CHAPTER 8[§]

Securities and Portfolios

Applications

This chapter appears in the Survey text only.

THIS chapter first explains where stocks come from and where they are traded. It then explains the process of going long (buying an asset to speculate that it will go up) and going short (selling an asset to speculate that it will go down). Finally, it explains portfolios and indexes.

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8·1 A Brief Overview of Equities Market Institutions and Vehicles

Let's look into the institutional arrangements for equity trading. After all, from a corporate perspective, stocks are more interesting than many other financial instruments, such as foreign government bonds, even if there is more money in foreign government bonds than in corporate equities. It is with equity that firms are financing themselves. It is the equity holders who absorb the residual risk and usually run the corporation (through their elected board). And although there is more money in non-equity financial markets, the subject area of investments also tends to focus on equities (stocks), because the data on stocks are relatively easy to come by. So it makes sense to describe a few institutional details as to how investors and stocks "connect"—exchange cash for claims and vice-versa.

8·1.A. Brokers

Brokers execute and keep track

Most individuals place their orders to buy or sell stocks with a **retail broker**, such as *Ameritrade* (a "deep-discount broker"), *Charles Schwab* (a discount broker), or *Merrill Lynch* (a full service broker). Investors can place either **market orders**, which ask for execution at the current price, or **limit orders**, which ask for execution if the price is above or below a limit that the investor can specify. (There are also many other types of orders, e.g., *stop-loss orders* [which instruct a broker to sell a security if it has lost a certain amount of money], *good-til-canceled* orders, and *fill-or-kill* orders.) The first function of retail brokers then is to execute these trades. They usually do so by routing investors' orders to a centralized trading location (e.g., a particular stock exchange), the choice of which is typically at the retail broker's discretion, as is the particular agent (e.g., floor broker) engaged to execute the trade. The second function of retail brokers is to keep track of investors' holdings, to facilitate purchasing **on margin** (whereby investors can borrow money to purchase stock, allowing them to purchase more securities than they could afford on a pure cash basis), and to facilitate selling securities "short," which allows investors to speculate that a stock will go down.

Prime Brokers break the two main functions apart. They leave execution to others.

Many larger and institutional investors, such as **funds** (described in Section 8·3.B), break these two functions apart: the investor can employ its own traders, while the broker takes care only of the bookkeeping of the investor's portfolio, margin provisions, and shorting provisions. Such limited brokers are called **prime brokers**.

SIDE NOTE

Discount brokers may charge only $10 or so per trade, but they often receive "rebate" payments back from the market-maker [see below] to which they route your order. This is called "payment for order flow." The market-maker in turn recoups this payment to the broker by executing your trade at a price that is less favorable. Although the purpose of such an arrangement seems deceptive, the evidence suggests that discount brokers are still often cheaper in facilitating investor trades—especially small investor trades—even after taking this hidden payment into account. They just are not as (relatively) cheap as they want to make you believe.

8·1.B. Exchanges and Non-Exchanges

The two big stock exchanges .

Exchanges are centralized trading locations where financial securities are traded. The two most important stock exchanges in the United States are the **New York Stock Exchange** (**NYSE**, also nicknamed the **Big Board**) and **Nasdaq** (originally an acronym for "National Association of Securities Dealers Automated Quotation" System). The NYSE used to be exclusively an **auction market**, in which one designated **specialist** (assigned for each stock) managed the auction process by trading with individual brokers on the floor of the exchange. This specialist was often a monopolist. However, even the NYSE now conducts much trading electronically. In contrast to the NYSE's hybrid human-electronic process primarily in one physical location on Wall Street, Nasdaq has always been a purely electronic exchange without specialists. (For security reasons, its location—well, the location of its computer systems—is secret.) For each Nasdaq stock, there is at least one **market-maker**, a broker-dealer who has agreed to continuously stand by to offer to buy or sell shares, electronically of course, thereby creating a liquid and immediate market for the general public. Most Nasdaq stocks have multiple market-makers, drawn from a pool of about 500 trading firms (such as J.P. Morgan or ETrade), which compete to offer the best

price. Market-makers have one advantage over the general public: they can see the **limit order book**, which contains as-yet-unexecuted orders from investors to purchase or sell if the stock price changes—giving them a good idea at which price a lot of buying or selling activity will happen. The NYSE is the older exchange, and for historical reasons, is the biggest exchange for trading most "blue chip" stocks. ("Blue chip" now means "well established and serious"; ironically, the term itself came from poker, where the highest-denomination chips were blue.) In 2006, the NYSE listed just under 3,000 companies worth about $25 trillion. (This is about twice the annual U.S. GDP.) Nasdaq tends to trade smaller and high-technology firms, lists about as many firms, and has more trading activity than the NYSE. Some stocks are traded on both exchanges.

Auctions have lower execution costs, but also lower execution speed.

Continuous trading—trading at any moment an investor wants to execute—relies on the presence of the standby intermediaries (specialists or market-makers), who are willing to absorb shares when no one else is available. This is risky business, and thus any intermediary must earn a good rate of return to be willing to do so. To avoid this cost, some countries have organized their exchanges into non-continuous auction systems, which match buy and sell orders a couple of times each day. The disadvantage is that you cannot execute orders immediately but have to delay until a whole range of buy orders and sell orders have accumulated. The advantage is that this eliminates the risk that an (expensive) intermediary would otherwise have to bear. Thus, auctions generally offer lower trading costs but slower execution.

New Alternative Trading Institutions: Electronic Communication Networks (ECNs) and more.

Even in the United States, innovation and change are everywhere. For example, **electronic communications networks** (**ECNs**) have recently made big inroads into the trading business, replacing exchanges, especially for large institutional trades. (They can trade the same stocks that exchanges are trading, and compete with exchanges in terms of cost and speed of execution.) An ECN cuts out the specialist, allowing investors to post price-contingent orders themselves. ECNs may specialize in lower execution costs, higher broker kickbacks, or faster execution. The biggest ECNs are *Archipelago* and *Instinet*. In 2005, the NYSE merged with Archipelago, and Nasdaq purchased Instinet. (It is hard to keep track of the most recent trading arrangements. For example, in 2006, the NYSE also merged with ArcaEx, yet another electronic trading system, and merged with Euronext, a pan-European stock exchange based in Paris. As of this writing, it is now officially called **NYSE Euronext**. In addition, the NYSE converted from a mutual company owned by its traders into a publicly traded for-profit company itself.)

Crossing networks and more...

An even more interesting method to buy and trade stocks is that of **crossing systems**, such as *ITG*'s *POSIT*. ITG focuses primarily on matching large institutional trades with one another in an auction-like manner. If no match on the other side is found, the order may simply not be executed. But if a match is made, by cutting out the specialist or market-maker, the execution is a lot cheaper than it would have been on an exchange. Recently, even more novel trading places have sprung up. For example, **Liquidnet** uses peer-to-peer networking—like the original Napster—to match buyers and sellers in real-time. ECNs or electronic limit order books are now the dominant trading systems for equities worldwide, with only the U.S. exchange floors as holdouts. Similar exchanges and computer programs are also used to trade futures, derivatives, currencies, and even some bonds.

Other markets, especially OTC.

