Markets: A Review of Theory and Empirical Work". Journal of Finance 25 (2): 383–417. doi:10.2307/2325486.
16. ung, Jeeman; Shiller, Robert (2005). "Samuelson's Dictum And The Stock Market". Economic Inquiry 43 (2): 221–228. doi:10.1093/ei/cbi015.

stock market was semi-strong-form efficient. However, the market's ability to efficiently respond to a short term, widely publicized event such as a takeover announcement does not necessarily prove market efficiency related to other more long term, amorphous factors. David Dreman has criticized the evidence provided by this instant "efficient" response, pointing out that an immediate response is not necessarily efficient, and that the long-term performance of the stock in response to certain movements are better indications. A study on stocks' response to dividend cuts or increases over three years found that after an announcement of a dividend cut, stocks underperformed the market by 15.3% for the three-year period, while stocks outperformed the market by 24.8% for the three years following the announcement of a dividend increase [17].

9.1.2 Theoretical background

Beyond the normal utility maximizing agents, the efficient-market hypothesis requires that agents have rational expectations; that on average the population is correct (even if no one person is) and whenever new relevant information appears, the agents update their expectations appropriately. Note that it is not required that the agents be rational. EMH allows that when faced with new information, some investors may overreact and some may underreact. All that is required by the EMH is that investors' reactions be random and follow a normal distribution pattern so that the net effect on market prices cannot be reliably exploited to make an abnormal profit, especially when considering transaction costs (including commissions and spreads). Thus, any one person can be wrong about the market—indeed, everyone can be—but the market as a whole is always right. There are three common forms in which the efficient-market hypothesis is commonly stated—**weak-form efficiency**, **semi-strong-form efficiency** and **strong-form efficiency**, each of which has different implications for how markets work.

In **weak-form efficiency**, future prices cannot be predicted by analyzing prices from the past. Excess returns cannot be earned in the long run by using investment strategies based on historical share prices or other historical data. Technical analysis techniques will not be able to consistently produce excess returns, though some forms of fundamental analysis may still provide excess returns. Share prices exhibit no serial dependencies, meaning that there are no "patterns" to asset prices. This implies that future price movements are determined entirely by information not contained in the price series. Hence, prices must follow a random walk. This 'soft' EMH does not require that prices remain at or near equilibrium, but only that market participants not be able to systematically profit from market 'inefficiencies'. However, while EMH predicts that all price movement (in the absence of change in fundamental information) is random (i.e., non-trending), many studies have shown a marked tendency for the stock markets to trend over time periods of weeks or longer [18] and

17. Michaely R, Thaler RH, Womack K. (1993). Price Reactions to Dividend Initiatives and Omissions: Overreaction or Drift? Cornell University, Working Paper.
18. Saad, Emad W., Student Member, IEEE; Prokhorov, Danil V. Member , IEEE; and Wunsch,II, Donald C. Senior Member, IEEE (November, 1998). "Comparative Study of Stock Trend Prediction Using Time Delay, Recurrent and Probabilistic Neural Networks". IEEE Transactions on Neural Networks 9 (6): 1456–1470. doi:10.1109/72.728395. PMID 18255823.

that, moreover, there is a positive correlation between degree of trending and length of time period studied [19] (but note that over long time periods, the trending is sinusoidal in appearance). Various explanations for such large and apparently non-random price movements have been promulgated.

The problem of algorithmically constructing prices which reflect all available information has been studied extensively in the field of computer science [20], [21]. For example, the complexity of finding the arbitrage opportunities in pair betting markets has been shown to be NP-hard [22].

In **semi-strong-form efficiency**, it is implied that share prices adjust to publicly available new information very rapidly and in an unbiased fashion, such that no excess returns can be earned by trading on that information. Semi-strong-form efficiency implies that neither fundamental analysis nor technical analysis techniques will be able to reliably produce excess returns. To test for semi-strong-form efficiency, the adjustments to previously unknown news must be of a reasonable size and must be instantaneous. To test for this, consistent upward or downward adjustments after the initial change must be looked for. If there are any such adjustments it would suggest that investors had interpreted the information in a biased fashion and hence in an inefficient manner.

In **strong-form efficiency**, share prices reflect all information, public and private, and no one can earn excess returns. If there are legal barriers to private information becoming public, as with insider trading laws, strong-form efficiency is impossible, except in the case where the laws are universally ignored. To test for strong-form efficiency, a market needs to exist where investors cannot consistently earn excess returns over a long period of time. Even if some money managers are consistently observed to beat the market, no refutation even of strong-form efficiency follows: with hundreds of thousands of fund managers worldwide, even a normal distribution of returns (as efficiency predicts) should be expected to produce a few dozen "star" performers.

9.2 Criticism and behavioral finance

Investors and researchers have disputed the efficient-market hypothesis both empirically and theoretically. Behavioral economists attribute the imperfections in financial markets to a combination of cognitive biases such as overconfidence, overreaction, representative bias, information bias, and various other predictable human errors in reasoning and information processing. These have been researched by psychologists such as Daniel Kahneman, Amos Tversky, Richard Thaler, and Paul Slovic. These errors in reasoning lead most investors to avoid value stocks and buy

19. Granger, Clive W. J. & Morgenstern, Oskar (5 May 2007). "Spectral Analysis Of New York Stock Market Prices". Kyklos 16 (1): 1–27. doi:10.1111/j.1467-6435.1963.tb00270.x.
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22. Chen, Y; Fortnow, L; Nikolova, E; Pennock, D (2007). "Betting on permutations". Proceedings of the 8th ACM conference on Electronic commerce 8: 326–335. ISBN 978-1-59593-653-0.

growth stocks at expensive prices, which allow those who reason correctly to profit from bargains in neglected value stocks and the overreacted selling of growth stocks.

Empirical evidence has been mixed, but has generally not supported strong forms of the efficient-market hypothesis [23], [24], [25]. According to Dreman and Berry, in a 1995 paper, low P/E stocks have greater returns [26]. In an earlier paper Dreman also refuted the assertion by Ray Ball that these higher returns could be attributed to higher beta [27], whose research had been accepted by efficient market theorists as explaining the anomaly [28] in neat accordance with modern portfolio theory.

One can identify "losers" as stocks that have had poor returns over some number of past years. "Winners" would be those stocks that had high returns over a similar period. The main result of one such study is that losers have much higher average returns than winners over the following period of the same number of years [29]. A later study showed that beta (β) cannot account for this difference in average returns [30]. This tendency of returns to reverse over long horizons (i.e., losers become winners) is yet another contradiction of EMH. Losers would have to have much higher betas than winners in order to justify the return difference. The study showed that the beta difference required to save the EMH is just not there.

23. Empirical papers questioning EMH: Francis Nicholson. Price-Earnings Ratios in Relation to Investment Results. Financial Analysts Journal. Jan/Feb 1968:105-109. Sanjoy Basu. (1977). Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A test of the Efficient Markets Hypothesis. Journal of Finance 32:663-682. Rosenberg B, Reid K, Lanstein R. (1985). Persuasive Evidence of Market Inefficiency. Journal of Portfolio Management 13:9-17.
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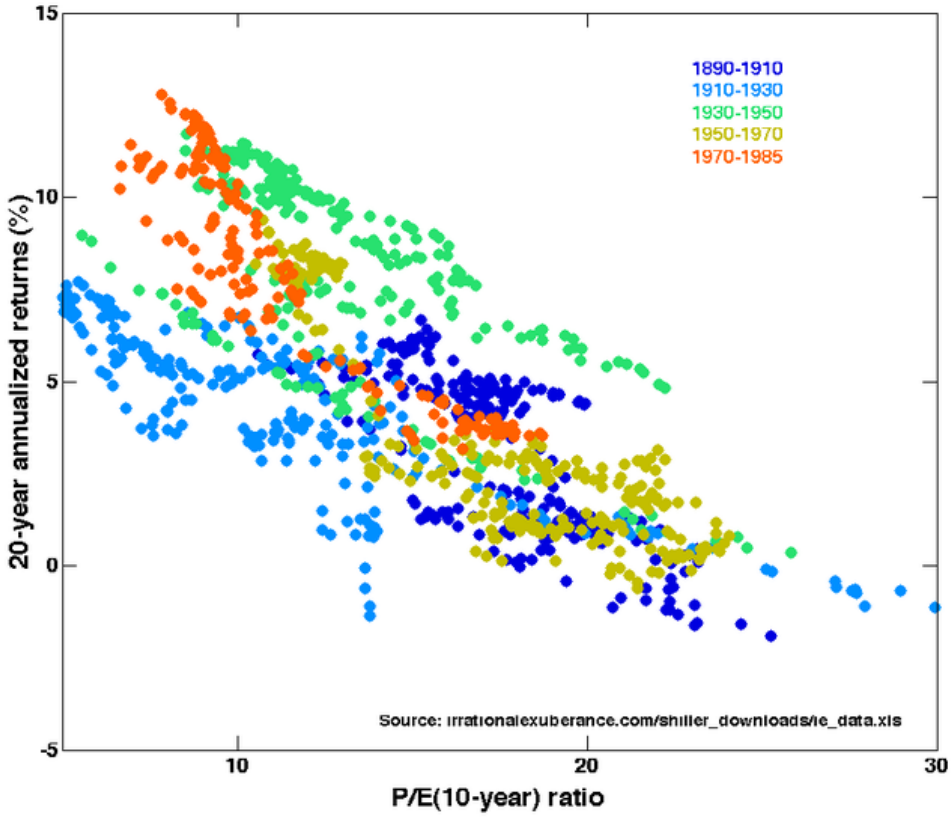

Figure 9.1

Price-Earnings ratios as a predictor of twenty-year returns based upon the plot by Robert Shiller (Figure 10.1, [31] source). The horizontal axis shows the real price-earnings ratio of the S&P Composite Stock Price Index as computed in Irrational Exuberance (inflation adjusted price divided by the prior ten-year mean of inflation-adjusted earnings). The vertical axis shows the geometric average real annual return on investing in the S&P Composite Stock Price Index, reinvesting dividends, and selling twenty years later. Data from different twenty-year periods is color-coded as shown in the key. See also ten-year returns. Shiller states that this plot "confirms that long-term investors—investors who commit their money to an investment for ten full years—did do well when prices were low relative to earnings at the beginning of the ten years. Long-term investors would be well advised, individually, to lower their exposure to the stock market when it is high, as it has been recently, and get into the market when it is low." [32] Burton Malkiel stated that this correlation may be consistent with an efficient market due to differences in interest rates [33].

