

MARKET EFFICIENCY

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LEARNING OUTCOMES

After completing this chapter, you will be able to do the following:

- Discuss market efficiency and related concepts, including their importance to investment practitioners.
- Explain the factors affecting a market's efficiency.
- Distinguish between market value and intrinsic value.
- Compare and contrast the weak-form, semistrong-form, and strong-form market efficiency.
- Explain the implications of each form of market efficiency for fundamental analysis, technical analysis, and the choice between active and passive portfolio management.
- Discuss identified market pricing anomalies and explain possible inconsistencies with market efficiency.
- Compare and contrast the behavioral finance view of investor behavior with that of traditional finance in regards to market efficiency.

1. INTRODUCTION

Market efficiency concerns the extent to which market prices incorporate available information. If market prices do not fully incorporate information, then opportunities may exist to make a profit from the gathering and processing of information. The subject of market efficiency is, therefore, of great interest to investment managers, as illustrated in Example 3-1.

EXAMPLE 3-1 Market Efficiency and Active Manager Selection

The chief investment officer (CIO) of a major university endowment fund has listed eight steps in the active manager selection process that can be applied both to traditional investments (e.g., common equity and fixed-income securities) and to alternative investments (e.g., private equity, hedge funds, and real assets). The first step specified is the evaluation of market opportunity:

What is the opportunity and why is it there? To answer this question we start by studying capital markets and the types of managers operating within those markets. We identify market inefficiencies and try to understand their causes, such as regulatory structures or behavioral biases. We can rule out many broad groups of managers and strategies by simply determining that the degree of market inefficiency necessary to support a strategy is implausible. Importantly, we consider the past history of active returns meaningless unless we understand why markets will allow those active returns to continue into the future.¹

The CIO's description underscores the importance of not assuming that past active returns that might be found in a historical dataset will repeat themselves in the future. **Active returns** refer to returns earned by strategies that do *not* assume that all information is fully reflected in market prices.

Governments and market regulators also care about the extent to which market prices incorporate information. Efficient markets imply informative prices—prices that accurately reflect available information about fundamental values. In market-based economies, market prices help determine which companies (and which projects) obtain capital. If these prices do not efficiently incorporate information about a company's prospects, then it is possible that funds will be misdirected. By contrast, prices that are informative help direct scarce resources and funds available for investment to their highest-valued uses.² Informative prices thus promote economic growth. The efficiency of a country's capital markets (in which businesses raise financing) is an important characteristic of a well-functioning financial system.

The remainder of this chapter is organized as follows. Section 2 provides specifics on how the efficiency of an asset market is described and discusses the factors affecting (i.e., contributing to and impeding) market efficiency. Section 3 presents an influential three-way classification of the efficiency of security markets and discusses its implications for fundamental analysis, technical analysis, and portfolio management. Section 4 presents several market anomalies (apparent market inefficiencies that have received enough attention to be individually identified and named) and describes how these anomalies relate to investment strategies. Section 5 introduces behavioral finance and how that field of study relates to market efficiency. Section 6 concludes and provides a summary.

¹The CIO is Christopher J. Brightman, CFA, of the University of Virginia Investment Management Company, as reported in Yau, Schneeweis, Robinson, and Weiss (2007, pp. 481–482).

²This concept is known as *allocative efficiency*.

2. THE CONCEPT OF MARKET EFFICIENCY

2.1. The Description of Efficient Markets

An **informationally efficient market** (an **efficient market**) is a market in which asset prices reflect new information quickly and rationally. An efficient market is thus a market in which asset prices reflect all past and present information.³

In this section we expand on this definition by clarifying the time frame required for an asset's price to incorporate information as well as describing the elements of information releases assumed under market efficiency. We discuss the difference between market value and intrinsic value and illustrate how inefficiencies or discrepancies between these values can provide profitable opportunities for active investment. As financial markets are generally not considered being either completely efficient or inefficient, but rather falling within a range between the two extremes, we describe a number of factors that contribute to and impede the degree of efficiency of a financial market. Finally, we conclude our overview of market efficiency by illustrating how the costs incurred by traders in identifying and exploiting possible market inefficiencies affect how we interpret market efficiency.