There are many other financial markets, too. There are financial exchanges handling stock options, commodities, insurance contracts, etc. A fascinating segment is the **over-the-counter** (**OTC**) markets. Over-the-counter means "call around, usually to a set of traders well-known to trade in the asset, until you find someone willing to buy or sell at a price you like." Though undergoing rapid institutional change, most bond transactions are still over-the-counter. Although OTC markets handle significantly more bond trading in terms of transaction dollar amounts than exchanges, their transaction costs are prohibitively high for retail investors—if you call without knowing the market in great detail, the person on the other end of the line will be happy to quote you a shamelessly high price, hoping that you do not know any better alternatives. The **NASD** (National Association of Securities Dealers) also operates a semi-OTC market for the stocks of smaller firms, which are listed on the so-called **pink sheets**. Foreign securities trade on their local national exchanges, but the costs for U.S. retail investors are again often too high to make direct participation worthwhile.

↦ *Over-the-counter 8·1.C on Page 170*

8·1.C. Investment Companies (ADRs and Funds)

Investment Companies are important players in the U.S. financial markets, regulated by the SEC. There are three kinds: unit investment trusts (UITs), mutual funds, and closed-end funds. (**Hedge funds** do not qualify as investment companies in the SEC sense. On the contrary, they are structured so as to avoid qualifying for official SEC status.)

UITs and ADRs

A **unit investment trust** (**UIT**) is a vehicle that holds other stocks. SEC rules forbid UITs to trade actively, and the UIT must have a fixed termination date (even if it is 50 years in the future). UITs can be listed on a stock exchange, which makes it easy for U.S. retail investors to buy and sell them. One prominent example are **American Depositary Receipts** (**ADR**). A typical ADR owns the stock of only one foreign security (held in escrow at a U.S. bank, usually the Bank of New York). The advantage of an ADR is that it makes it easy for U.S. retail investors to trade in a foreign security without large transaction costs. Another prominent example are **Exchange-Traded Funds** (**ETF**), which typically try to mimic a market index (such as the S&P500 that you just saw).

The "open end" feature.

UITs are **open end**, which means that UIT investors cannot only sell their shares to other investors, but they can also demand an exchange of their UIT shares into the appropriate fraction of the underlying holdings. For example, an ADR with 1 million outstanding shares may itself hold 200 million shares in Siemens. A large ADR shareholder can send in her ADR shares and demand that the fund send her 200 Siemens shares for every ADR share. This exchange right gives the law of one price a lot of bite—if a UIT were to fall below its underlying holdings' value, an arbitrageur could buy up the ADR shares, exchange them for the stock, and thereby earn free money. It is therefore no surprise that UIT prices are almost always nearly exactly what their underlying holdings are worth.

Mutual funds.

Like UITs, **mutual funds** also hold shares of other stocks and are open end. Unlike UITs, mutual fund managers can actively buy and sell many different stocks—and many fund managers do so. Some mutual funds specialize in imitating common stock market indexes, just like ETFs; others try to be more "boutique." Most mutual funds are classified into just a few categories based on their general trading motivation (such as "growth" or "income"). Interestingly, in the United States, there are now more mutual funds than there are stocks in the financial market. Mutual funds do not trade on exchanges, but most are easily and cheaply accessible through retail brokers.

Closed-end Funds

In a **closed-end fund**, investors cannot request an exchange of their fund shares for the underlying shares held by the fund. The advantage of a closed-end fund is that it can itself invest in assets that are less liquid. After all, it may not be forced to sell its holdings on the whims of its own investors. The disadvantage is that the law of one price has much less bite. On average, closed-end funds trade persistently below the value of their underlying holdings, roughly in line with the (often high) fees that the managers of many of these closed-end funds are charging.

8·1.D. How Securities Appear and Disappear

Inflows

Most publicly traded equities appear on public exchanges, almost always Nasdaq, through **initial public offerings** (**IPOs**). This is an event in which a privately traded company first sells shares to ordinary retail and institutional investors. IPOs are usually executed by **underwriters** (investment bankers such as *Goldman Sachs* or *Merrill Lynch*), which are familiar with the complex legal and regulatory process and which have easy access to an investor client base to buy the newly issued shares. Shares in IPOs are typically sold at a fixed price—and for about 10% below the price at which they are likely to trade on the first day of after-market open trading. (Many IPO shares are allocated to the brokerage firm's favorite customers, and can be an important source of profit.)

Firms first sell shares in IPOs.

Usually, about a third of the company is sold in the IPO, and the typical IPO offers shares worth between $20 million and $100 million, although some are much larger (e.g., privatizations, like British Telecom). About two-thirds of all such IPO companies never amount to much or even die within a couple of years, but the remaining third soon thereafter offer more shares in **seasoned equity offerings** (**SEOs**). These days, however, much expansion in the number of shares in publicly traded companies, especially large companies, comes not from seasoned equity offerings, but from employee stock option plans, which eventually become unrestricted publicly traded shares.

Money flows into the financial markets through IPOs and SEOs.

Because IPOs face complex legal regulation, an alternative of **reverse mergers** has recently become prominent. In a reverse merger, a large privately owned company that wants to go public merges with a small company that is already publicly traded. The owners of the big company receive newly issued shares in the combined entity. And, of course, any time a publicly traded company purchases assets, such as privately held companies, and issues more shares, capital is in effect being deployed from the private sector into the public markets.

A reverse merger has become another way to enter the public financial markets.

In 1933/1934, Congress established the **U.S. Securities and Exchange Commission** (SEC) through the *Securities Exchange Acts*. It further regulated investment advisors through the *Investment Advisers Act of 1940*. (The details of these acts can be obtained at the SEC website.) Aside from regulating the IPO process, they also prescribe what publicly traded corporations must do. For example, publicly traded companies must regularly report their financials and other information to the SEC, and their executives have **fiduciary obligations** to their shareholders. Moreover, these acts prohibit **insider trading** on unreleased specific information, although more general trading by insiders is legal (and seems to be done fairly profitably). The SEC cannot pursue criminal charges. It can only pursue civil fines, although it can do so in cases that have criminal repercussions, too.

Publicly traded companies must report financials, and restrict insider trading.

Anecdote: Trading Volume in the Tech Bubble

During the tech bubble of 1999 and 2000, IPO's appreciated by 65% on their opening day *on average*. Getting an IPO share allocation was like getting free money. Of course, ordinary investors rarely received any such share allocations—only the underwriter's favorite clients did. This later sparked a number of lawsuits, one of which revealed that **Credit Suisse First Boston** (**CSFB**) allocated shares of IPOs to more than 100 customers who, in return for IPO allocations, funneled between 33 and 65 percent of their IPO profits back to CSFB in the form of excessive trading of other stocks (like Compaq and Disney) at inflated trading commissions.
How important was this "kickback" activity? In the aggregate, in 1999 and 2000, underwriters left about $66 billion on the table for their first-day IPO buyers. If investors rebated 20 percent back to underwriters in the form of extra commissions, this would amount to $13 billion in excessive underwriter profits. At an average commission of 10 cents per share, this would require 130 billion shares traded, or an average of 250 million shares per trading day. This figure suggests that kickback portfolio churning may have accounted for as much as 10 percent of all shares traded!
Source: Ritter-Welch (2002).

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Outflows

Money flows out from the financial markets in dividends and share repurchases.