Speculative economic bubbles are an obvious anomaly, in that the market often appears to be driven by buyers operating on irrational exuberance, who take little notice of underlying value. These bubbles are typically followed by an overreaction of frantic selling, allowing shrewd investors to buy stocks at bargain prices. Rational investors have difficulty profiting by shorting irrational bubbles because, as John Maynard Keynes commented, "Markets can remain irrational far longer than you or I can remain solvent." Sudden market crashes as happened on Black Monday in 1987 are mysterious from the perspective of efficient markets, but allowed as a rare statistical event under the Weak-form of EMH. One could also argue that if the

31. Shiller, Robert (2005). Irrational Exuberance (2d ed.). Princeton University Press. ISBN 0-691-12335-7.
32. Shiller, Robert (2005). Irrational Exuberance (2d ed.). Princeton University Press. ISBN 0-691-12335-7.
33. Burton G. Malkiel (2006). A Random Walk Down Wall Street. ISBN 0-393-32535-0. p.254.

hypothesis is so weak, it cannot be used in statistical models due to its lack of predictive behavior.

Burton Malkiel, a well-known proponent of the general validity of EMH, has warned that certain emerging markets such as China are not empirically efficient; that the Shanghai and Shenzhen markets, unlike markets in United States, exhibit considerable serial correlation (price trends), non-random walk, and evidence of manipulation [34].

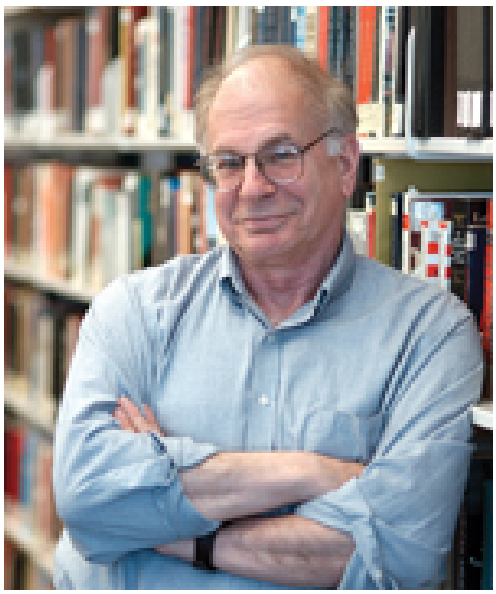

Figure 9.2 Daniel Kahneman

Behavioral psychology approaches to stock market trading are among some of the more promising alternatives to EMH (and some investment strategies seek to exploit exactly such inefficiencies). But Nobel Laureate co-founder of the programme—Daniel Kahneman—announced his skepticism of investors beating the market: "They're [investors] just not going to do it [beat the market]. It's just not going to happen." [35] Indeed defenders of EMH maintain that Behavioral Finance strengthens the case for EMH in that BF highlights biases in individuals and committees and not competitive markets. For example, one prominent finding in Behaviorial Finance is that individuals employ hyperbolic discounting. It is palpably true that bonds, mortgages, annuities and other similar financial instruments subject to competitive market forces do not. Any manifestation of hyperbolic discounting in the pricing of these obligations would invite arbitrage thereby quickly eliminating any vestige of individual biases. Similarly, diversification, derivative securities and other hedging strategies assuage if not eliminate potential mispricings from the severe risk-intolerance (loss aversion) of individuals underscored by behavioral finance. On the other hand, economists, behaviorial psychologists and mutual fund managers are drawn from the human population and are therefore subject to the biases that behavioralists showcase. By contrast, the price signals in markets are far less subject to individual biases highlighted by the Behavioral Finance programme. Richard Thaler has started a fund based on his research on cognitive biases. In a 2008 report he identified complexity and herd behavior as central to the global financial crisis of 2008 [36].

34. Burton Malkiel. Investment Opportunities in China (http://ca.youtube.com/watch?v=uVcV0H4qtgw). July 16, 2007. (34:15 mark)
35. Hebner, Mark (12 August 2005). "Step 2: Nobel Laureates" (http://www.ifa.com/Book/Book_pdf/02_Nobel_Laureates.pdf). Index Funds: The 12-Step Program for Active Investors. Index Funds Advisors, Inc.. Retrieved 12 August 2005.
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Further empirical work has highlighted the impact transaction costs have on the concept of market efficiency, with much evidence suggesting that any anomalies pertaining to market inefficiencies are the result of a cost benefit analysis made by those willing to incur the cost of acquiring the valuable information in order to trade on it. Additionally the concept of liquidity is a critical component to capturing "inefficiencies" in tests for abnormal returns. Any test of this proposition faces the joint hypothesis problem, where it is impossible to ever test for market efficiency, since to do so requires the use of a measuring stick against which abnormal returns are compared - one cannot know if the market is efficient if one does not know if a model correctly stipulates the required rate of return. Consequently, a situation arises where either the asset pricing model is incorrect or the market is inefficient, but one has no way of knowing which is the case.

A key work on random walk was done in the late 1980s by Profs. Andrew Lo and Craig MacKinlay; they effectively argue that a random walk does not exist, nor ever has [37]. Their paper took almost two years to be accepted by academia and in 1999 they published "A Non-random Walk Down Wall St." which collects their research papers on the topic up to that time.

Economists Matthew Bishop and Michael Green claim that full acceptance of the hypothesis goes against the thinking of Adam Smith and John Maynard Keynes, who both believed irrational behavior had a real impact on the markets [38].

Warren Buffett has also argued against EMH, saying the preponderance of value investors among the world's best money managers rebuts the claim of EMH proponents that luck is the reason some investors appear more successful than others [39]. As Malkiel [40] has shown, over the 30 years (to 1996) more than two-thirds of professional portfolio managers have been outperformed by the S&P 500 Index (and, more to the point, there is little correlation between those who outperform in one year and those who outperform in the next.

9.3 Late 2000s financial crisis

The financial crisis of 2007–2010 has led to renewed scrutiny and criticism of the hypothesis [41]. Market strategist Jeremy Grantham has stated flatly that the EMH is responsible for the current financial crisis, claiming that belief in the hypothesis caused financial leaders to have a "chronic underestimation of the dangers of asset bubbles breaking" [42]. Noted financial journalist Roger Lowenstein blasted the theory, declaring "The upside of the current Great Recession is that it could drive a stake

37. "A Non-Random Walk Down Wall Street" (http://press.princeton.edu/titles/6558.html). Princeton University Press.
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through the heart of the academic nostrum known as the efficient-market hypothesis." [43] Former Federal Reserve chairman Paul Volcker chimed in, saying it's "clear that among the causes of the recent financial crisis was an unjustified faith in rational expectations [and] market efficiencies." [44]

At the International Organization of Securities Commissions annual conference, held in June 2009, the hypothesis took center stage. Martin Wolf, the chief economics commentator for the Financial Times, dismissed the hypothesis as being a useless way to examine how markets function in reality. Paul McCulley, managing director of PIMCO, was less extreme in his criticism, saying that the hypothesis had not failed, but was "seriously flawed" in its neglect of human nature [45].

The financial crisis has led Richard Posner, a prominent judge, University of Chicago law professor, and innovator in the field of Law and Economics, to back away from the hypothesis and express some degree of belief in Keynesian economics. Posner accused some of his Chicago School colleagues of being "asleep at the switch", saying that "the movement to deregulate the financial industry went too far by exaggerating the resilience - the self healing powers - of laissez-faire capitalism." [46] Others, such as Fama himself, said that the hypothesis held up well during the crisis and that the markets were a casualty of the recession, not the cause of it. Despite this, Fama has conceded that "poorly informed investors could theoretically lead the market astray" and that stock prices could become "somewhat irrational" as a result [47].

[48]

Critics have suggested that financial institutions and corporations have been able to reduce the efficiency of financial markets by creating private information and reducing the accuracy of conventional disclosures, and by developing new and complex products which are challenging for most market participants to evaluate and correctly price [49],.

9.3.1 Notes

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9.3.3 External links

- e-m-h.org
- "Earnings Quality and the Equity Risk Premium: A Benchmark Model" abstract from Contemporary Accounting Research
- "As The Index Fund Moves from Heresy to Dogma . . . What More Do We Need To Know?" Remarks by John Bogle on the superior returns of passively managed index funds.
- Proof That Properly Discounted Present Values of Assets Vibrate Randomly Paul Samuelson
- Human Behavior and the Efficiency of the Financial System (1999) by Robert J. Shiller Handbook of Macroeconomics

9.4 Modern Portfolio Theory

Modern portfolio theory (**MPT**) is a theory of finance which attempts to maximize portfolio expected return for a given amount of portfolio risk, or equivalently minimize risk for a given level of expected return, by carefully choosing the proportions of various assets. Although MPT is widely used in practice in the financial industry and several of its creators won a Nobel Memorial Prize in Economic Sciences for the theory [50], in recent years the basic assumptions of MPT have been widely challenged by fields such as behavioral economics.

MPT is a mathematical formulation of the concept of diversification in investing, with the aim of selecting a collection of investment assets that has collectively lower risk than any individual asset. That this is possible can be seen intuitively because different types of assets often change in value in opposite ways [51]. For example, to the extent prices in the stock market move differently from prices in the bond market, a collection of both types of assets can in theory face lower overall risk than either individually. But diversification lowers risk even if assets' returns are not negatively correlated—indeed, even if they are positively correlated [52].

More technically, MPT models an asset's return as a normally distributed function (or more generally as an elliptically distributed random variable), defines risk as the standard deviation of return, and models a portfolio as a weighted combination of assets, so that the return of a portfolio is the weighted combination of the assets' returns. By combining different assets whose returns are not perfectly positively correlated, MPT seeks to reduce the total variance of the portfolio return. MPT also assumes that investors are rational and markets are efficient.

MPT was developed in the 1950s through the early 1970s and was considered an important advance in the mathematical modeling of finance. Since then, many theoretical and practical criticisms have been leveled against it. These include the fact that financial returns do not follow a Gaussian distribution or indeed any symmetric distribution, and that correlations between asset classes are not fixed but can vary depending on external events (especially in crises). Further, there is growing evidence that investors are not rational and markets are not efficient [53], [54].

50. Harry M. Markowitz - Autobiography, The Nobel Prizes 1990, Editor Tore Frängsmyr, [Nobel Foundation], Stockholm, 1991
51. http://www.emanagedfutures.com/articles/reducing-portfolio-volatility/
52. Bhalla, V. K. (2010). Investment Management. New Delhi: S. Chand & Co. Ltd. pp. 587–93. ISBN 81-219-1248-2.
53. Andrei Shleifer: Inefficient Markets: An Introduction to Behavioral Finance. Clarendon Lectures in Economics (2000)
54. Koponen, Timothy M. 2003. Commodities in action: measuring embeddedness and imposing values. The Sociological Review. Volume 50 Issue 4, Pages 543 - 569

9.4.1 Concept

The fundamental concept behind MPT is that the assets in an investment portfolio should not be selected individually, each on their own merits. Rather, it is important to consider how each asset changes in price relative to how every other asset in the portfolio changes in price.