Investment managers and analysts, as noted, are interested in market efficiency because the extent to which a market is efficient affects how many profitable trading opportunities (market inefficiencies) exist. Consistent, superior, risk-adjusted returns (net of all expenses) are not achievable in an efficient market.⁴ In a highly efficient market, a **passive investment** strategy (i.e., buying and holding a broad market portfolio) that does not seek superior risk-adjusted returns is preferred to an **active investment** strategy because of lower costs (for example, transaction and information-seeking costs). By contrast, in a very inefficient market, opportunities may exist for an active investment strategy to achieve superior risk-adjusted returns (net of all expenses in executing the strategy) as compared with a passive investment strategy. In inefficient markets, an active investment strategy may outperform a passive investment strategy on a risk-adjusted basis. Understanding the characteristics of an efficient market and being able to evaluate the efficiency of a particular market are important topics for investment analysts and portfolio managers.

An efficient market is a market in which asset prices reflect information quickly. But what is the time frame of "quickly"? Trades are the mechanism by which information can be incorporated into asset transaction prices. The time needed to execute trades to exploit an inefficiency may provide a baseline for judging speed of adjustment.⁵ The time frame for an asset's price to incorporate information must be at least as long as the shortest time a trader needs to execute a transaction in the asset. In certain markets, such as foreign exchange and developed equity markets, market efficiency relative to certain types of information has been studied using time frames as short as one minute or less. If the time frame of price adjustment

³This definition is convenient for making several instructional points. The definition that most simply explains the sense of the word *efficient* in this context can be found in Fama (1976): "An efficient capital market is a market that is efficient in processing information" (p. 134).

⁴The technical term for *superior* in this context is *positive abnormal* in the sense of higher than expected given the asset's risk (as measured, according to capital market theory, by the asset's contribution to the risk of a well-diversified portfolio).

⁵Although the original theory of market efficiency does not quantify this speed, the basic idea is that it is sufficiently swift to make it impossible to consistently earn abnormal profits. Chordia, Roll, and Subrahmanyam (2005) suggest that the adjustment to information on the New York Stock Exchange (NYSE) is between 5 and 60 minutes.

allows many traders to earn profits with little risk, then the market is relatively inefficient. These considerations lead to the observation that market efficiency can be viewed as falling on a continuum.

Finally, an important point is that in an efficient market, prices should be expected to react only to the elements of information releases that are not anticipated fully by investors—that is, to the “unexpected” or “surprise” element of such releases. Investors process the unexpected information and revise expectations (for example, about an asset’s future cash flows, risk, or required rate of return) accordingly. The revised expectations enter or get incorporated in the asset price through trades in the asset. Market participants who process the news and believe that at the current market price an asset does not offer sufficient compensation for its perceived risk will tend to sell it or even sell it short. Market participants with opposite views should be buyers. In this way the market establishes the price that balances the various opinions after expectations are revised.

EXAMPLE 3-2 Price Reaction to the Default on a Bond Issue

Suppose that a speculative-grade bond issuer announces, just before bond markets open, that it will default on an upcoming interest payment. In the announcement, the issuer confirms various reports made in the financial media in the period leading up to the announcement. Prior to the issuer’s announcement, the financial news media reported the following: (1) suppliers of the company were making deliveries only for cash payment, reducing the company’s liquidity; (2) the issuer’s financial condition had probably deteriorated to the point that it lacked the cash to meet an upcoming interest payment; and (3) although public capital markets were closed to the company, it was negotiating with a bank for a private loan that would permit it to meet its interest payment and continue operations for at least nine months. If the issuer defaults on the bond, the consensus opinion of analysts is that bondholders will recover approximately \$0.36 to \$0.38 per dollar face value.

1. If the market for the bond is highly efficient, the bond’s market price is *most likely* to fully reflect the bond’s value after default:
 - A. In the period leading up to the announcement.
 - B. In the first trade prices after the market opens on the announcement day.
 - C. When the issuer actually misses the payment on the interest payment date.
2. If the market for the bond is highly efficient, the piece of information that bond investors *most likely* focused on in the issuer’s announcement was that the issuer:
 - A. Had failed in its negotiations for a bank loan.
 - B. Lacked the cash to meet the upcoming interest payment.
 - C. Had been required to make cash payments for supplier deliveries.