Capital flows out of the financial markets in a number of ways. The most important venues are capital distributions such as dividends and share repurchases. Many companies pay some of their earnings in **dividends** to investors. Dividends, of course, do not fall like manna from heaven. For example, a firm worth $100,000 may pay $1,000, and would therefore be worth $99,000 after the dividend distribution. If you own a share of $100, you would own (roughly) $99 in stock and $1 in dividends after the payment—still $100 in total, no better or worse. (If you have to pay some taxes on dividend receipts, you might come out for the worse.) Alternatively, firms may reduce their outstanding shares by paying out earnings in **share repurchases**. For example, the firm may dedicate the $1,000 to share repurchases, and you could ask the firm to dedicate $100 thereof to repurchasing your share. But even if you hold onto your share, you have not lost anything. Previously, you owned $\$100/\$100,000 = 0.1\%$ of a $100,000 company, for a net of $100. Now, you will own $\$100/\$99,000 = 1.0101\%$ of a $99,000 company—multiply this to find that your share is still worth $100. In either case, the value of outstanding public equity in the firm has shrunk from $100,000 to $99,000. To learn more about dividends and share repurchases, you should read a corporate finance text.

Shares can also shrink out of the financial markets in bankruptcies, liquidations, and delistings.

Firms can also exit the public financial markets entirely by delisting. Delistings usually occur either when a firm is purchased by another firm, or when it runs into financial difficulties so bad that they fail to meet minimum listing requirements. Often, such financial difficulties lead to bankruptcy or liquidation. Some firms even voluntarily liquidate, determining that they can pay their shareholders more if they sell their assets and return the money to them. This is rare, because managers usually like to keep their jobs—even if continuation of the company is not in the interest of shareholders. More commonly, firms make bad investments, and fall in value to the point where they are delisted from the exchange and/or go into bankruptcy. Fortunately, investors enjoy **limited liability**, which means that they can at most lose their investments and do not have to pay further for any sins of management.

Solve Now!

Q 8.1 What are the two main functions of brokerage firms?

Q 8.2 How does a prime broker differ from a retail broker?

Q 8.3 What is a specialist? What is a market-maker? When trading, what advantage do the two have over you?

Q 8.4 Describe some alternatives to trading on the main stock exchanges.

Q 8.5 What are the institutional mechanisms by which more shares appear and disappear in the public financial markets.

8·2 Equities Transaction Costs

8·2.A. Going Long

The costs of buying shares depend on the stock, but typically are less than 0.5 percent (round-trip) for a large firm's stock.

The process of buying stocks is familiar to almost everyone: you call up your broker to purchase 100 shares of a stock (say PepsiCo) with cash sitting in your account, and the shares appear in your account and the cash disappears from your account. When you want to sell your shares, you call your broker again to sell the shares and the appropriate value of the shares returns as cash into your account. There are some transaction costs in the process: the broker collects a commission (typically ranging from about $8 at a discount broker to $100 at a full-service broker); and you are most likely to buy your shares at the **ask price**, which is higher than the **bid price**, at which you can sell the shares. For a stock like PepsiCo, trading around $50, the "bid-ask spread" may be 10 to 20 cents or about 0.2 percent. Buying and then immediately selling 1,000 shares of PepsiCo ($50,000), a **round-trip transaction**, might cost you **transaction costs** of around $100 to $200 (lost to the bid-ask spread) plus $16 to $200 (lost to your broker). Your $50,000 would have turned into about $49,600 to $49,900.

8·2.B. Going Short: The Academic Fiction

Idealized shorting, as used in academia, gives shortsellers interest on the stock that is being sold.

But, what if you want to speculate that a stock will be going down rather than up? This is called **shorting** a stock. (In optional Section b, we have already discussed shorting in the context of Treasury securities and apples.) Optimally, you would want to do the same thing that the PepsiCo company does: give other investors who want to buy shares in PEP the exact same payoffs (including dividends!) that PEP will provide in exchange for them giving you $50. If the share price declines to $30, upon termination of the short, you would have received their $50 up front and only repaid them $30—you would have earned $20. In addition, you could have earned interest on the $50. This is the idealized world of theoretical finance and of this book, in which borrowing and lending can be done without friction. The upper half of Table 8.1 shows such an example of a particular portfolio that involves idealized, frictionless shorting.

8·2.C. Going Short: The Real World

Real-world shorting requires more than just offering the same cash flows as the stock

In the real world, shorting is not so easy. First, there are rules and regulations that the SEC imposes on short-selling that you have to follow. Second, you need to credibly guarantee that you can give the share purchaser all the cash flows that PepsiCo shares offer. (What have you committed to if the share price triples? Remember that you have unlimited liability as a short!) Third, a real investor in PepsiCo also receives the accounting statements of PepsiCo in the mail and can vote at the annual meetings. How do you offer this service? The answer is that you need to find an investor who already owns the shares and who is willing to lend them to you, so that you can sell the shares—real physical shares—to someone on the exchange. You then owe shares to this lending investor, rather than to the person buying the shares on the exchange.

DIG DEEPER

The most important SEC regulation concerning shorting is that the broker must borrow the shares from a willing owner and then resell them to a third party. It is not enough for another investor to be willing to take the other side of the short trade: instead, the shares have to be actually physically found from an investor holding them. For some smaller stocks, it can occasionally be difficult to find someone willing to lend the shares, which can make shorting difficult or impossible. In addition, there is a second SEC rule that states that shares can only be shorted on an up-tick. The intent is to reduce further short-selling during a stock market crash, when up-ticks are rare.

Real-world shorting loses the use of (some) proceeds. This is a "friction."

All of the details necessary to execute a short can be arranged by your broker. Unlike buying shares long, execution of a short is often not instantaneous. But more importantly, the broker's service comes at a price. The broker usually does not return to you the $100 paid by the person buying the shares, so that you can invest the proceeds in bonds. That is, if the stock price declines to $90, you still made $10, but the interest on the $100 is earned by your broker, not by you. In addition, as with a purchase of shares, the broker earns commissions and the bid-ask spread goes against you. The lower panel in Table 8.1 contrasts the idealized version of shorting (used in this book) to the grittier real-world version of shorting.

Large fund investors can short at more favorable rates than ordinary investors.

Large clients can usually negotiate to receive at least some of the interest earned on the $100, at least for large, liquid stocks. Hypothetically, if such a large investor were both short one share of a firm and long one share of the same firm, she would lose about 100 to 300 basis points per year. On a $100 share, the cost of being long one share and being short one share would typically be $1 to $3 per share per year. This money is shared between the brokerage firm and the investor willing to loan out shares to you for shorting (so that you can sell them to someone else). Nowadays in the real-world, large stock index funds earn most of their profits through lending out shares to shortsellers.

Our theories will assume that shorting is possible—a model simplification that is often but not always acceptable.

Shorting is not ideal in the real world—but it is a whole lot more ideal in financial markets than in non-financial markets. Consider the large long exposure risk that a house purchaser suffers. If the house value drops by 20%, the owner could easily lose more than all his equity stake in the house. To hedge against drops in the value of the house, it would make sense for this purchaser to go short on equivalent housing in the same neighborhood. This way, if real estate prices were to go down, the short position in the neighborhood would mitigate the own-house loss. For all practical purposes, this is unfortunately impossible. (I have myself failed to figure out how to do this.) In effect, the costs of shorting can be almost infinitely high. When you use the

situation in real estate as your benchmark, it indeed seems reasonable to assume no transaction costs to shorting equities, after all, at least for our academic purposes.

Solve Now!

Q 8.6 What are the main differences between academic, theoretical, perfect shorting and real-world, practical shorting?

Q 8.7 If you simultaneously buy and short $5,000 of IBM at the beginning of the year, and you terminate these two positions at the end of the year, how much would it cost you in the real world?