Investing is a tradeoff between risk and expected return. In general, assets with higher expected returns are riskier. For a given amount of risk, MPT describes how to select a portfolio with the highest possible expected return. Or, for a given expected return, MPT explains how to select a portfolio with the lowest possible risk (the targeted expected return cannot be more than the highest-returning available security, of course, unless negative holdings of assets are possible.) [55]

Therefore, MPT is a form of diversification. Under certain assumptions and for specific quantitative definitions of risk and return, MPT explains how to find the best possible diversification strategy.

9.4.2 History

Harry Markowitz introduced MPT in a 1952 article [56] and a 1959 book [57]. Markowitz classifies it simply as "Portfolio Theory," because "There's nothing modern about it." See also this [58] survey of the history.

9.4.3 Mathematical model

In some sense the mathematical derivation below is MPT, although the basic concepts behind the model have also been very influential [59].

This section develops the "classic" MPT model. There have been many extensions since.

55. Edwin J. Elton and Martin J. Gruber, "Modern portfolio theory, 1950 to date", Journal of Banking & Finance 21 (1997) 1743-1759
56. Markowitz, H.M. (March 1952). "Portfolio Selection". The Journal of Finance 7 (1): 77–91. doi:10.2307/2975974.
57. Markowitz, H.M. (1959). Portfolio Selection: Efficient Diversification of Investments (http://cowles.econ.yale.edu/P/cm/m16/index.htm). New York: John Wiley & Sons. (reprinted by Yale University Press, 1970, ISBN 978-0-300-01372-6; 2nd ed. Basil Blackwell, 1991, ISBN 978-1-55786-108-5)
58. Edwin J. Elton and Martin J. Gruber, "Modern portfolio theory, 1950 to date", Journal of Banking & Finance 21 (1997) 1743-1759
59. Edwin J. Elton and Martin J. Gruber, "Modern portfolio theory, 1950 to date", Journal of Banking & Finance 21 (1997) 1743-1759

9.4.3.1 Risk and expected return

MPT assumes that investors are risk averse, meaning that given two portfolios that offer the same expected return, investors will prefer the less risky one. Thus, an investor will take on increased risk only if compensated by higher expected returns. Conversely, an investor who wants higher expected returns must accept more risk. The exact trade-off will be the same for all investors, but different investors will evaluate the trade-off differently based on individual risk aversion characteristics. The implication is that a rational investor will not invest in a portfolio if a second portfolio exists with a more favorable risk-expected return profile – i.e., if for that level of risk an alternative portfolio exists which has better expected returns.

Note that the theory uses standard deviation of return as a proxy for risk, which is valid if asset returns are jointly normally distributed or otherwise elliptically distributed. There are problems with this, however; see criticism.

Under the model:

- Portfolio return is the proportion-weighted combination of the constituent assets' returns.
- Portfolio volatility is a function of the correlations ρ_{ij} of the component assets, for all asset pairs (*i*, *j*).

In general:

Expected return:

$$\mathrm{E}(R_p) = \sum_i w_i \, \mathrm{E}(R_i)$$

where

R_p

is the return on the portfolio,

R_i

is the return on asset i and

w_i

is the weighting of component asset

i

(that is, the share of asset i in the portfolio).

Portfolio return variance:

$$\sigma_p^2 = \sum_i w_i^2 \sigma_i^2 + \sum_i \sum_{j \neq i} w_i w_j \sigma_i \sigma_j \rho_{ij},$$

where ρ_{ij} is the correlation coefficient between the returns on assets *i* and *j*. Alternatively the expression can be written as:

$$\sigma_p^2 = \sum_i \sum_j w_i w_j \sigma_i \sigma_j \rho_{ij},$$

where

$$\rho_{ij} = 1$$

for *i=j*.

Portfolio return volatility (standard deviation):

$$\sigma_p = \sqrt{\sigma_p^2}$$

For a two asset portfolio:

Portfolio return:

$$\mathrm{E}(R_p) = w_A\,\mathrm{E}(R_A) + w_B\,\mathrm{E}(R_B) = w_A\,\mathrm{E}(R_A) + (1 - w_A)\,\mathrm{E}(R_B).$$

Portfolio variance:

$$\sigma_p^2 = w_A^2\sigma_A^2 + w_B^2\sigma_B^2 + 2w_A w_B \sigma_A \sigma_B \rho_{AB}$$

For a three asset portfolio:

Portfolio return:

$$w_A\,\mathrm{E}(R_A) + w_B\,\mathrm{E}(R_B) + w_C\,\mathrm{E}(R_C)$$

Portfolio variance:

$$\sigma_p^2 = w_A^2\sigma_A^2 + w_B^2\sigma_B^2 + w_C^2\sigma_C^2 + 2w_A w_B \sigma_A \sigma_B \rho_{AB} + 2w_A w_C \sigma_A \sigma_C \rho_{AC} + 2w_B w_C \sigma_B \sigma_C \rho_{BC}$$

9.4.3.2 Diversification

An investor can reduce portfolio risk simply by holding combinations of instruments which are not perfectly positively correlated (correlation coefficient

$$-1 \leq \rho_{ij} < 1$$

). In other words, investors can reduce their exposure to individual asset risk by holding a diversified portfolio of assets. Diversification may allow for the same portfolio expected return with reduced risk. These ideas have been started with Markowitz and then reinforced by other economists and mathematicians such as Andrew Brennan who have expressed ideas in the limitation of variance through portfolio theory.

If all the asset pairs have correlations of 0—they are perfectly uncorrelated—the portfolio's return variance is the sum over all assets of the square of the fraction held in the asset times the asset's return variance (and the portfolio standard deviation is the square root of this sum).

9.4.3.3 The efficient frontier with no risk-free asset

As shown in this graph, every possible combination of the risky assets, without including any holdings of the risk-free asset, can be plotted in risk-expected return space, and the collection of all such possible portfolios defines a region in this space.

The left boundary of this region is a hyperbola [60], and the upper edge of this region is the efficient frontier in the absence of a risk-free asset (sometimes called "the Markowitz bullet"). Combinations along this upper edge represent portfolios (including no holdings of the risk-free asset) for which there is lowest risk for a given level of expected return. Equivalently, a portfolio lying on the efficient frontier represents the combination offering the best possible expected return for given risk level.

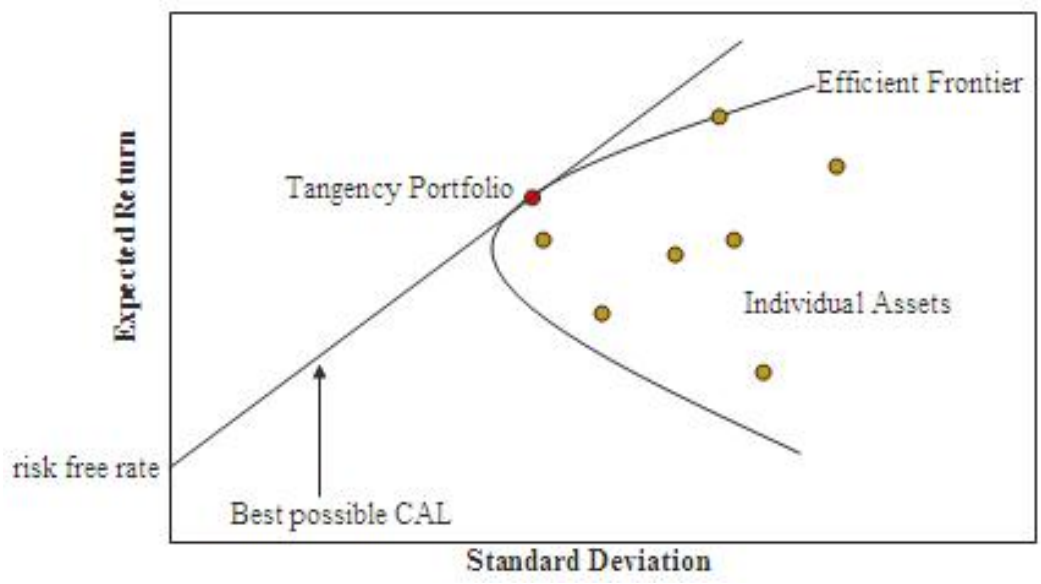

Figure 9.3

Efficient Frontier. The hyperbola is sometimes referred to as the 'Markowitz Bullet', and is the efficient frontier if no risk-free asset is available. With a risk-free asset, the straight line is the efficient frontier.

Matrices are preferred for calculations of the efficient frontier.

In matrix form, for a given "risk tolerance"

$$q \in [0, \infty),$$

, the efficient frontier is found by minimizing the following expression:

$$w^T \Sigma w - q * R^T w$$

where

w is a vector of portfolio weights and

$$\sum_i w_i = 1$$

. (The weights can be negative, which means investors can short a security.);

$$\Sigma$$

is the covariance matrix for the returns on the assets in the portfolio;

$$q \geq 0$$

is a "risk tolerance" factor, where 0 results in the portfolio with minimal risk and

$$\infty$$

results in the portfolio infinitely far out on the frontier with both expected return and risk unbounded; and

$$R$$

is a vector of expected returns.

60. Merton, Robert. "An analytic derivation of the efficient portfolio frontier," Journal of Financial and Quantitative Analysis 7, September 1972, 1851-1872.

$$w^T \Sigma w$$

is the variance of portfolio return.

$$R^T w$$

is the expected return on the portfolio.

The above optimization finds the point on the frontier at which the inverse of the slope of the frontier would be q if portfolio return variance instead of standard deviation were plotted horizontally. The frontier in its entirety is parametric on q.

Many software packages, including MATLAB, Microsoft Excel, Mathematica and R, provide optimization routines suitable for the above problem.

An alternative approach to specifying the efficient frontier is to do so parametrically on the expected portfolio return

$$R^T w$$

. This version of the problem requires that we minimize

$$w^T \Sigma w$$

subject to

$$R^T w = \mu$$

for parameter

$$\mu$$

. This problem is easily solved using a Lagrange multiplier.

9.4.3.4 Two mutual fund theorem

One key result of the above analysis is the two mutual fund theorem [61]. This theorem states that any portfolio on the efficient frontier can be generated by holding a combination of any two given portfolios on the frontier; the latter two given portfolios are the "mutual funds" in the theorem's name. So in the absence of a risk-free asset, an investor can achieve any desired efficient portfolio even if all that is accessible is a pair of efficient mutual funds. If the location of the desired portfolio on the frontier is between the locations of the two mutual funds, both mutual funds will be held in positive quantities. If the desired portfolio is outside the range spanned by the two mutual funds, then one of the mutual funds must be sold short (held in negative quantity) while the size of the investment in the other mutual fund must be greater than the amount available for investment (the excess being funded by the borrowing from the other fund).

61. Merton, Robert. "An analytic derivation of the efficient portfolio frontier," Journal of Financial and Quantitative Analysis 7, September 1972, 1851-1872.