Solution to 1: B is correct. The announcement removed any uncertainty about default. In the period leading up to the announcement, the bond’s market price incorporated a probability of default but the price would not have fully reflected the bond’s value after

default. The possibility that a bank loan might permit the company to avoid default was not eliminated until the announcement.

Solution to 2: A is correct. The failure of the loan negotiations first becomes known in this announcement. The failure implies default.

2.2. Market Value versus Intrinsic Value

Market value is the price at which an asset can currently be bought or sold. **Intrinsic value** (sometimes called **fundamental value**) is, broadly speaking, the value that would be placed on it by investors if they had a complete understanding of the asset's investment characteristics.⁶ For a bond, for example, such information would include its interest (coupon) rate, principal value, the timing of its interest and principal payments, the other terms of the bond contract (indenture), a precise understanding of its default risk, the liquidity of its market, and other issue-specific items. In addition, market variables such as the term structure of interest rates and the size of various market premiums applying to the issue (for default risk, etc.) would enter into a discounted cash flow estimate of the bond's intrinsic value (discounted cash flow models are often used for such estimates). The word *estimate* is used because in practice, intrinsic value can be estimated but is not known for certain.

If investors believe a market is highly *efficient*, they will usually accept market prices as accurately reflecting intrinsic values. Discrepancies between market price and intrinsic value are the basis for profitable active investment. Active investors seek to own assets selling below perceived intrinsic value in the marketplace and to sell or sell short assets selling above perceived intrinsic value.

If investors believe an asset market is relatively *inefficient*, they may try to develop an independent estimate of intrinsic value. The challenge for investors and analysts is estimating an asset's intrinsic value. Numerous theories and models, including the dividend discount model, can be used to estimate an asset's intrinsic value, but they all require some form of judgment regarding the size, timing, and riskiness of the future cash flows associated with the asset. The more complex an asset's future cash flows, the more difficult it is to estimate its intrinsic value. These complexities and the estimates of an asset's market value are reflected in the market through the buying and selling of assets. The market value of an asset represents the intersection of supply and demand—the point that is low enough to induce at least one investor to buy while being high enough to induce at least one investor to sell. Because information relevant to valuation flows continually to investors, estimates of intrinsic value change, and hence, market values change.

EXAMPLE 3-3 Intrinsic Value

1. An analyst estimates that a security's intrinsic value is lower than its market value. The security appears to be:

⁶Intrinsic value is often defined as the present value of all expected future cash flows of the asset.

- A. Undervalued.
 - B. Fairly valued.
 - C. Overvalued.
2. A market in which assets' market values are, on average, equal to or nearly equal to intrinsic values is *best described* as a market that is attractive for:
- A. Active investment.
 - B. Passive investment.
 - C. Both active and passive investment.
3. Suppose that the future cash flows of an asset are accurately estimated. The asset trades in a market that you believe is highly efficient based on most evidence. But your intrinsic value estimate exceeds market value by a moderate amount. The most likely conclusion is that you have:
- A. Overestimated the asset's risk.
 - B. Underestimated the asset's risk.
 - C. Identified a market inefficiency.

Solution to 1: C is correct. The market is valuing the asset at more than its true worth.

Solution to 2: B is correct because an active investment is not expected to earn superior risk-adjusted returns. The additional costs of active investment are not justified in such a market.

Solution to 3: B is correct. If risk is underestimated, the discount rate being applied to find the present value of the expected cash flows (estimated intrinsic value) will be too low and the intrinsic value estimate will be too high.

2.3. Factors Contributing to and Impeding a Market's Efficiency

For markets to be efficient, prices should adjust quickly and rationally to the release of new information. In other words, prices of assets in an efficient market should "fully reflect" all information. Financial markets, however, are generally not classified at the two extremes as either completely inefficient or completely efficient but, rather, as exhibiting various degrees of efficiency. In other words, market efficiency should be viewed as falling on a continuum between extremes of completely efficient, at one end, and completely inefficient, at the other. Asset prices in a highly efficient market, by definition, reflect information more quickly and more accurately than in a less-efficient market. These degrees of efficiency also vary through time, across geographical markets, and by type of market. A number of factors contribute to and impede the degree of efficiency in a financial market.