Q 8.8 Assume you believe that stock in KO will go up by 12% and stock in PEP will go up by 15% over the next year. The current risk-free interest rate is 2% per year. You have $300,000 to invest, and your broker allows you to go short up to $100,000.

(a) How much could you go long in PEP?

(b) If your forecast comes true, how much money would you earn in a fictional world? What would your rate of return be?

(c) If your forecast comes true, how much money would you earn in the real world?

Anecdote: Eternal Shorts?

The short must make good on all promises that the underlying firms make. There are some rare instances in which this can cause unexpected problems. For example, when Heartland Industrial Partners acquired Mascotech for about $2 billion in 2000, the latter promised to dispose of some non-operating assets and distribute the proceeds to the original shareholders. As of 2005, that has not yet happened. Anyone having written a short on Mascotech—including myself—still has an escrowed obligation as of 2005 that cannot be closed out.

Table 8.1: Shorting in an Idealized and in the Real World

Idealized Shorting Example

Your Wealth: \$200.

You can sell \$100 worth of KO shares (or an equivalent promise) to another investor, who wants to hold KO shares. This gives you \$200 + \$100 = \$300 of cash, which you can invest into Pepsico.

Portfolio P: $w_{KO} = -\$100,\ w_{PEP} = \$300, \quad \Longrightarrow w_{KO} = -50\%,\ w_{PEP} = 150\%.$

Hypothetical Rates of Return: KO $= -10\%$, PEP $= +15\%$.

$\Longrightarrow$ Portfolio Rate of Return: $r_P = -50\% \cdot (-10\%) + 150\% \cdot (+15\%) = +27.5\%.$

\$100 KO shares borrowed became a liability of \$90, for a gain of \$10;
\$300 PEP shares invested became an asset of \$345, for a gain of \$45.

$\Longrightarrow$ Your net portfolio gain is \$55 on an original investment of assets worth \$200, which comes to a +27.5% rate of return.

Real World Retail Investor Shorting Example

Your Wealth: \$200.

The broker finds another investor to borrow shares from and sells the shares (on your behalf) for \$100 to another investor, who wants to hold KO shares. The broker keeps \$100, because in our example, the retail investor is assumed to receive absolutely no shorting proceeds. (Institutional investors can typically receive some, but not all of the shorting proceeds.) You still have \$200 in cash (\$100 less than in the idealized case), which you can invest into Pepsico.

Portfolio P: $w_{KO} = -\$100,\ w_{PEP} = \$200, \quad \Longrightarrow w_{KO} = -50\%,\ w_{PEP} = 100\%.$

Hypothetical Rates of Return: KO $= -10\%$, PEP $= +15\%$.

$\Longrightarrow$ Portfolio Rate of Return: $r_P = -50\% \cdot (-10\%) + 100\% \cdot (+15\%) = +20.0\%.$

\$100 KO shares borrowed became a liability of \$90, for a gain of \$10;
\$200 PEP shares invested became an asset of \$230, for a gain of \$30.

$\Longrightarrow$ The net portfolio gain is \$40 on an original investment of assets worth \$200, which comes to a +20% rate of return.

Both examples ignore trading costs incurred in buying and selling securities.

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8·3 Portfolios and Indexes

8·3.A. Portfolio Returns

What exactly is a portfolio? Is it a set of returns? No. The portfolio is a set of investment weights. When these weights are multiplied by their asset returns, you obtain your overall portfolio return.

IMPORTANT: A **portfolio** is a set of investment weights.

Overall portfolio returns are the investment-weighted average returns of its constituents.

You would usually own not just one security but form a portfolio consisting of many holdings. Your ultimate goal—and the subject of the area of investments—is to select good portfolios with high rates of return. But how do you compute your portfolio rate of return? For example, say you hold \$500 in PEP, \$300 in KO, and \$200 in CSG. Your total investment is \$1,000, and your portfolio investment weights are 50% in PEP, 30% in KO, and 20% in CSG. If the rate of return on PEP is 5%, the rate of return on KO is 2%, and the rate of return on CSG is -4%, then the rate of return on your overall portfolio (P) is

$$\begin{aligned} \tilde{r}_P &= \left(\frac{\$500}{\$1,000}\right)\cdot(+5\%) + \left(\frac{\$300}{\$1,000}\right)\cdot(+2\%) + \left(\frac{\$200}{\$1,000}\right)\cdot(-4\%) \\ &\quad (50\%)\cdot(+5\%) + (30\%)\cdot(+2\%) + (20\%)\cdot(-4\%) = +2.3\% \\ &= w_{PEP}\cdot r_{PEP} + w_{KO}\cdot r_{KO} + w_{CSG}\cdot r_{CSG} \end{aligned}$$

When you own multiple assets, your overall investment rate of return is the investment-weighted rate of return on each investment, with the weights being the relative investment proportions. Let us check this. A \$500 investment in PEP at a 5% rate of return gave \$25. A \$300 investment in KO at a 2% rate of return gave \$6. A \$200 investment in CSG at a -4% rate of return gave -\$8. The net dollar return on the \$1,000 was therefore \$25 + \$6 − \$8 = \$23. The portfolio P rate of return was $(r_{P,t=1} - r_{P,t=0})/r_{P,t=0} = \$23/\$1,000 - 1 = 2.3\%$. This also clarifies that the portfolio formula also works with absolute dollar investments instead of relative percentage investments:

$$\begin{aligned} r_P &= (\$500)\cdot(+5\%) + (\$300)\cdot(+2\%) + (\$200)\cdot(-4\%) = +\$23 \\ &= w_{PEP}\cdot r_{PEP} + w_{KO}\cdot r_{KO} + w_{CSG}\cdot r_{CSG} \end{aligned}$$

SIDE NOTE

When a security has additional payouts (such as dividends) over the measurement period, its rate of return should really be written as

$$r_{t-1,t} = \frac{(P_t + \text{Dividends}_{t-1,t}) - P_{t-1}}{P_{t-1}}$$

Alternatively, you could quote a net price at the end of the period, which includes dividends. Our discussions will mostly just ignore dividends and stock splits. That is, when I write about returns, I usually mean rates of returns that take into account all payments to the investor, but I sometimes abbreviate this as $(P_t - P_{t-1})/P_{t-1}$ for convenience.

Notation: number investments. A portfolio is a set of known weights.

The goal of the subject of investments is to evaluate all possible investment choices in order to determine the best portfolio. We need to come up with good notation that does not make discussing this task too cumbersome. Let us use R and r as our designated letters for "rate of return." But with thousands of possible investment choices, it is rather inconvenient to work with ticker symbols (or even full stock names). It would also be tedious to write "average the returns over all possible stocks (ticker symbols) and other securities" and the name them all. Therefore, we often change the names of our securities to the numbers $1, 2, 3, \ldots, N$. We also usually use the letter P to name a portfolio (or, if we work with multiple portfolios, with a capital

letter close by, such as Q or O). We call the investment weight in security i by the moniker w_i, where i is a number between 1 and N. Finally, we rely on "summation notation": $\sum_{i=1}^{N} f(i)$ is the algebraic way of stating that we compute the sum $f(1) + f(2) + ...f(N)$. For example, $\sum_{i=2}^{4} \sqrt{i}$ is notation for $\sqrt{2} + \sqrt{3} + \sqrt{4} \approx 5.15$. (Appendix Chapter 2·2 reviews summations.) Yes, notation is a pain, but with the notation we have, we can now write the rate of return on a portfolio much more easily:

IMPORTANT: The rate of return R on a portfolio P that consists of N securities named 1 through N is

$$r_P = \sum_{i=1}^{N} w_i \cdot r_i = w_1 \cdot r_1 + w_2 \cdot r_2 + \cdots + w_N \cdot r_N \tag{8.1}$$

where w_i is the investment weight in the i-th security (from N choices). If weights are quoted as a fraction of the overall investment portfolio, their sum must add up to 100%,

$$\sum_{i=1}^{N} w_i = 100\%$$

Notation: Abbreviations

OK, we are cheating a little on notation: each rate of return R should really have three subscripts: one to name the financial security (e.g., PEP or i or 4), one for the beginning of the period (e.g., t), and one for the end of the period (e.g., $t + 1$)—too many for my taste. When there is no danger of confusion—or the formula works no matter what periods we choose (as long as we choose the same period for all securities)—let us omit the time subscripts.