9.4.3.5 The risk-free asset and the capital allocation line

The risk-free asset is the (hypothetical) asset which pays a risk-free rate. In practice, short-term government securities (such as US treasury bills) are used as a risk-free asset, because they pay a fixed rate of interest and have exceptionally low default risk. The risk-free asset has zero variance in returns (hence is risk-free); it is also uncorrelated with any other asset (by definition, since its variance is zero). As a result, when it is combined with any other asset or portfolio of assets, the change in return is linearly related to the change in risk as the proportions in the combination vary.

When a risk-free asset is introduced, the half-line shown in the figure is the new efficient frontier. It is tangent to the hyperbola at the pure risky portfolio with the highest Sharpe ratio. Its horizontal intercept represents a portfolio with 100% of holdings in the risk-free asset; the tangency with the hyperbola represents a portfolio with no risk-free holdings and 100% of assets held in the portfolio occurring at the tangency point; points between those points are portfolios containing positive amounts of both the risky tangency portfolio and the risk-free asset; and points on the half-line beyond the tangency point are leveraged portfolios involving negative holdings of the risk-free asset (the latter has been sold short—in other words, the investor has borrowed at the risk-free rate) and an amount invested in the tangency portfolio equal to more than 100% of the investor's initial capital. This efficient half-line is called the capital allocation line (CAL), and its formula can be shown to be

$$E(R_C) = R_F + \sigma_C \frac{E(R_P) - R_F}{\sigma_P}.$$

In this formula *P* is the sub-portfolio of risky assets at the tangency with the Markowitz bullet, *F* is the risk-free asset, and *C* is a combination of portfolios *P* and *F*.

By the diagram, the introduction of the risk-free asset as a possible component of the portfolio has improved the range of risk-expected return combinations available, because everywhere except at the tangency portfolio the half-line gives a higher expected return than the hyperbola does at every possible risk level. The fact that all points on the linear efficient locus can be achieved by a combination of holdings of the risk-free asset and the tangency portfolio is known as the one mutual fund theorem [62], where the mutual fund referred to is the tangency portfolio.

9.4.4 Asset pricing using MPT

The above analysis describes optimal behavior of an individual investor. Asset pricing theory builds on this analysis in the following way. Since everyone holds the risky assets in identical proportions to each other—namely in the proportions given by the

62. Merton, Robert. "An analytic derivation of the efficient portfolio frontier," Journal of Financial and Quantitative Analysis 7, September 1972, 1851-1872.

tangency portfolio—in market equilibrium the risky assets' prices, and therefore their expected returns, will adjust so that the ratios in the tangency portfolio are the same as the ratios in which the risky assets are supplied to the market. Thus relative supplies will equal relative demands. MPT derives the required expected return for a correctly priced asset in this context.

9.4.4.1 Systematic risk and specific risk

Specific risk is the risk associated with individual assets - within a portfolio these risks can be reduced through diversification (specific risks "cancel out"). Specific risk is also called diversifiable, unique, unsystematic, or idiosyncratic risk. Systematic risk (a.k.a. portfolio risk or market risk) refers to the risk common to all securities—except for selling short as noted below, systematic risk cannot be diversified away (within one market). Within the market portfolio, asset specific risk will be diversified away to the extent possible. Systematic risk is therefore equated with the risk (standard deviation) of the market portfolio.

Since a security will be purchased only if it improves the risk-expected return characteristics of the market portfolio, the relevant measure of the risk of a security is the risk it adds to the market portfolio, and not its risk in isolation. In this context, the volatility of the asset, and its correlation with the market portfolio, are historically observed and are therefore given. (There are several approaches to asset pricing that attempt to price assets by modelling the stochastic properties of the moments of assets' returns - these are broadly referred to as conditional asset pricing models.)

Systematic risks within one market can be managed through a strategy of using both long and short positions within one portfolio, creating a "market neutral" portfolio.

9.4.4.2 Capital asset pricing model

The asset return depends on the amount paid for the asset today. The price paid must ensure that the market portfolio's risk / return characteristics improve when the asset is added to it. The CAPM is a model which derives the theoretical required expected return (i.e., discount rate) for an asset in a market, given the risk-free rate available to investors and the risk of the market as a whole. The CAPM is usually expressed:

$$\mathrm{E}(R_i) = R_f + \beta_i(\mathrm{E}(R_m) - R_f)$$

\beta , Beta, is the measure of asset sensitivity to a movement in the overall market; Beta is usually found via regression on historical data. Betas exceeding one signify more than average "riskiness" in the sense of the asset's contribution to overall portfolio risk; betas below one indicate a lower than average risk contribution.

$$(\mathrm{E}(R_m) - R_f)$$

is the market premium, the expected excess return of the market portfolio's expected return over the risk-free rate.

This equation can be statistically estimated using the following regression equation:

$$\mathrm{SCL} : R_{i,t} - R_f = \alpha_i + \beta_i\,(R_{M,t} - R_f) + \epsilon_{i,t}$$

where αi is called the asset's alpha, βi is the asset's beta coefficient and SCL is the Security Characteristic Line.

Once an asset's expected return,

$$E(R_i),$$

is calculated using CAPM, the future cash flows of the asset can be discounted to their present value using this rate to establish the correct price for the asset. A riskier stock will have a higher beta and will be discounted at a higher rate; less sensitive stocks will have lower betas and be discounted at a lower rate. In theory, an asset is correctly priced when its observed price is the same as its value calculated using the CAPM derived discount rate. If the observed price is higher than the valuation, then the asset is overvalued; it is undervalued for a too low price.

(1) The incremental impact on risk and expected return when an additional risky asset, **a**, is added to the market portfolio, **m**, follows from the formulae for a two-asset portfolio. These results are used to derive the asset-appropriate discount rate.

Market portfolio's risk =

$$(w_m^2\sigma_m^2 + [w_a^2\sigma_a^2 + 2w_m w_a \rho_{am}\sigma_a\sigma_m])$$

Hence, risk added to portfolio =

$$[w_a^2\sigma_a^2 + 2w_m w_a \rho_{am}\sigma_a\sigma_m]$$

but since the weight of the asset will be relatively low,

$$w_a^2 \approx 0$$

i.e. additional risk =

$$[2w_m w_a \rho_{am}\sigma_a\sigma_m]$$

Market portfolio's expected return =

$$(w_m\,\mathrm{E}(R_m) + [w_a\,\mathrm{E}(R_a)])$$

Hence additional expected return =

$$[w_a\,\mathrm{E}(R_a)]$$

(2) If an asset, **a**, is correctly priced, the improvement in its risk-to-expected return ratio achieved by adding it to the market portfolio, **m**, will at least match the gains of spending that money on an increased stake in the market portfolio. The assumption is that the investor will purchase the asset with funds borrowed at the risk-free rate,

$$R_f$$

; this is rational if

$$\mathrm{E}(R_a) > R_f$$

.

Thus:

$$[w_a(\mathrm{E}(R_a) - R_f)]/[2w_m w_a \rho_{am}\sigma_a\sigma_m] = [w_a(\mathrm{E}(R_m) - R_f)]/[2w_m w_a \sigma_m\sigma_m]$$

i.e. :

$$[\mathrm{E}(R_a)] = R_f + [\mathrm{E}(R_m) - R_f] * [\rho_{am}\sigma_a\sigma_m]/[\sigma_m\sigma_m]$$

i.e. :

$$[\mathrm{E}(R_a)] = R_f + [\mathrm{E}(R_m) - R_f] * [\sigma_{am}]/[\sigma_{mm}]$$

$$[\sigma_{am}]/[\sigma_{mm}]$$

is the "beta",

$$\beta$$

return— the covariance between the asset's return and the market's return divided by the variance of the market return— i.e. the sensitivity of the asset price to movement in the market portfolio's value.

9.4.5 Criticisms

Despite its theoretical importance, critics of MPT question whether it is an ideal investing strategy, because its model of financial markets does not match the real world in many ways.

Efforts to translate the theoretical foundation into a viable portfolio construction algorithm have been plagued by technical difficulties stemming from the instability of the original optimization problem with respect to the available data. Recent research has shown that instabilities of this type disappear when a regularizing constraint or penalty term is incorporated in the optimization procedure [63].

9.4.5.1 Assumptions

The framework of MPT makes many assumptions about investors and markets. Some are explicit in the equations, such as the use of Normal distributions to model returns. Others are implicit, such as the neglect of taxes and transaction fees. None of these assumptions are entirely true, and each of them compromises MPT to some degree.

- **Investors are interested in the optimization problem described above (maximizing the mean for a given variance).** In reality, investors have utility functions that may be sensitive to higher moments of the distribution of the returns. For the investors to use the mean-variance optimization, one must suppose that the combination of utility and returns make the optimization of utility problem similar to the mean-variance optimization problem. A quadratic utility without any assumption about returns is sufficient. Another assumption is to use exponential utility and normal distribution, as discussed below.
- **Asset returns are (jointly) normally distributed random variables.** In fact, it is frequently observed that returns in equity and other markets are not normally distributed. Large swings (3 to 6 standard deviations from the mean) occur in the market far more frequently than the normal distribution assumption would

63. Brodie, De Mol, Daubechies, Giannone and Loris (2009). "Sparse and stable Markowitz portfolios" (http://www.pnas.org/content/106/30/12267.abstract). Proceedings of the National Academy of Sciences 106 (30). doi:10.1073/pnas.0904287106.

predict [64]. While the model can also be justified by assuming any return distribution which is jointly elliptical [65], [66], all the joint elliptical distributions are symmetrical whereas asset returns empirically are not.

- **Correlations between assets are fixed and constant forever.** Correlations depend on systemic relationships between the underlying assets, and change when these relationships change. Examples include one country declaring war on another, or a general market crash. During times of financial crisis all assets tend to become positively correlated, because they all move (down) together. In other words, MPT breaks down precisely when investors are most in need of protection from risk.
- **All investors aim to maximize economic utility (in other words, to make as much money as possible, regardless of any other considerations).** This is a key assumption of the efficient market hypothesis, upon which MPT relies.
- **All investors are rational and risk-averse.** This is another assumption of the efficient market hypothesis, but we now know from behavioral economics that market participants are not rational. It does not allow for "herd behavior" or investors who will accept lower returns for higher risk. Casino gamblers clearly pay for risk, and it is possible that some stock traders will pay for risk as well.
- **All investors have access to the same information at the same time.** In fact, real markets contain information asymmetry, insider trading, and those who are simply better informed than others. Moreover, estimating the mean (for instance, there is no consistent estimator of the drift of a brownian when subsampling between 0 and T) and the covariance matrix of the returns (when the number of assets is of the same order of the number of periods) are difficult statistical tasks.
- **Investors have an accurate conception of possible returns, i.e., the probability beliefs of investors match the true distribution of returns.** A different possibility is that investors' expectations are biased, causing market prices to be informationally inefficient. This possibility is studied in the field of behavioral finance, which uses psychological assumptions to provide alternatives to the CAPM such as the overconfidence-based asset pricing model of Kent Daniel, David Hirshleifer, and Avanidhar Subrahmanyam (2001) [67].
- **There are no taxes or transaction costs.** Real financial products are subject both to taxes and transaction costs (such as broker fees), and taking these into account will alter the composition of the optimum portfolio. These assumptions can be relaxed with more complicated versions of the model.
- **All investors are price takers, i.e., their actions do not influence prices.** In reality, sufficiently large sales or purchases of individual assets can shift market prices for that asset and others (via cross elasticity of demand.) An investor may not even be able to assemble the theoretically optimal portfolio if the market moves too much while they are buying the required securities.
- **Any investor can lend and borrow an unlimited amount at the risk free rate of interest.** In reality, every investor has a credit limit.