2.3.1. Market Participants

One of the most critical factors contributing to the degree of efficiency in a market is the number of market participants. Consider the following example that illustrates the relationship between the number of market participants and market efficiency.

EXAMPLE 3-4 Illustration of Market Efficiency

Assume that the shares of a small market capitalization (cap) company trade on a public stock exchange. Because of its size, it is not considered “blue-chip” and not many professional investors follow the activities of the company.⁷ A small-cap fund analyst reports that the most recent annual operating performance of the company has been surprisingly good, considering the recent slump in its industry. The company’s share price, however, has been slow to react to the positive financial results because the company is not being recommended by the majority of research analysts. This mispricing implies that the market for this company’s shares is less than fully efficient. The small-cap fund analyst recognizes the opportunity and immediately recommends the purchase of the company’s shares. The share price gradually increases as more investors purchase the shares once the news of the mispricing spreads through the market. As a result, it takes a few days for the share price to fully reflect the information.

Six months later, the company reports another solid set of interim financial results. But because the previous mispricing and subsequent profit opportunities have become known in the market, the number of analysts following the company’s shares has increased substantially. As a result, as soon as unexpected information about the positive interim results are released to the public, a large number of buy orders quickly drive up the stock price, thereby making the market for these shares more efficient than before.

A large number of investors (individual and institutional) follow the major financial markets closely on a daily basis, and if mispricings exist in these markets, as illustrated by the example, investors will act so that these mispricings disappear quickly. Besides the number of investors, the number of financial analysts who follow or analyze a security or asset should be positively related to market efficiency. The number of market participants and resulting trading activity can vary significantly through time. A lack of trading activity can cause or accentuate other market imperfections that impede market efficiency. In fact, in many of these markets, such as China, trading in many of the listed stocks is restricted for foreigners. By nature, this limitation reduces the number of market participants, restricts the potential for trading activity, and hence reduces market efficiency.

EXAMPLE 3-5 Factors Affecting Market Efficiency

The expected effect on market efficiency of opening a securities market to trading by foreigners would be to:

⁷A “blue-chip” share is one from a well-recognized company that is considered to be high quality but low risk. This term generally refers to a company that has a long history of earnings and paying dividends.

- A. Decrease market efficiency.
- B. Leave market efficiency unchanged.
- C. Increase market efficiency.

Solution: C is correct. The opening of markets as described should increase market efficiency by increasing the number of market participants.

2.3.2. Information Availability and Financial Disclosure

Information availability (e.g., an active financial news media) and financial disclosure should promote market efficiency. Information regarding trading activity and traded companies in such markets as the New York Stock Exchange, the London Stock Exchange, and the Tokyo Stock Exchange is readily available. Many investors and analysts participate in these markets, and analyst coverage of listed companies is typically substantial. As a result, these markets are quite efficient. In contrast, trading activity and material information availability may be lacking in smaller securities markets, such as those operating in some emerging markets.

Similarly, significant differences may exist in the efficiency of different types of markets. For example, many securities trade primarily or exclusively in dealer or over-the-counter (OTC) markets, including bonds, money market instruments, currencies, mortgage-backed securities, swaps, and forward contracts. The information provided by the dealers who serve as market makers for these markets can vary significantly in quality and quantity, both through time and across different product markets.

Treating all market participants fairly is critical for the integrity of the market and explains why regulators place such an emphasis on “fair, orderly, and efficient markets.”⁸ A key element of this fairness is that all investors have access to the information necessary to value securities that trade in the market. Rules and regulations that promote fairness and efficiency in a market include those pertaining to the disclosure of information and illegal insider trading.

For example, U.S. Securities and Exchange Commission’s (SEC’s) Regulation FD (Fair Disclosure) requires that if security issuers provide nonpublic information to some market professionals or investors, they must also disclose this information to the public.⁹ This requirement helps provide equal and fair opportunities, which is important in encouraging participation in the market. A related issue deals with illegal insider trading. The SEC’s rules, along with court cases, define illegal insider trading as trading in securities by market participants who are considered insiders “while in possession of material, nonpublic information about the security.”^{10,11} Although these rules cannot guarantee that some participants will not

⁸“The Investor’s Advocate: How the SEC Protects Investors, Maintains Market Integrity, and Facilitates Capital Formation,” U.S. Securities and Exchange Commission (www.sec.gov/about/whatwedo.shtml).