8·3.B. Funds and Net Holdings

Funds are themselves portfolios of other financial assets.

One can think of portfolios, consisting of stocks, the same ways as one can think of stocks themselves. Indeed, **funds** are firms which hold underlying stocks or other financial assets and are thus themselves de facto portfolio—and funds can be bought and sold just like any other stocks. Investors often like buying shares in funds because they believe that a professional manager can pick securities better than they can, plus funds in effect allow individual investors to purchase thousands of stocks, even if they only have a small amount of money to invest. Depending on their legal arrangements, funds may be called **exchange-traded funds** (bought and sold on a financial market), **mutual funds** (bought and sold by the general public, but not on an exchange), or **hedge funds** (not marketed to the broad public, and therefore not subject to SEC restrictions). Many mutual funds have prices that are listed daily in the *Wall Street Journal*. Like exchange funds, they can be purchased easily through most stock brokers. An **ADR** (**American Depositary Receipt**) is another common form of fund. It is a relatively easy way by which a large foreign company can trade shares on the New York Stock Exchange. Its domestic shares are put into an escrow, and the U.S. exchange trades the ADR. An ADR really operates like an open-end fund which holds shares only in this one company.

Anecdote: More funds or more stocks?

In 1999, U.S. equity funds managed roughly 3 trillion dollars of assets, or about one-third of U.S. stock market capitalization. More surprisingly, there were more U.S. equity funds than there were U.S. stocks: In 1999, there were 8,435 equities, but 11,882 equity funds. Source: Harry Mamaysky and Matthew Spiegel.

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Open-ended vs. closed-ended Mutual Funds.

Mutual funds come in two main forms. **Open-ended** funds allow any investor to exchange the fund shares for the underlying assets in the appropriate proportion. For example, if a fund has sold 50 shares, and used the money to purchase 200 shares of PepsiCo and 300 shares of Coca Cola, then each mutual fund share represents 4 PepsiCo shares and 6 Coca Cola shares. The mutual fund share holder can, at her will, exchange her fund share into 4 PepsiCo and 6 Coca Cola shares. This forces an **arbitrage** link between the price of the fund and the value of its assets: if the price of the fund drops too much relative to the underlying assets, then investors will redeem their mutual fund shares. In a **closed-end** mutual fund, redemption is not permitted. If the underlying fund assets are very illiquid (e.g., real-estate in emerging countries), an open-ended like redemption request would be very expensive or even impossible to satisfy. Closed-end funds often trade for substantially less than their underlying assets, and for significant periods of time. Among the explanations for this **closed end fund discount** are the significant fees collected by the fund managers. At the end of 2002, there were about 7,000 open-end mutual funds with $4 trillion in assets. There were only about 500 closed-end mutual funds with about $150 billion in assets, and another 4,500 hedge funds with assets of about $350 billion (most hedge funds are closed-end). Thus, open-ended funds controlled about ten times more money than closed-ended funds.

How to compute net underlying holdings.

Most mutual funds disclose their holdings on a quarterly basis to the SEC (semi-annual is mandatory), which makes it easy for investors to compute their net exposures (at least on the reporting day). For example, assume that Fund FA holds $500,000 of PepsiCo and $1,500,000 of Coca Cola. Assume that Fund FBholds $300,000 of Coca Cola and $700,000 of Cadbury Schweppes. What is your net portfolio if you put 60% of your wealth into Fund FA and 40% of into Fund FB? The funds have holdings of

$$\text{Fund FA Holdings: } w_{\text{FA,PEP}} = 0.25 \text{ , } w_{\text{FA,KO}} = 0.75 \text{ , } w_{\text{FA,CSG}} = 0$$

$$\text{Fund FB Holdings: } w_{\text{FB,PEP}} = 0 \text{ , } w_{\text{FB,KO}} = 0.30 \text{ , } w_{\text{FB,CSG}} = 0.70$$

You can compute your net exposures by computing the sum of your holdings multiplied by the fund holdings:

$$w_{\text{PEP}} = 60\% \cdot 0.25 + 40\% \cdot 0.00 = 15\%$$

$$w_{\text{KO}} = 60\% \cdot 0.75 + 40\% \cdot 0.30 = 57\%$$

$$w_{\text{CSG}} = 60\% \cdot 0.00 + 40\% \cdot 0.70 = 28\%$$

$$w_{\text{i}} = w_{\text{FA}} \cdot w_{\text{FA},i} + w_{\text{FB}} \cdot w_{\text{FB},i}$$

which adds up to 100%. For example, for a $2,000 investment, you own $300 of shares in PepsiCo, $1,140 of shares in Coca Cola, and $570 of shares in Cadbury Schweppes. In sum, you can think of funds and portfolios the same way you think of stocks: they are investment opportunities representing combinations of assets. You can always compute the underlying

stock holdings represented by the funds. In fact, if you wish, you could even see ordinary firms as portfolios bundling underlying assets for you.

8·3.C. Some Common Indexes

Although an Index is a weighted average of stock prices, it is just a number, not a portfolio.

An index is almost like a fund or portfolio, but it is not something that one can invest in *because an index is just a number*. (There are, however, funds that try to mimic the behavior of indexes.) Most commonly, an index is the figure obtained by computing a weighted sum of the prices of a predetermined basket of securities. It is intended to summarize the performance of a particular market or market segment. For example, the **Dow-Jones 30** index is a weighted average of the prices of 30 pre-selected "big" stocks. (Table b below lists them.) If you purchase a portfolio holding the same 30 stocks (or a fund holding the 30 stocks), your investment rate of return should be fairly close to the percentage change in the index—except for one difference. When stocks pay dividends, their stock prices decline by just about the amounts of dividends paid. (If they dropped less on average, you should purchase the stocks, collect the dividends, and then resell them for a profit. If they dropped more, you should short the stocks, pay the dividends, and then cover your shorts for a profit.) Your portfolio mimicking the Dow-Jones 30 should earn these dividends, even though the index would decline by the percent paid out in dividends. Therefore, in theory, you should be able to easily outperform an index. Unfortunately, in the real world, most portfolio managers fail to do so, primarily because of transaction costs and excessive trading.

↦ *Table b on Page 235*

Some more detail: plain indexes vs. total return indexes.

Most indexes, including the S&P500 and the Dow-Jones 30, are not adjusted for dividends, although they are adjusted for **stock splits**. In a 3:1 stock split, a firm trading at $120 per old share would henceforth trade at $40 per new share. Each investor who held one old share would receive three new shares. The "guardians of the index" would adjust the index formulas by tripling the weight on the stock that split. In contrast to plain price indexes, there are also **total return indexes**. For example, the guardians of the formula for the German **Dax Performance Index** change the formula to reflect the return that a portfolio of Dax stocks would earn through dividends.