64. Mandelbrot, B., and Hudson, R. L. (2004). The (Mis)Behaviour of Markets: A Fractal View of Risk, Ruin, and Reward. London: Profile Books.
65. Chamberlain, G. 1983."A characterization of the distributions that imply mean-variance utility functions", Journal of Economic Theory 29, 185-201.
66. Owen, J.; Rabinovitch, R. (1983). "On the class of elliptical distributions and their applications to the theory of portfolio choice". Journal of Finance 38: 745–752.
67. 'Overconfidence, Arbitrage, and Equilibrium Asset Pricing,' Kent D. Daniel, David Hirshleifer and Avanidhar Subrahmanyam, Journal of Finance, 56(3) (June, 2001), pp. 921-965

- **All securities can be divided into parcels of any size.** In reality, fractional shares usually cannot be bought or sold, and some assets have minimum orders sizes.
- **Risk/Volatility of an asset is known in advance/is constant.** In fact, markets often misprice risk (e.g. the US mortgage bubble or the European debt crisis) and volatility changes rapidly.

More complex versions of MPT can take into account a more sophisticated model of the world (such as one with non-normal distributions and taxes) but all mathematical models of finance still rely on many unrealistic premises.

9.4.5.2 MPT does not really model the market

The risk, return, and correlation measures used by MPT are based on expected values, which means that they are mathematical statements about the future (the expected value of returns is explicit in the above equations, and implicit in the definitions of variance and covariance). In practice, investors must substitute predictions based on historical measurements of asset return and volatility for these values in the equations. Very often such expected values fail to take account of new circumstances which did not exist when the historical data were generated.

More fundamentally, investors are stuck with estimating key parameters from past market data because MPT attempts to model risk in terms of the likelihood of losses, but says nothing about why those losses might occur. The risk measurements used are probabilistic in nature, not structural. This is a major difference as compared to many engineering approaches to risk management.

Options theory and MPT have at least one important conceptual difference from the probabilistic risk assessment done by nuclear power [plants]. A PRA is what economists would call a structural model. The components of a system and their relationships are modeled in Monte Carlo simulations. If valve X fails, it causes a loss of back pressure on pump Y, causing a drop in flow to vessel Z, and so on.

But in the Black–Scholes equation and MPT, there is no attempt to explain an underlying structure to price changes. Various outcomes are simply given probabilities. And, unlike the PRA, if there is no history of a particular system-level event like a liquidity crisis, there is no way to compute the odds of it. If nuclear engineers ran risk management this way, they would never be able to compute the odds of a meltdown at a particular plant until several similar events occurred in the same reactor design.

—Douglas W. Hubbard, 'The Failure of Risk Management', p. 67, John Wiley & Sons, 2009. ISBN 978-0-470-38795-5

Essentially, the mathematics of MPT view the markets as a collection of dice. By examining past market data we can develop hypotheses about how the dice are weighted, but this isn't helpful if the markets are actually dependent upon a much bigger and more complicated chaotic system—the world. For this reason, accurate

structural models of real financial markets are unlikely to be forthcoming because they would essentially be structural models of the entire world. Nonetheless there is growing awareness of the concept of systemic risk in financial markets, which should lead to more sophisticated market models.

Mathematical risk measurements are also useful only to the degree that they reflect investors' true concerns—there is no point minimizing a variable that nobody cares about in practice. MPT uses the mathematical concept of variance to quantify risk, and this might be justified under the assumption of elliptically distributed returns such as normally distributed returns, but for general return distributions other risk measures (like coherent risk measures) might better reflect investors' true preferences.

In particular, variance is a symmetric measure that counts abnormally high returns as just as risky as abnormally low returns. Some would argue that, in reality, investors are only concerned about losses, and do not care about the dispersion or tightness of above-average returns. According to this view, our intuitive concept of risk is fundamentally asymmetric in nature.

MPT does not account for the personal, environmental, strategic, or social dimensions of investment decisions. It only attempts to maximize risk-adjusted returns, without regard to other consequences. In a narrow sense, its complete reliance on asset prices makes it vulnerable to all the standard market failures such as those arising from information asymmetry, externalities, and public goods. It also rewards corporate fraud and dishonest accounting. More broadly, a firm may have strategic or social goals that shape its investment decisions, and an individual investor might have personal goals. In either case, information other than historical returns is relevant.

Financial economist Nassim Nicholas Taleb has also criticized modern portfolio theory because it assumes a Gaussian distribution:

After the stock market crash (in 1987), they rewarded two theoreticians, Harry Markowitz and William Sharpe, who built beautifully Platonic models on a Gaussian base, contributing to what is called Modern Portfolio Theory. Simply, if you remove their Gaussian assumptions and treat prices as scalable, you are left with hot air. The Nobel Committee could have tested the Sharpe and Markowitz models – they work like quack remedies sold on the Internet – but nobody in Stockholm seems to have thought about it. [68]*:p.279*

9.4.5.3 The MPT does not take its own effect on asset prices into account

Diversification eliminates non-systematic risk, but at the cost of increasing the systematic risk. Diversification forces the portfolio manager to invest in assets without analyzing their fundamentals, solely for the benefit of eliminating the portfolio's non-systematic risk (the CAPM assumes investment in all available assets). This artificially increased demand pushes up the price of assets that, when analyzed individually, would be of little fundamental value. The result is that the whole portfolio becomes

68. Taleb, Nassim Nicholas (2007), The Black Swan: The Impact of the Highly Improbable, Random House, ISBN 978-1-4000-6351-2.

more expensive and, as a result, the probability of a positive return decreases (i.e. the risk of the portfolio increases).

Empirical evidence for this is the price hike that stocks typically experience once they are included in major indices like the S&P 500.

9.4.6 Extensions

Since MPT's introduction in 1952, many attempts have been made to improve the model, especially by using more realistic assumptions.

Post-modern portfolio theory extends MPT by adopting non-normally distributed, asymmetric measures of risk. This helps with some of these problems, but not others.

Black-Litterman model optimization is an extension of unconstrained Markowitz optimization which incorporates relative and absolute `views' on inputs of risk and returns.

9.4.7 Other Applications

9.4.7.1 Applications to project portfolios and other "non-financial" assets

Some experts apply MPT to portfolios of projects and other assets besides financial instruments [69], [70]. When MPT is applied outside of traditional financial portfolios, some differences between the different types of portfolios must be considered.

1. The assets in financial portfolios are, for practical purposes, continuously divisible while portfolios of projects are "lumpy". For example, while we can compute that the optimal portfolio position for 3 stocks is, say, 44%, 35%, 21%, the optimal position for a project portfolio may not allow us to simply change the amount spent on a project. Projects might be all or nothing or, at least, have logical units that cannot be separated. A portfolio optimization method would have to take the discrete nature of projects into account.
2. The assets of financial portfolios are liquid; they can be assessed or re-assessed at any point in time. But opportunities for launching new projects may be limited and may occur in limited windows of time. Projects that have already been initiated cannot be abandoned without the loss of the sunk costs (i.e., there is little or no recovery/salvage value of a half-complete project).

69. Hubbard, Douglas (2007). How to Measure Anything: Finding the Value of Intangibles in Business. Hoboken, NJ: John Wiley & Sons. ISBN 978-0-470-11012-6.
70. Sabbadini, Tony (2010). "Manufacturing Portfolio Theory" (http://www.scribd.com/doc/40365034/Manufacturing-Portfolio-Theory-CFPv1). International Institute for Advanced Studies in Systems Research and Cybernetics.

Neither of these necessarily eliminate the possibility of using MPT and such portfolios. They simply indicate the need to run the optimization with an additional set of mathematically-expressed constraints that would not normally apply to financial portfolios.

Furthermore, some of the simplest elements of Modern Portfolio Theory are applicable to virtually any kind of portfolio. The concept of capturing the risk tolerance of an investor by documenting how much risk is acceptable for a given return may be applied to a variety of decision analysis problems. MPT uses historical variance as a measure of risk, but portfolios of assets like major projects don't have a well-defined "historical variance". In this case, the MPT investment boundary can be expressed in more general terms like "chance of an ROI less than cost of capital" or "chance of losing more than half of the investment". When risk is put in terms of uncertainty about forecasts and possible losses then the concept is transferable to various types of investment [71].

9.4.7.2 Application to other disciplines

In the 1970s, concepts from Modern Portfolio Theory found their way into the field of regional science. In a series of seminal works, Michael Conroy modeled the labor force in the economy using portfolio-theoretic methods to examine growth and variability in the labor force. This was followed by a long literature on the relationship between economic growth and volatility [72].

More recently, modern portfolio theory has been used to model the self-concept in social psychology. When the self attributes comprising the self-concept constitute a well-diversified portfolio, then psychological outcomes at the level of the individual such as mood and self-esteem should be more stable than when the self-concept is undiversified. This prediction has been confirmed in studies involving human subjects [73].

Recently, modern portfolio theory has been applied to modelling the uncertainty and correlation between documents in information retrieval. Given a query, the aim is to maximize the overall relevance of a ranked list of documents and at the same time minimize the overall uncertainty of the ranked list [74].

71. Hubbard, Douglas (2007). How to Measure Anything: Finding the Value of Intangibles in Business. Hoboken, NJ: John Wiley & Sons. ISBN 978-0-470-11012-6.
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73. Chandra, Siddharth; Shadel, William G. (2007). "Crossing disciplinary boundaries: Applying financial portfolio theory to model the organization of the self-concept". Journal of Research in Personality 41 (2): 346–373. doi:10.1016/j.jrp.2006.04.007.
74. http://web4.cs.ucl.ac.uk/staff/jun.wang/blog/2009/07/11/portfolio-theory/

9.4.8 Comparison with arbitrage pricing theory

The SML and CAPM are often contrasted with the arbitrage pricing theory (APT), which holds that the expected return of a financial asset can be modeled as a linear function of various macro-economic factors, where sensitivity to changes in each factor is represented by a factor specific beta coefficient.