⁹Regulation FD, “Selective Disclosure and Insider Trading,” 17 CFR Parts 240, 243, and 249, effective 23 October 2000.

¹⁰Although not the focus of this particular chapter, it is important to note that a party is considered an insider not only when the individual is a corporate insider, such as an officer or director, but also when the individual is aware that the information is nonpublic information [Securities and Exchange Commission, Rules 10b5-1 (“Trading on the Basis of Material Nonpublic Information in Insider Trading Cases”) and Rule 10b5-2 (“Duties of Trust or Confidence in Misappropriation Insider Trading Cases”)].

¹¹In contrast to the situation in the United States, in other developed markets, the insider trading laws are generally promulgated by the courts, although the definition of “insider trading” is generally through statutes. See, for example, the European Community’s (EC’s) Insider Trading Directive, *Council Directive Coordinating Regulations on Insider Dealing*, Directive 89/592, article 32, 1989 OJ (L 334) 30, 1.

have an advantage over others and that insiders will not trade on the basis of inside information, the civil and criminal penalties associated with breaking these rules are intended to discourage illegal insider trading and promote fairness.

2.3.3. Limits to Trading

Arbitrage is a set of transactions that produces riskless profits. Arbitrageurs are traders who engage in such trades to benefit from pricing discrepancies (inefficiencies) in markets. Such trading activity contributes to market efficiency. For example, if an asset is traded in two markets but at different prices, the actions of buying the asset in the market in which it is underpriced and selling the asset in the market in which it is overpriced will eventually bring these two prices together. The presence of these arbitrageurs helps pricing discrepancies disappear quickly. Obviously, market efficiency is impeded by any limitation on arbitrage resulting from operating inefficiencies, such as difficulties in executing trades in a timely manner, prohibitively high trading costs, and a lack of transparency in market prices.

Some market experts argue that restrictions on short selling limit arbitrage trading, which impedes market efficiency. **Short selling** is the transaction whereby an investor sells shares that he or she does not own by borrowing them from a broker and agreeing to replace them at a future date. Short selling allows investors to sell securities they believe to be overvalued, much in the same way they can buy those they believe to be undervalued. In theory, such activities promote more efficient pricing. Regulators and others, however, have argued that short selling may exaggerate downward market movements, leading to crashes in affected securities. In contrast, some researchers report evidence indicating that when investors are unable to borrow securities (that is, to short the security), or when costs to borrow shares are high, market prices may deviate from intrinsic values.¹² Furthermore, research suggests that short selling is helpful in price discovery (that is, it facilitates supply and demand in determining prices).¹³

2.4. Transaction Costs and Information-Acquisition Costs

The costs incurred by traders in identifying and exploiting possible market inefficiencies affect the interpretation of market efficiency. The two types of costs to consider are transaction costs and information-acquisition costs.

- *Transaction costs*: Practically, transaction costs are incurred in trading to exploit any perceived market inefficiency. Thus, “efficient” should be viewed as efficient within the bounds of transaction costs. For example, consider a violation of the principle that two identical assets should sell for the same price in different markets. Such a violation can be considered to be a rather simple possible exception to market efficiency because prices appear to be inconsistently processing information. To exploit the violation, a trader could arbitrage by simultaneously shorting the asset in the higher-price market and buying the asset in the lower-price market. If the price discrepancy between the two markets is smaller than the transaction costs involved in the arbitrage for the lowest cost traders, the arbitrage will not occur, and both prices are in effect efficient within the bounds of arbitrage. These

¹²A significant amount of research supports this view, including Jones and Lamont (2002) and Duffie, Garleanu, and Pederson (2002).

¹³See Bris, Goetzmann, and Zhu (2009).

bounds of arbitrage are relatively narrow in highly liquid markets, such as the market for U.S. Treasury bills, but could be wide in illiquid markets.