There are more indexes than one can count, and new ones get invented all the time.

There are literally hundreds of indexes, created and published by hundreds of companies. The **Money&Investing** Section of the *Wall Street Journal* lists just a sampling. In the United States, the most prominent stock market indexes are the **S&P 500** (holding 500 large stocks), the aforementioned **Dow-Jones 30** (holding 30 big stocks, selected to cover different industries), and the **Nasdaq** index (holding the largest Nasdaq companies). The **Russell 2000** covers 2,000 small-firm stocks. There are also other asset class indexes. For example, **Lehman Brothers** publishes the **MBS** (Mortgage Bond Securities) index; **Dow Jones** also publishes a corporate bond index; and **Morgan Stanley** publishes a whole slew of country stock prices indexes (**MSCI EAFE**). Furthermore, each country with a stock market has its own domestic index. Some foreign stock market indexes are familiar even to casual investors: the **Financial Times Stock Exchange**

Anecdote: The Worst of all Worlds: High Losses plus High Taxes

To prevent tax arbitrage—which are basically transactions that create fake losses to reduce taxable income—the IRS has instituted special tax rules for mutual funds. The precise treatment of the taxes is complex and beyond the scope of this book, but the most important aspect is simple: investors must absorb the underlying capital gains/losses and dividend payments received by the funds, as if they themselves had traded the underlying shares themselves.

In the second half of 2000, many mutual funds had lost significant amounts of money in the collapse of the technology bubble. Although their values had declined (and with them, the wealth of their clients), the funds had generally not yet realized these capital losses. But they had realized capital gains earlier in the year. The IRS requires these realized losses to be declared by fund investors as "pass-through" capital gains, which were therefore taxed. Thus, in 2000, many unlucky investors experienced high losses and still had to pay high taxes.

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Index, spelled **FTSE** and pronounced "foot-sy" for Great Britain; the **Nikkei**-225 Index for Japan; and the **DAX** index for Germany.

8·3.D. Equal-Weighted and Value-Weighted Portfolios

An example of an equal-weighted and a value-weighted portfolio.

Two kinds of portfolios deserve special attention, the equal-weighted and the value-weighted market portfolio. To see the difference between the two, assume that there are only three securities in the market. The first is worth $100 million, the second $300 million, and the third $600 million. An **equal-weighted** portfolio purchases an equal amount in each security. For example, if you had $30 million, you would invest $10 million into each security. Does it take trading to maintain an equal-weighted portfolio? Table 8.2 shows what happens when one stock's price changes: security $i = 1$ quadruples in value. If you do not trade, your portfolio holdings would be too much in security 1 relative to securities 2 and 3. To maintain an equal-weighted portfolio, you would have to rebalance. In the example, you would have to trade $40 worth of stock.

Table 8.2: Maintaining an Equal-Weighted Portfolio

	Time 0			Time 1			
Security i	Market Value	Investor Pfio	Rate of Return	Market Value	Investor, No Trade	Investor, Desired	Necessary Trading
1	$100	$10	+300%	$400	$40	$20	−$20
2	$300	$10	0%	$300	$10	$20	+$10
3	$600	$10	0%	$600	$10	$20	+$10
Sum	$1,000	$30		$1,300	$60	$40	$0

Table 8.3: Maintaining a Value-Weighted Portfolio

	Time 0			Time 1			
Security i	Market Value	Investor Pfio	Rate of Return	Market Value	Investor, No Trade	Investor, Desired	Necessary Trading
1	$100 (10%)	$3	+300%	$400 (31%)	$12	$12	$0
2	$300 (30%)	$9	0%	$300 (23%)	$9	$9	$0
3	$600 (60%)	$18	0%	$600 (46%)	$18	$18	$0
Total	$1,000 (100%)	$30		$1,300 (100%)	$39	$39	$0

Anecdote: The Presidential Election Market

The University of Iowa runs the Iowa Electronic Market, which are indexes measuring the likelihood for each presidential candidate to win the next presidential election. You can actually trade futures based on these indexes. This market tends to be a better forecaster of who the next president will be than the press.

A **value-weighted** portfolio purchases an amount proportional to the availability of each security. In the example, with $30 million, a portfolio that invests $3 million in the first security (weight: $2/$20 = 10%), $9 million in the second security (weight: 30%), and $18 million in the third security (weight: 60%) is value-weighted. How difficult is it to maintain this value-weighted portfolio? In Table 8.3, the first security has again quadrupled in value, increasing in market capitalization to $400 million. Without trading, your previously value-weighted portfolio has increased its holdings in this security from $3 million to $12 million. The portfolio weight in the first security would therefore have increased to $12/$39 ≈ 31%, the second security would have dropped to $9/$39 ≈ 23%, and the third security would have dropped to $18/$39 ≈ 46%. But these are exactly the weights that a value weighted portfolio of $39 million, if initiated at time 1, would require! The portfolio weights require no adjustment because any changes in the market values of securities are reflected both in the overall market capitalizations and the weight of the securities in your portfolio. In contrast to the earlier equal-weighted portfolio, a value-weighted portfolio requires no trading. (The only exception are securities that enter and exit the market altogether.) Even though it may be easier at the beginning to select an equal-weighted portfolio (you do not need to know how much of each security is available), over time, it is easier to maintain a value-weighted portfolio.

Value-weighted portfolios are easier to maintain.

IMPORTANT: To maintain an equal-weighted portfolio, continuous rebalancing is necessary. To maintain a value-weighted portfolio, no rebalancing is usually necessary.

There is a second important feature of value-weighted portfolios: it is possible for everyone in the economy to hold a value-weighted portfolio, but not possible for everyone in the economy to hold an equal-weighted portfolio. Return to the example with $1 billion in overall market capitalization and only two investors: the first has $100 million in wealth, the second has $900 million in wealth. Equal-weighted portfolios would have the first investor allocate $33 million to the first security and have the second investor allocate $300 million to the first security. In sum, they would want to purchase $333 million in the first security—but there is only $100 million worth of the first security to go around. The pie is just not big enough. In contrast, holding value-weighted portfolios, both investors could be fully satisfied with their slices. In the example, for the first security, the first investor would allocate $10 million, the second investor would allocate $90 million, and the sum-total would equal the $100 million available in the economy.

It is possible for everyone in the economy to hold a value-weighted portfolio, but not an equal-weighted portfolio.

IMPORTANT: It is possible for all investors in the economy to hold value-weighted portfolios. It is impossible for all investors in the economy to hold equal-weighted portfolios.

Three more points: First, over time, if you do not trade, even a non-value weighted portfolio becomes more and more value-weighted. The reason is that stocks that increase in market value turn into larger and larger fractions of your portfolio, and stocks that decline in market value turn into smaller and smaller fractions. Eventually, the largest firms in the economy will be the biggest component of your portfolio. Second, the most popular and important stock market indexes are more like value-weighted portfolios than equal-weighted portfolios. For example, the S&P500 index behaves much more like the value-weighted than like the equal-weighted market index. Third, over short time frames (say a month or even a year), broad stock market indexes within a country tend to be very highly correlated (say, above 95%), no matter whether they are equal-weighted, value-weighted, or arbitrary (e.g., the Dow-Jones 30 or the S&P500). Therefore, if the newspaper reports the return of the S&P500 yesterday, it is a pretty good estimator either for the return of broader portfolios (like a value-weighted overall stock market portfolio) or for the return of narrower portfolios (like the Dow-Jones 30). It is rare that one goes up dramatically, while the other goes down, and vice-versa.