The APT is less restrictive in its assumptions: it allows for a statistical model of asset returns, and assumes that each investor will hold a unique portfolio with its own particular array of betas, as opposed to the identical "market portfolio". Unlike the CAPM, the APT, however, does not itself reveal the identity of its priced factors - the number and nature of these factors is likely to change over time and between economies.

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2. http://www.emanagedfutures.com/articles/reducing-portfolio-volatility/

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9.4.11 External links

- Free Stock Portfolio Optimization Online Allows users to compare stock performance, make free stock analysis, and optimize stock portfolio.
- Macro-Investment Analysis, Prof. William F. Sharpe, Stanford
- An Introduction to Investment Theory[dead link], Prof. William N. Goetzmann, Yale School of Management

9.5 Capital Asset Pricing Model

In finance, the **capital asset pricing model** (**CAPM**) is used to determine a theoretically appropriate required rate of return of an asset, if that asset is to be

added to an already well-diversified portfolio, given that asset's non-diversifiable risk. The model takes into account the asset's sensitivity to non-diversifiable risk (also known as systematic risk or market risk), often represented by the quantity beta (β) in the financial industry, as well as the expected return of the market and the expected return of a theoretical risk-free asset.

The model was introduced by Jack Treynor (1961, 1962) [75], William Sharpe (1964), John Lintner (1965a,b) and Jan Mossin (1966) independently, building on the earlier work of Harry Markowitz on diversification and modern portfolio theory. Sharpe, Markowitz and Merton Miller jointly received the Nobel Memorial Prize in Economics for this contribution to the field of financial economics.

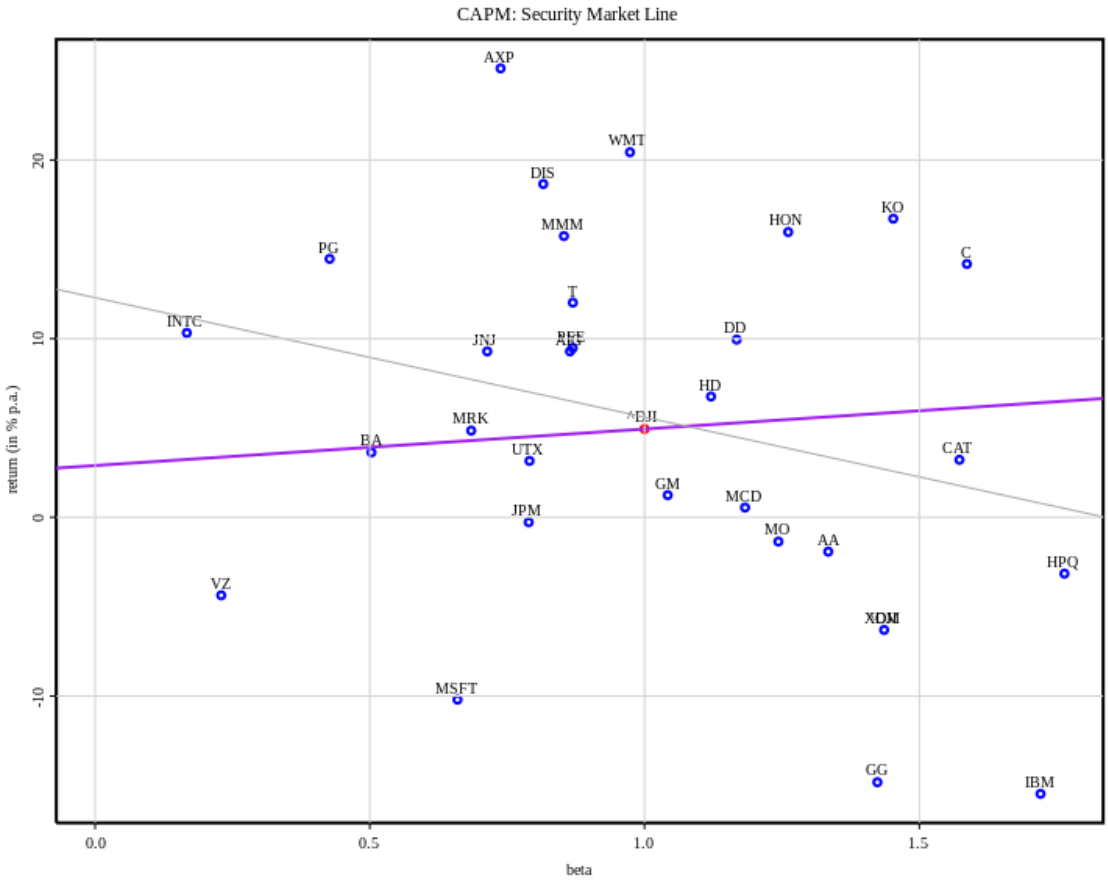

Figure 9.4

An estimation of the CAPM and the Security Market Line (purple) for the Dow Jones Industrial Average over 3 years for monthly data.

9.5.1 The formula

The CAPM is a model for pricing an individual security or portfolio. For individual securities, we make use of the security market line (SML) and its relation to expected return and systematic risk (beta) to show how the market must price individual securities in relation to their security risk class. The SML enables us to calculate the reward-to-risk ratio for any security in relation to that of the overall market. Therefore, when the expected rate of return for any security is deflated by its beta coefficient, the

75. French, Craig W. (2003). "The Treynor Capital Asset Pricing Model". Journal of Investment Management 1 (2): 60–72.

reward-to-risk ratio for any individual security in the market is equal to the market reward-to-risk ratio, thus:

$$\frac{E(R_i) - R_f}{\beta_i} = E(R_m) - R_f$$

The market reward-to-risk ratio is effectively the market risk premium and by rearranging the above equation and solving for E(Ri), we obtain the Capital Asset Pricing Model (CAPM).

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f)$$

where:

$$E(R_i)$$

is the expected return on the capital asset

$$R_f$$

is the risk-free rate of interest such as interest arising from government bonds

$$\beta_i$$

(the beta) is the sensitivity of the expected excess asset returns to the expected excess market returns, or also

$$\beta_i = \frac{\operatorname{Cov}(R_i, R_m)}{\operatorname{Var}(R_m)},$$

$$E(R_m)$$

is the expected return of the market

$$E(R_m) - R_f$$

is sometimes known as the *market premium* (the difference between the expected market rate of return and the risk-free rate of return).

$$E(R_i) - R_f$$

is also known as the *risk premium*

Restated, in terms of risk premium, we find that:

$$E(R_i) - R_f = \beta_i(E(R_m) - R_f)$$

which states that the *individual risk premium* equals the *market premium times β.*

Note 1: the expected market rate of return is usually estimated by measuring the Geometric Average of the historical returns on a market portfolio (e.g. S&P 500).

Note 2: the risk free rate of return used for determining the risk premium is usually the arithmetic average of historical risk free rates of return and not the current risk free rate of return.

For the full derivation see Modern portfolio theory.

9.5.2 Security market line

The SML essentially graphs the results from the capital asset pricing model (CAPM) formula. The x-axis represents the risk (beta), and the y-axis represents the expected return. The market risk premium is determined from the slope of the SML.

The relationship between β and required return is plotted on the *securities market line* (SML), which shows expected return as a function of β. The intercept is the nominal risk-free rate available for the market, while the slope is the market premium, $E(R_m) - R_f$. The securities market line can be regarded as representing a single-factor model of the asset price, where Beta is exposure to changes in value of the Market. The equation of the SML is thus:

$$\text{SML} : E(R_i) = R_f + \beta_i(E(R_M) - R_f).$$

It is a useful tool in determining if an asset being considered for a portfolio offers a reasonable expected return for risk. Individual securities are plotted on the SML graph. If the security's expected return versus risk is plotted above the SML, it is undervalued since the investor can expect a greater return for the inherent risk. And a security plotted below the SML is overvalued since the investor would be accepting less return for the amount of risk assumed.

9.5.3 Asset pricing

Once the expected/required rate of return, $E(R_i)$, is calculated using CAPM, we can compare this required rate of return to the asset's estimated rate of return over a specific investment horizon to determine whether it would be an appropriate investment. To make this comparison, you need an independent estimate of the return outlook for the security based on either **fundamental or technical analysis techniques**, including P/E, M/B etc.

Assuming that the CAPM is correct, an asset is correctly priced when its estimated price is the same as the present value of future cash flows of the asset, discounted at the rate suggested by CAPM. If the estimated price is higher than the CAPM valuation, then the asset is undervalued (and overvalued when the estimated price is below the CAPM valuation) [76]. When the asset does not lie on the SML, this could also suggest mis-pricing. Since the expected return of the asset at time t is

$$E(R_t) = \frac{E(P_{t+1}) - P_t}{P_t}$$

, a higher expected return than what CAPM suggests indicates that P_t

76. Luenberger, David (1997). Investment Science. Oxford University Press. ISBN 978-0-19-510809-5.

is too low (the asset is currently undervalued), assuming that at time $t+1$ the asset returns to the CAPM suggested price [77].

The asset price P_0 using CAPM, sometimes called the certainty equivalent pricing formula, is a linear relationship given by

$$P_0 = \frac{1}{1+R_f}\left[E(P_T) - \frac{\mathrm{Cov}(P_T, R_M)(E(R_M) - R_f)}{\mathrm{Var}(R_M)}\right]$$

where P_T is the payoff of the asset or portfolio [78].

9.5.4 Asset-specific required return

The CAPM returns the asset-appropriate required return or discount rate—i.e. the rate at which future cash flows produced by the asset should be discounted given that asset's relative riskiness. Betas exceeding one signify more than average "riskiness"; betas below one indicate lower than average. Thus, a more risky stock will have a higher beta and will be discounted at a higher rate; less sensitive stocks will have lower betas and be discounted at a lower rate. Given the accepted concave utility function, the CAPM is consistent with intuition—investors (should) require a higher return for holding a more risky asset.

Since beta reflects asset-specific sensitivity to non-diversifiable, i.e. market risk, the market as a whole, by definition, has a beta of one. Stock market indices are frequently used as local proxies for the market—and in that case (by definition) have a beta of one. An investor in a large, diversified portfolio (such as a mutual fund), therefore, expects performance in line with the market.

9.5.5 Risk and diversification

The risk of a portfolio comprises systematic risk, also known as undiversifiable risk, and unsystematic risk which is also known as idiosyncratic risk or diversifiable risk. Systematic risk refers to the risk common to all securities—i.e. market risk. Unsystematic risk is the risk associated with individual assets. Unsystematic risk can be diversified away to smaller levels by including a greater number of assets in the portfolio (specific risks "average out"). The same is not possible for systematic risk within one market. Depending on the market, a portfolio of approximately 30-40 securities in developed markets such as UK or US will render the portfolio sufficiently

77. Bodie, Z.; Kane, A.; Marcus, A. J. (2008). Investments (7th International ed.). Boston: McGraw-Hill. p. 303. ISBN 0-07-125916-3.
78. Luenberger, David (1997). Investment Science. Oxford University Press. ISBN 978-0-19-510809-5.

diversified such that risk exposure is limited to systematic risk only. In developing markets a larger number is required, due to the higher asset volatilities.