- *Information-acquisition costs*: Practically, expenses are always associated with gathering and analyzing information. New information is incorporated in transaction prices by traders placing trades based on their analysis of information. Active investors who place trades based on information they have gathered and analyzed play a key role in market prices adjusting to reflect new information. The classic view of market efficiency is that active investors incur information acquisition costs but that money is wasted because prices already reflect all relevant information. This view of efficiency is very strict in the sense of viewing a market as inefficient if active investing can recapture any part of the costs, such as research costs and active asset selection. Grossman and Stiglitz (1980) argue that prices must offer a return to information acquisition; in equilibrium, if markets are efficient, returns net of such expenses are just fair returns for the risk incurred. The modern perspective views a market as inefficient if, after deducting such costs, active investing can earn superior returns. Gross of expenses, a return should accrue to information acquisition in an efficient market.

In summary, a modern perspective calls for the investor to consider transaction costs and information-acquisition costs when evaluating the efficiency of a market. A price discrepancy must be sufficiently large to leave the investor with a profit (adjusted for risk) after taking account of the transaction costs and information-acquisition costs to reach the conclusion that the discrepancy may represent a market inefficiency. Prices may not fully reflect available information but still not provide a true market opportunity for active investors.

3. FORMS OF MARKET EFFICIENCY

Eugene Fama developed a framework for describing the degree to which markets are efficient.¹⁴ In his efficient market hypothesis, markets are efficient when prices reflect *all* relevant information at any point in time. This means that the market prices observed for securities, for example, reflect the information available at the time.

In his framework, Fama defines three forms of efficiency: weak, semistrong, and strong. Each form is defined with respect to the available information that is reflected in prices.

<i>Forms of Market Efficiency</i>	Market Prices Reflect:		
	Past Market Data	Public Information	Private Information
Weak form of market efficiency	✓		
Semistrong form of market efficiency	✓	✓	
Strong form of market efficiency	✓	✓	✓

A finding that investors can consistently earn **abnormal returns** by trading on the basis of information is evidence contrary to market efficiency. In general, abnormal returns are returns in excess of those expected given a security's risk and the market's return. In other words, abnormal return equals actual return less expected return.

¹⁴Fama (1970).

3.1. Weak Form

In the **weak form** of the efficient market hypothesis, security prices fully reflect *all past market data*, which refers to all historical price and trading volume information. If markets are weak-form efficient, past trading data are already reflected in current prices and investors cannot predict future price changes by extrapolating prices or patterns of prices from the past.¹⁵

Tests of whether securities markets are weak-form efficient require looking at patterns of prices. One approach is to see whether there is any serial correlation in security returns, which would imply a predictable pattern.¹⁶ Although there is some weak correlation in daily security returns, there is not enough correlation to make this a profitable trading rule after considering transaction costs.

An alternative approach to test weak-form efficiency is to examine specific trading rules that attempt to exploit historical trading data. If any such trading rule consistently generates abnormal risk-adjusted returns after trading costs, this evidence will contradict weak-form efficiency. This approach is commonly associated with **technical analysis**, which involves the analysis of historical trading information (primarily pricing and volume data) in an attempt to identify recurring patterns in the trading data that can be used to guide investment decisions. Many technical analysts, also referred to as “technicians,” argue that many movements in stock prices are based, in large part, on psychology. Many technicians attempt to predict how market participants will behave, based on analyses of past behavior, and then trade on those predictions. Technicians often argue that simple statistical tests of trading rules are not conclusive because they are not applied to the more sophisticated trading strategies that can be used and that the research excludes the technician’s subjective judgment. Thus, it is difficult to definitively refute this assertion because there are an unlimited number of possible technical trading rules.

Can technical analysts profit from trading on past trends? Overall, the evidence indicates that investors cannot consistently earn abnormal profits using past prices or other technical analysis strategies in developed markets.¹⁷ Some evidence suggests, however, that there are opportunities to profit on technical analysis in countries with developing markets, including China, Hungary, Bangladesh, and Turkey.¹⁸

3.2. Semistrong Form

In a **semistrong-form efficient market**, prices reflect all publicly known and available information. Publicly available information includes financial statement data (such as earnings, dividends, corporate investments, changes in management, etc.) and financial market data (such as closing prices, shares traded, etc.). Therefore, the semistrong form of market efficiency encompasses the weak form. In other words, if a market is semistrong efficient, then it must also be weak-form efficient. A market that quickly incorporates all publicly available information into its prices is semistrong efficient.