Time Convergence?

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Solve Now!

Q 8.9 An investor's portfolio P consists of 40% of stock A and 60% of stock B. A has a rate of return of +4%, B has a rate of return of +6%. What is the overall portfolio rate of return?

Q 8.10 An investor owns \$40 in stock A and \$60 in stock B. A has a return of \$1.60, B has a return of +\$3.60. What is the overall portfolio return?

Q 8.11 An investor owns \$40 in stock A and \$60 in stock B. The first stock has a return of +4%, the second has a return of +6%. What is the overall portfolio rate of return?

Q 8.12 Write down the formula for the return of a portfolio, given individual security returns and their weights. First use summation notation, then write it out.

Q 8.13 A portfolio consists of \$200 invested in PEP, and \$600 invested in CSG. If the stock price per share on PEP increased from \$30 to \$33, and the stock price per share in CSG declined from \$40 to \$38 but CSG paid a dividend of \$1 per share, then what was the portfolio's return and rate of return?

Q 8.14 Fund FA holds \$100,000 of PEP and \$600,000 of KO, and \$300,000 of CSG. Fund FBholds \$5,000,000 of PEP, \$1,000,000 of KO, and \$4,000,000 of CSG. You have \$500 to invest. Can you go long and short in the two funds to neutralize your exposure to PEP? (This means having a net zero exposure to PEP.) How much of each fund would you purchase? What are your de facto holdings of KO and CSG?

Q 8.15 What is $\sum_{j=1}^{5} j^2$?

Q 8.16 What is $\sum_{i=1}^{5} 2 \cdot i$?

Q 8.17 What is $\sum_{j=1}^{5} (j-5)$?

Q 8.18 What is the difference between a hedge fund and a mutual fund?

Q 8.19 What is the difference between an open-ended mutual fund and a closed-ended mutual fund?

Q 8.20 You hold two funds. Fund FA has holdings in stocks 1, 2, and 3 of 0.15, 0.5, and 0.35, respectively. Fund FBhas holdings in stocks 1, 2, and 3, of 0.4, 0.2, and 0.4, respectively. You would like to have a portfolio that has a net investment weight of 30% on the first stock. If you have decided only to hold funds and not individual stocks, what would your exposure be on stocks 2 and 3?

Q 8.21 What is the difference between an index and a mutual fund?

Q 8.22 List a few prominent financial indexes.

Q 8.23 How does an index differ from a portfolio?

Q 8.24 Compute the value-weighted dollar investments of the two investors (with wealths \$100 million and \$900 million, respectively) for the second and third securities in the example on Page 181.

Q 8.25 Continuing with this example, what would be the dollar investments and relative investments if the first security were to double in value? Does this portfolio require rebalancing to remain value-weighted?

Q 8.26 There are two stocks: stock 1 has a market capitalization of \$100 million, stock 2 has a market capitalization of \$300 million.

(a) What are the investment weights of the equal-weighted portfolio?

(b) What are the investment weights of the value-weighted portfolio?

(c) There are 5 equally wealthy investors in this economy. How much of stock 1 would they demand if they all held the equal-weighted portfolio? If they held the value weighted portfolio?

(d) If the first stock appreciates by 10% and the second stock depreciates by 30%, how much trading would such an investor have to do to continue holding an equal-weighted portfolio?

(e) Repeat the previous question with a value-weighted portfolio.

Q 8.27 To maintain an equal-weighted portfolio, do you have to sell recent winner stocks or recent loser stocks? (Is this a bad or a good idea?)

Q 8.28 How different would the one-month performance of an investment in an S&P500 mimicking portfolio be, relative to the performance of the value-weighted market portfolio?

8·3.E. Quo Vadis? Random Returns on Portfolios

A Road map.

Most of your attention in the next few chapters will be devoted to the case where returns are not yet known: they are still "random variables," denoted with a tilde above the unknown quantity (e.g., $\tilde{r}$). The goal of investments is to select a portfolio P (that is, a set of N investment weights, $w_1, w_2, \ldots, w_N$) which offers the highest likely future performance with the least risk. Using both the tilde and our portfolio sum formula, we can write the uncertain future rate of return to our portfolio as

$$\tilde{r}_P = \sum_{i=1}^{N} w_i \cdot \tilde{r}_i = w_1 \cdot \tilde{r}_1 + w_2 \cdot \tilde{r}_2 + \cdots + w_N \cdot \tilde{r}_N$$

We now need to find

1. a good measure for the reward (likely performance) of a portfolio;
2. and a good measure for the risk of a portfolio.

For this, you shall need statistics, the subject of the next chapter.

8·4 Summary

The chapter covered the following major points:

- Securities appear through initial public offerings (IPOs) on exchanges, and disappear through delistings.
- A round-trip transaction is one purchase and one sale of the same security. In the real world, trades incur both brokerage fees and the bid-ask spread. In addition, going short (selling without owning) incurs one extra cost—lack of full use of (interest earnings from) the short-sale proceeds.
- Portfolio returns are a weighted average of individual returns.
- Fund holdings can be deconstructed into individual underlying stock exposures.
- An index is usually computed as the weighted averages of its component price figures. The index is therefore just a number. In contrast, funds and portfolios are collections of underlying assets, the value of which are similarly computed as the weighted average of the underlying component values. Index funds attempt to mimic index percent changes by purchasing stocks similar to those used in the computation of the index.
- Maintaining an equal-weighted index requires constant rebalancing. Maintaining a value-weighted index requires no trading.
- Unlike other portfolios, the value-weighted market portfolio can be owned by each and every investor in equilibrium.

[No keyterm list for secpfios-g.]

End of Chapter Problems

Q 8.29 Explain the differences between a market order and a limit order.

Q 8.30 What extra functions do retail brokers handle that prime brokers do not?

Q 8.31 Describe the differences between the NYSE and Nasdaq.

Q 8.32 Roughly, how many firms are listed on the NYSE? How many are listed on Nasdaq? Then use the WWW to find an estimate of the current number.

Q 8.33 What is the OTC market? Who owns it?

Q 8.34 What are the three main types of investment companies? Which is the best deal in a perfect market?

Q 8.35 What are the two main mechanisms by which a privately held company can go public?

Q 8.36 When and under what circumstance was the SEC founded?

Q 8.37 Insider trading is a criminal offense. Does the SEC prosecute these charges?

Q 8.38 If a firm repurchases 1% of its shares, does this change the capitalization of the stock market on which it lists? If a firm pays 1% of its value in dividends, does this change the capitalization of the stock market on which it lists?