A rational investor should not take on any diversifiable risk, as only non-diversifiable risks are rewarded within the scope of this model. Therefore, the required return on an asset, that is, the return that compensates for risk taken, must be linked to its riskiness in a portfolio context—i.e. its contribution to overall portfolio riskiness—as opposed to its "stand alone riskiness." In the CAPM context, portfolio risk is represented by higher variance i.e. less predictability. In other words the beta of the portfolio is the defining factor in rewarding the systematic exposure taken by an investor.

9.5.6 The efficient frontier

The CAPM assumes that the risk-return profile of a portfolio can be optimized—an optimal portfolio displays the lowest possible level of risk for its level of return. Additionally, since each additional asset introduced into a portfolio further diversifies the portfolio, the optimal portfolio must comprise every asset, (assuming no trading costs) with each asset value-weighted to achieve the above (assuming that any asset is infinitely divisible). All such optimal portfolios, i.e., one for each level of return, comprise the efficient frontier.

Because the unsystematic risk is diversifiable, the total risk of a portfolio can be viewed as beta.

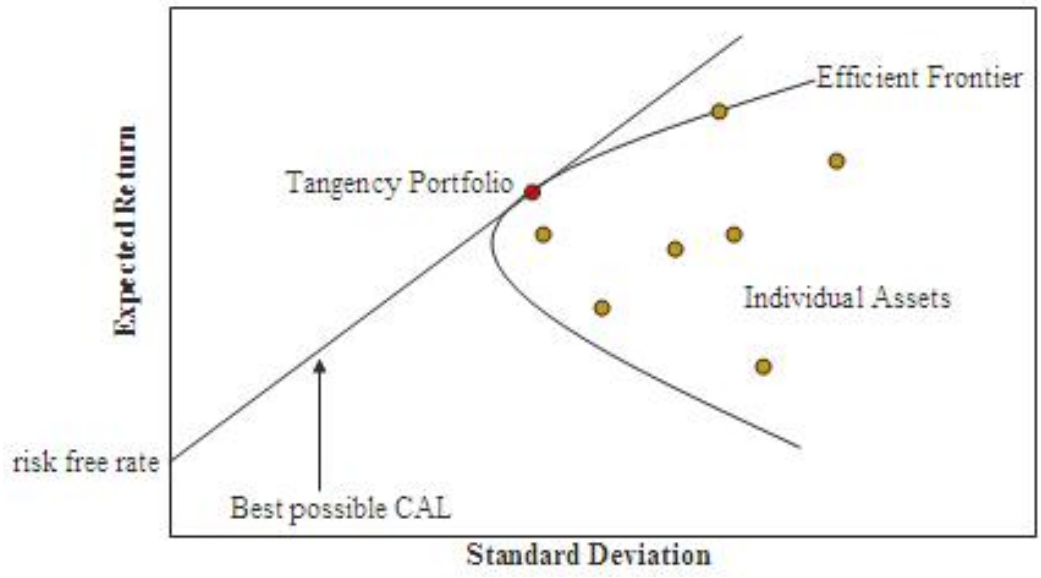

Figure 9.5 The (Markowitz) efficient frontier. CAL stands for the capital allocation line.

9.5.7 The market portfolio

An investor might choose to invest a proportion of his or her wealth in a portfolio of risky assets with the remainder in cash—earning interest at the risk free rate (or

indeed may borrow money to fund his or her purchase of risky assets in which case there is a negative cash weighting). Here, the ratio of risky assets to risk free asset does not determine overall return—this relationship is clearly linear. It is thus possible to achieve a particular return in one of two ways:

1. By investing all of one's wealth in a risky portfolio,
2. or by investing a proportion in a risky portfolio and the remainder in cash (either borrowed or invested).

For a given level of return, however, only one of these portfolios will be optimal (in the sense of lowest risk). Since the risk free asset is, by definition, uncorrelated with any other asset, option 2 will generally have the lower variance and hence be the more efficient of the two.

This relationship also holds for portfolios along the efficient frontier: a higher return portfolio plus cash is more efficient than a lower return portfolio alone for that lower level of return. For a given risk free rate, there is only one optimal portfolio which can be combined with cash to achieve the lowest level of risk for any possible return. This is the market portfolio.

9.5.8 Assumptions of CAPM

All investors [79]: Template:Unreferenced section

1. Aim to maximize economic utilities.
2. Are rational and risk-averse.
3. Are broadly diversified across a range of investments.
4. Are price takers, i.e., they cannot influence prices.
5. Can lend and borrow unlimited amounts under the risk free rate of interest.
6. Trade without transaction or taxation costs.
7. Deal with securities that are all highly divisible into small parcels.
8. Assume all information is available at the same time to all investors.

Further, the model assumes that standard deviation of past returns is a perfect proxy for the future risk associated with a given security.

9.5.9 Problems of CAPM

- The model assumes that the variance of returns is an adequate measurement of risk. This would be implied by the assumption that returns are normally distributed, or indeed are distributed in any two-parameter way, but for general return distributions other risk measures (like coherent risk measures) will reflect the active and potential shareholders' preferences more adequately. Indeed risk

79. Arnold, Glen (2005). Corporate financial management (3. ed. ed.). Harlow [u.a.]: Financial Times/Prentice Hall. pp. 354.

in financial investments is not variance in itself, rather it is the probability of losing: it is asymmetric in nature.

- The model assumes that all active and potential shareholders have access to the same information and agree about the risk and expected return of all assets (homogeneous expectations assumption).
- The model assumes that the probability beliefs of active and potential shareholders match the true distribution of returns. A different possibility is that active and potential shareholders' expectations are biased, causing market prices to be informationally inefficient. This possibility is studied in the field of behavioral finance, which uses psychological assumptions to provide alternatives to the CAPM such as the overconfidence-based asset pricing model of Kent Daniel, David Hirshleifer, and Avanidhar Subrahmanyam (2001) [80].
- The model does not appear to adequately explain the variation in stock returns. Empirical studies show that low beta stocks may offer higher returns than the model would predict. Some data to this effect was presented as early as a 1969 conference in Buffalo, New York in a paper by Fischer Black, Michael Jensen, and Myron Scholes. Either that fact is itself rational (which saves the efficient-market hypothesis but makes CAPM wrong), or it is irrational (which saves CAPM, but makes the EMH wrong – indeed, this possibility makes volatility arbitrage a strategy for reliably beating the market).
- The model assumes that given a certain expected return, active and potential shareholders will prefer lower risk (lower variance) to higher risk and conversely given a certain level of risk will prefer higher returns to lower ones. It does not allow for active and potential shareholders who will accept lower returns for higher risk. Casino gamblers pay to take on more risk, and it is possible that some stock traders will pay for risk as well.
- The model assumes that there are no taxes or transaction costs, although this assumption may be relaxed with more complicated versions of the model.
- The market portfolio consists of all assets in all markets, where each asset is weighted by its market capitalization. This assumes no preference between markets and assets for individual active and potential shareholders, and that active and potential shareholders choose assets solely as a function of their risk-return profile. It also assumes that all assets are infinitely divisible as to the amount which may be held or transacted.
- The market portfolio should in theory include all types of assets that are held by anyone as an investment (including works of art, real estate, human capital...) In practice, such a market portfolio is unobservable and people usually substitute a stock index as a proxy for the true market portfolio. Unfortunately, it has been shown that this substitution is not innocuous and can lead to false inferences as to the validity of the CAPM, and it has been said that due to the inobservability of the true market portfolio, the CAPM might not be empirically testable. This was presented in greater depth in a paper by Richard Roll in 1977, and is generally referred to as Roll's critique [81].

80. Daniel, Kent D.; Hirshleifer, David; Subrahmanyam, Avanidhar (2001). "Overconfidence, Arbitrage, and Equilibrium Asset Pricing". Journal of Finance 56 (3): 921–965. doi:10.1111/0022-1082.00350.
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- The model assumes economic agents optimise over a short-term horizon, and in fact investors with longer-term outlooks would optimally choose long-term inflation-linked bonds instead of short-term rates as this would be more risk-free asset to such an agent [82], [83].
- The model assumes just two dates, so that there is no opportunity to consume and rebalance portfolios repeatedly over time. The basic insights of the model are extended and generalized in the intertemporal CAPM (ICAPM) of Robert Merton [84], and the consumption CAPM (CCAPM) of Douglas Breeden and Mark Rubinstein [85].
- CAPM assumes that all active and potential shareholders will consider all of their assets and optimize one portfolio. This is in sharp contradiction with portfolios that are held by individual shareholders: humans tend to have fragmented portfolios or, rather, multiple portfolios: for each goal one portfolio — see behavioral portfolio theory [86] and Maslowian Portfolio Theory [87].
- Empirical tests show market anomalies like the size and value effect that cannot be explained by the CAPM [88]. For details see the Fama–French three-factor model [89].

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9.5.12 External links

- Multiasset efficient frontier

9.6 Arbitrage pricing theory

In finance, **arbitrage pricing theory** (**APT**) is a general theory of asset pricing that holds that the expected return of a financial asset can be modeled as a linear function of various macro-economic factors or theoretical market indices, where sensitivity to changes in each factor is represented by a factor-specific beta coefficient. The model-derived rate of return will then be used to price the asset correctly - the asset price should equal the expected end of period price discounts and allowances|discounted at the rate implied by the model. If the price diverges, arbitrage should bring it back into line.

The theory was proposed by the economist Stephen Ross (economist)|Stephen Ross in 1976.

9.6.1 The APT model

Risky asset returns are said to follow a factor structure if they can be expressed as:

$$r_j = a_j + b_{j1}F_1 + b_{j2}F_2 + \cdots + b_{jn}F_n + \epsilon_j$$

where

$$a_j$$

is a constant for asset j

$$F_k$$

is a systematic factor

b_{jk}

is the sensitivity of the jth asset to factor

k

, also called factor loading,

and

ϵ_j

is the risky asset's idiosyncratic random shock with mean zero.

Idiosyncratic shocks are assumed to be uncorrelated across assets and uncorrelated with the factors.

The APT states that if asset returns follow a factor structure then the following relation exists between expected returns and the factor sensitivities:

$$E\left(r_j\right) = r_f + b_{j1}RP_1 + b_{j2}RP_2 + \cdots + b_{jn}RP_n$$

where

RP_k

is the risk premium of the factor,

r_f

is the risk-free rate,

That is, the expected return of an asset j is a linear function of the assets sensitivities to the n factors.