¹⁵Market efficiency should not be confused with the **random walk hypothesis**, in which price changes over time are independent of one another. A random walk model is one of many alternative expected-return-generating models. Market efficiency does not require that returns follow a random walk.

¹⁶Serial correlation is a statistical measure of the degree to which the returns in one period are related to the returns in another period.

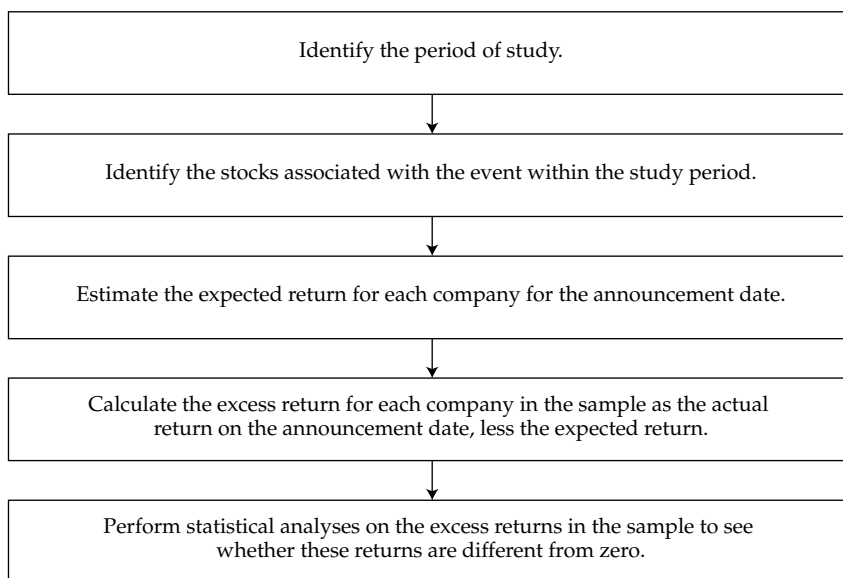
¹⁷Bessembinder and Chan (1998) and Fifield, Power, and Sinclair (2005).

¹⁸Fifield, Power, and Sinclair (2005), Chen and Li (2006), and Mobarek, Mollah, and Bhuyan (2008).

In a semistrong market, efforts to analyze publicly available information are futile. That is, analyzing earnings announcements of companies to identify underpriced or overpriced securities is pointless because the prices of these securities already reflect all publicly available information. If markets are semistrong efficient, no single investor has access to information that is not already available to other market participants, and as a consequence, no single investor can gain an advantage in predicting future security prices. In a semistrong efficient market, prices adjust quickly and accurately to new information. Suppose a company announces earnings that are higher than expected. In a semistrong efficient market, investors would not be able to act on this announcement and earn abnormal returns.

A common empirical test of investors' reaction to information releases is the event study. Suppose a researcher wants to test whether investors react to the announcement that the company is paying a special dividend. The researcher identifies a sample period and then those companies that paid a special dividend in the period and the date of the announcement. Then, for each company's stock, the researcher calculates the expected return on the share for the event date. This expected return may be based on many different models, including the capital asset pricing model, a simple market model, or a market index return. The researcher calculates the excess return as the difference between the actual return and the expected return. Once the researcher has calculated the event's excess return for each share, statistical tests are conducted to see whether the abnormal returns are statistically different from zero. The process of an event study is outlined in Exhibit 3-1.

EXHIBIT 3-1 The Event Study Process



How do event studies relate to efficient markets? In a semistrong efficient market, share prices react quickly and accurately to public information. Therefore, if the information is good news, such as better-than-expected earnings, one would expect the company's shares to increase