28 "Solve Now" Answers

1. Brokers execute orders and keep track of investors' portfolios. They also arrange for margin.
2. Prime brokers are usually used by larger investors. Prime brokers allow investors to employ their own traders to execute trades. (Like retail brokers, prime brokers provide portfolio accounting, margin, and securities borrowing.)
3. The specialist is often a monopolist who makes the market on the NYSE. The specialist buys and sells from his own inventory of a stock, thereby "making a market." Market-makers are the equivalent on Nasdaq, but there are usually many and they compete with one another. Unlike ordinary investors, both specialists and market-makers can see the limit orders placed by other investors.
4. The alternatives are often electronic, and often rely on matching trades—thus, they may not execute trades that they cannot match. Electronic Communication Networks are the dominant example of these. Another alternative is to execute the trade in the Over-The-Counter (OTC) market, which is a network of geographically dispersed dealers who are making markets in various securities.
5. Shares on an exchange can appear via an IPO or an SEO. Shares can disappear in a delisting or a repurchase.
6. For academic shorting, you just promise the same cash that the shares themselves are paying. For real-world shorting, you ask your broker to find a holder of the shares, borrow them (i.e., and promise him the same payoffs), and then sell them to someone else. Most importantly, the broker who arranges this will not give you the cash obtained from selling the borrowed shares—that is, the broker will earn the interest on the cash, rather than you. Other important differences have to do with the fact that you can be called upon to terminate your short if the lender of shares wants to sell the shares (you have to return the borrowed shorts), and with the fact that you have to find someone willing to lend you the shares.
7. The bid-ask transaction round-trip costs (bid-ask spread and broker commissions) for either the long or the short would be around 30-60 basis points. In addition, you would have to provide the cash for the share purchase; the cash from the share short is most likely kept by the broker. The loss of proceeds would cost you another 300 to 500 basis points per year in lost interest proceeds, depending on who you are and whether you already have the money or whether you have to borrow the money. If the shares cost $5,000, you would have "buy" transaction costs of around $25 and "sell" transaction costs of around $25, for total transaction costs of $50; plus interest opportunity costs of around $100 to $250.
8.
    1. $400,000.
    2. If you use the KO short proceeds to purchase stock in PEP, then $\$400,000 \cdot (+15\%) - \$100,000 \cdot (+12\%) = \$48,000$. On $300,000 net investment, your rate of return would be 16%.
    3. $\$300,000 \cdot (+15\%) - \$100,000 \cdot (+12\%) = \$33,000$. On $300,000 net investment, so your rate of return would be 11%. You would be better off forgetting about the shorting and earn the 15% on PEP.

9. $r_P = w_A \cdot r_A + w_B \cdot r_B = 40\% \cdot 4\% + 60\% \cdot 6\% = 5.2\%$.
10. $r_p = r_A + r_B = \$5.20$.
11. $r_P = w_A \cdot r_A + w_B \cdot r_B = \$40 \cdot 4\% + \$60 \cdot 6\% = \$5.20$. Note that the formula works with dollar investments, too.
12. See Formula 8.1 on Page 177.
13. $r_{PEP} = 10\%.r_{CSG} = (\$38 + \$1 - \$40)/\$40 = -2.5\%$. Therefore, the absolute return and the rate of return on the portfolio was

$$r_P = \$200 \cdot (10\%) + \$600 \cdot (-2.5\%) = +\$5$$
$$r_P = \left(\frac{\$200}{\$800}\right) \cdot (10\%) + \left(\frac{\$600}{\$800}\right) \cdot (-2.5\%) = +0.625\%$$

14. The PEP weights in the two funds are 10% and 50%, respectively. To have zero exposure, you solve

$$w_{FA} \cdot 10\% + (1 - w_{FA}) \cdot 50\% = 0 \quad w_{FA} = 1.25 \ , \quad w_{FB} = -0.25$$

Therefore, your net exposures are

$$w_{KO} = 1.25 \cdot 60\% + (-0.25) \cdot 10\% = 72.5\% w_{CSG} = 1.25 \cdot 30\% + (-0.25) \cdot 40\% = 27.5\%$$

If you have \$500 to invest, you would short \$125 in Fund FB, leaving you with \$625 to go long in Fund FA.

15. $\sum_{i=1}^{5} i^2 = 1 + 4 + 9 + 16 + 25 = 55$. (Note that i is just a counter name, which can be replaced by any letter, so this answer is correct.)
16. $\sum_{j=1}^{5} (2 \cdot j) = 2 + 4 + 6 + 8 + 10 = 30$.
17. $\sum_{j=1}^{5} (j - 5) = -4 - 3 - 2 - 1 - 0 = -10$.
18. See Page 177.
19. See Page 177.
20.

$$w_{FA} \cdot 15\% + (1 - w_{FA}) \cdot 40\% = 30\% \quad w_{FA} = 40\%$$
$$w_{FA} \cdot w_{FA,1} + w_{FB} \cdot w_{FB,1} = w_1$$

If you purchase 40% in fund FA, your net holdings in each stock are

Stock 1: $40\% \cdot 15\% + 60\% \cdot 40\% = 30\%$

Stock 2: $40\% \cdot 50\% + 60\% \cdot 20\% = 32\%$

Stock 3: $40\% \cdot 35\% + 60\% \cdot 40\% = 38\%$

$$w_{FA} \cdot w_{FA,i} + w_{FB} \cdot w_{FB,i} = w_i$$

21. An index is a series of numbers; a mutual fund holds stocks. A mutual fund can hold stocks to mimic the return on an index.
22. See text for possible indexes to mention.
23. Indexes are numbers, not investments. Their percent change differs from a mimicking portfolio rate of return in that dividends are ignored.
24. In the second security: \$30 and \$270, for the first and second investor, respectively. In the third security: \$60 million and \$540 million, respectively.
25. As already computed in the text, the first security would increase from \$100 million to \$200 million, and thus total market capitalization would increase from \$1 billion to \$1.1 billion. Therefore, the weight of the three securities would be 18%, 27%, and 55%. (Moreover, the portfolio increased by 10% in value, which means that the first investor now has holdings worth \$110 million, and the second investor has holdings worth \$990 million.) The dollar investments are even simpler: the first investor started with \$10, \$30, and \$60 million, respectively, and now holds \$20, \$30, and \$60 million. The second investor now holds \$180, \$270, and \$540 million, respectively.
26.
    1. $w_1 = 50\%, w_2 = 50\%$.
    2. $w_1 = 25\%, w_2 = 75\%$.
    3. Each investor would own \$80 million worth of securities. If each investor held the equal-weighted portfolio, the total demand for stock 1 would be $\$40 \cdot 5 = \$200$. This is impossible. If each investor held the value-weighted portfolio, the total demand for stock 1 would be $\$20 \cdot 5 = \$100$. This is definitely possible.
    4. The equal-weighted portfolio would have started out at $w_1 = \$40m, w_2 = \$40m$. The returns would have made the portfolio $w_1 = \$44m, w_2 = \$28m$ for a total value of $\$72m$. The revised portfolio would have to be $w_1 = \$36m, w_2 = \$36m$. Therefore, the investor would have to sell $\$8m$ in security 1 in order to purchase $\$8m$ in security 2.

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5. The value-weighted investor portfolio started out at $w_1 = \$20m, w_2 = \$60m$, and without trading would have become $w_1 = \$22m, w_2 = 42m$ for a portfolio worth $\$64m$. The investor's weights would be $w_1 = 34.375\%$, $w_2 = 65.625\%$.
   In terms of the market, the first stock would have appreciated in value from \$100 million to \$110 million, while the second would have depreciated from \$300 million to \$210 million. The value-weighted market portfolio would therefore invest $w_1 = \$110/\$320 \approx 34.375\%$ and $w_2 = \$280/\$320 \approx 65.625\%$. Therefore, no trading is necessary.

27. Recent winners have to be sold, recent losers have to be bought. The answer to the question in parentheses is that if the stock market is competitive, past returns should have little predictive power for future returns, so this trading strategy is not necessarily a good or a bad idea. This will be covered in more detail in Chapter 16.

28. The correlation between these two is high. Therefore, it would make little difference.

All answers should be treated as suspect. They have only been sketched and have not been checked.