Note that there are some assumptions and requirements that have to be fulfilled for the latter to be correct: There must be perfect competition in the market, and the total number of factors may never surpass the total number of assets (in order to avoid the problem of matrix singularity),

9.6.2 Arbitrage and the APT

Arbitrage is the practice of taking positive expected return from overvalued or undervalued securities in the inefficient market without any incremental risk and zero additional investments.

9.6.2.1 Arbitrage in expectations

The CAPM | capital asset pricing model and its extensions are based on specific assumptions on investors' asset demand. For example:

- Investors care only about mean return and variance.
- Investors hold only traded assets.

9.6.2.2 Arbitrage mechanics

In the APT context, arbitrage consists of trading in two assets – with at least one being mispriced. The arbitrageur sells the asset which is relatively too expensive and uses the proceeds to buy one which is relatively too cheap.

Under the APT, an asset is mispriced if its current price diverges from the price predicted by the model. The asset price today should equal the sum of all future cash flows discounted at the APT rate, where the expected return of the asset is a linear function of various factors, and sensitivity to changes in each factor is represented by a factor-specific beta coefficient.

A correctly priced asset here may be in fact a synthetic asset - a portfolio consisting of other correctly priced assets. This portfolio has the same exposure to each of the macroeconomic factors as the mispriced asset. The arbitrageur creates the portfolio by identifying x correctly priced assets (one per factor plus one) and then weighting the assets such that portfolio beta per factor is the same as for the mispriced asset.

When the investor is long (finance)|long the asset and short selling|short the portfolio (or vice versa) he has created a position which has a positive expected return (the difference between asset return and portfolio return) and which has a net-zero exposure to any macroeconomic factor and is therefore risk free (other than for firm specific risk). The arbitrageur is thus in a position to make a risk-free profit:

Where today's price is too low:

The implication is that at the end of the period the portfolio would have appreciated at the rate implied by the APT, whereas the mispriced asset would have appreciated at more than this rate. The arbitrageur could therefore:

Today:

1. short selling|short sell the portfolio
2. buy the mispriced asset with the proceeds.

At the end of the period:

1. sell the mispriced asset
2. use the proceeds to buy back the portfolio
3. pocket the difference.

Where today's price is too high:

The implication is that at the end of the period the portfolio would have appreciated at the rate implied by the APT, whereas the mispriced asset would have appreciated at less than this rate. The arbitrageur could therefore:

Today:

1. short selling|short sell the mispriced asset
2. buy the portfolio with the proceeds.

At the end of the period:

1. sell the portfolio
2. use the proceeds to buy back the mispriced asset
3. pocket the difference.

9.6.3 Relationship with the capital asset pricing model (CAPM)

The APT along with the capital asset pricing model (CAPM) is one of two influential theories on asset pricing. The APT differs from the CAPM in that it is less restrictive in its assumptions. It allows for an explanatory (as opposed to statistical) model of asset returns. It assumes that each investor will hold a unique portfolio with its own particular array of betas, as opposed to the identical "market portfolio". In some ways, the CAPM can be considered a "special case" of the APT in that the Modern portfolio theory#Securities Market Line|securities market line represents a single-factor model of the asset price, where beta is exposed to changes in value of the market.

Additionally, the APT can be seen as a "supply-side" model, since its beta coefficients reflect the sensitivity of the underlying asset to economic factors. Thus, factor shocks would cause structural changes in assets' expected returns, or in the case of stocks, in firms' profitabilities.

On the other side, the capital asset pricing model is considered a "demand side" model. Its results, although similar to those of the APT, arise from a maximization problem of each investor's utility function, and from the resulting market equilibrium (investors are considered to be the "consumers" of the assets).

9.6.4 Using the APT

9.6.4.1 Identifying the factors

As with the CAPM, the factor-specific betas are found via a linear regression of historical security returns on the factor in question. Unlike the CAPM, the APT, however, does not itself reveal the identity of its priced factors - the number and nature of these factors is likely to change over time and between economies. As a result, this issue is essentially empirical in nature. Several A priori and a posteriori (philosophy)|a priori guidelines as to the characteristics required of potential factors are, however, suggested:

1. their impact on asset prices manifests in their unexpected movements
2. they should represent undiversifiable influences (these are, clearly, more likely to be macroeconomic rather than firm-specific in nature)
3. timely and accurate information on these variables is required
4. the relationship should be theoretically justifiable on economic grounds

Chen, Richard Roll|Roll and Stephen Ross (economist)|Ross (1986) identified the following macro-economic factors as significant in explaining security returns:

- surprises in inflation;
- surprises in GNP as indicated by an industrial production index;
- surprises in investor confidence due to changes in default premium in corporate bonds;
- surprise shifts in the yield curve.

As a practical matter, indices or spot or futures market prices may be used in place of macro-economic factors, which are reported at low frequency (e.g. monthly) and often with significant estimation errors. Market indices are sometimes derived by means of factor analysis. More direct "indices" that might be used are:

- short term interest rates;
- the difference in long-term and short-term interest rates;
- a diversified stock index such as the S&P 500 or NYSE Composite Index;
- oil prices
- gold or other precious metal prices
- Currency exchange rates

9.6.4.2 APT and asset management

The linear factor model structure of the APT is used as the basis for many of the commercial risk systems employed by asset managers.

9.6.5 References

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9.6.6 External links

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9.7 Correlation Among Securities

9.7.1 A two security portfolio

When building a portfolio, it is important not only to consider the individual securities in a portfolio, but also how they interact with one another. For example, consider a portfolio that contains two stocks, XYZ and ABC.

The following formula finds the variance of a portfolio using the correlation (rho) between two stocks in a portfolio:

$$\sigma^2_{portfolio} = x_1^2\sigma_1^2 + x_2^2\sigma_2^2 + 2(x_1 x_2 \rho_{12} \sigma_1 \sigma_2)$$

Where x represents the weight of each security in the portfolio.

So, let us suppose the following information:

	XYZ	ABC
Price	$50	$60
Shares	20	15
Variance	0.02	0.04
Std. Dev.	0.1414	0.2

And the correlation between the two is 0.25

Find the variance of this portfolio.

The first thing we must do is determine the relative weights of each stock. We see that we have $1000 in XYZ, and 900 in ABC. Therefore x_1=0.53 and x_2=0.47. The other relevant information is listed, so we simply plug it into the equation:

$$\sigma_p^2 = 0.53^2(0.02) + .47^2(0.04) + 2(0.53 * 0.47 * 0.25 * 0.1414 * 0.2) = 0.01798$$

Now let us say we were trying to find the Beta of the XYZ company, and we know that the market has a variance of 0.04. The following formula will allow us to do so:

$$\beta_i = \frac{\sigma_{im}}{\sigma_m^2}$$

First, we will need to find the covariance (σ_{12}) between the market and XYZ. For that, we will use the following formula:

$$\sigma_{12} = \rho_{12}\sigma_1\sigma_2$$

For this exercise we will need to know the correlation between the market and XYZ, which we will say is 0.75. Therefore:

$$\sigma_{12} = 0.75 * 0.1414 * 0.2 = 0.02121$$

Applying our covariance of 0.02121 to the formula for beta, we find that:

$$\beta_i = \frac{0.02121}{0.04} = 0.53$$

9.8 Optimal Market Portfolio

The **Capital Allocation** Line shows how an investor can use an optimal market portfolio matched to his risk preferences. According to capital market theory, there is one particular portfolio that has the highest expected returns for its risk. However, the risk category that this portfolio is in may not be suitable for all investors. Some investors will naturally prefer lower risk, lower return securities. Other investors will prefer riskier ventures with the possibility of higher returns. The Capital Allocation Line is kinked at one point in the middle, this represents the optimal market portfolio.

The line slopes down and to the left from this point. All of the points on this left half of the line represent a **lending portfolio**. A lending portfolio consists of the market portfolio, plus some risk free government securities. These securities serve to reduce the risk profile of the portfolio, while of course also reducing expected returns.

The line slopes up and to the right from the point in the middle. Every point on the right half of the line represents a **borrowing portfolio**. This shows how an investor can buy the market portfolio, and also borrow money in order to buy more of the market portfolio. Therefore, an investor can hold the same market portfolio and increase his risk and expected return. Notice that the slope of the lending portfolio is higher than that of the borrowing portfolio. This is because the rate at which one can borrow money will always be higher than the risk free lending rate.

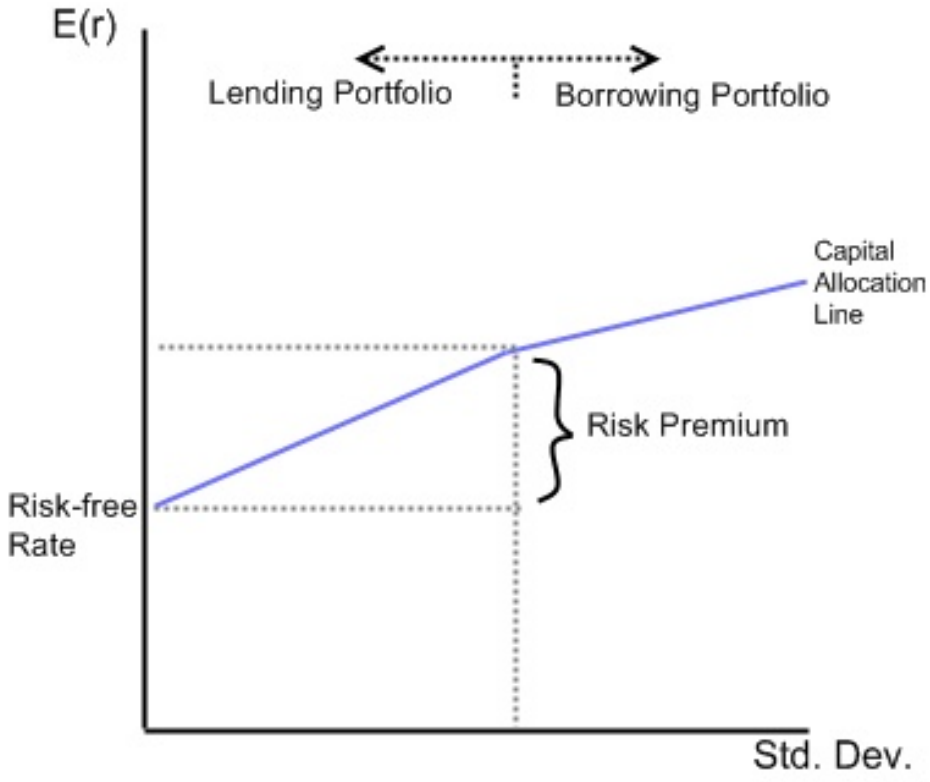
E(r)
Lending Portfolio
Borrowing Portfolio
Capital
Allocation
Line
Risk Premium
Risk-free
Rate
Std. Dev.

Figure 9.6