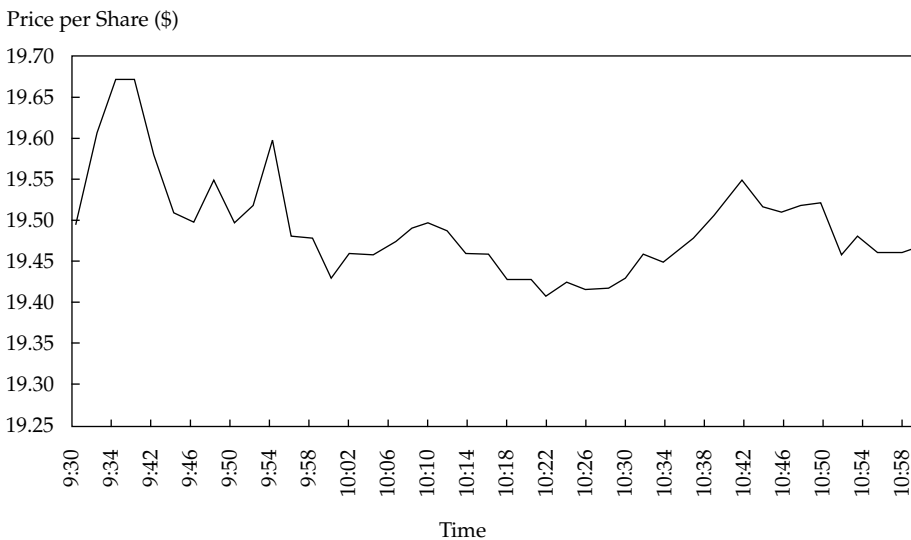
immediately at the time of the announcement; if it is bad news, one would expect a swift, negative reaction. If actual returns exceed what is expected in absence of the announcement and these returns are confined to the announcement period, then they are consistent with the idea that market prices react quickly to new information. In other words, the finding of excess returns at the time of the announcement does not necessarily indicate market inefficiency. In contrast, the finding of consistent excess returns following the announcement would suggest a trading opportunity. Trading on the basis of the announcement—that is, once the announcement is made—would not, on average, yield abnormal returns.

EXAMPLE 3-6 Information Arrival and Market Reaction

Consider an example of a news item and its effect on a share's price. In June 2008, the U.S. Federal Trade Commission (FTC) began an investigation of Intel Corporation regarding noncompetitiveness, and on 16 December 2009, the FTC announced that it was suing Intel over noncompetitive issues. This announcement was made before the market opened for trading on 16 December.

Intel stock closed at \$19.78 on 15 December 2009 but opened at \$19.50 on 16 December. The stock then traded in the range from \$19.45 to \$19.68 within the first half hour as the news of the suit and Intel's initial response were spreading among investors. Exhibit 3-2 illustrates the price of Intel for the first 90 minutes of trading on 16 December.

EXHIBIT 3-2 Price of Intel: 16 December 2009



Source: Price data from Yahoo! Finance.

Is the fact that the price of Intel moves up immediately and then comes down indicative of an inefficiency regarding information? Not necessarily. Does it mean that investors overreacted? Not necessarily. During the morning, both before and after the market opened, news flowed about the lawsuit and the company's reaction to the lawsuit. The price of the shares reflects investors' reactions to this news. Why didn't Intel's shares simply move to a new level and stay there? Because (1) information continued to flow during the day on Intel and investors' estimate of the importance of this news on Intel's stock value continued to change, and (2) other news, related to other events and issues (such as the economy), affected stock prices.

Researchers have examined many different company-specific information events, including stock splits, dividend changes, and merger announcements, as well as economy-wide events, such as regulation changes and tax rate changes. The results of most research are consistent with the view that developed securities markets might be semistrong efficient. But some evidence suggests that the markets in developing countries may not be semistrong efficient.¹⁹

3.3. Strong Form

In the **strong form** of efficient markets, security prices fully reflect both public and private information. A market that is strong-form efficient is, by definition, also semistrong- and weak-form efficient. In the case of a strong-form efficient market, insiders would not be able to earn abnormal returns from trading on the basis of private information. A strong-form efficient market also means that prices reflect all private information, which means that prices reflect everything that the management of a company knows about the financial condition of the company that has not been publicly released. However, this is not likely because of the strong prohibitions against insider trading that are found in most countries. If a market is strong-form efficient, those with insider information cannot earn abnormal returns.

Researchers test whether a market is strong-form efficient by testing whether investors can earn abnormal profits by trading on nonpublic information. The results of these tests are consistent with the view that securities markets are not strong-form efficient; many studies have found that abnormal profits can be earned when nonpublic information is used.²⁰

3.4. Implications of the Efficient Market Hypothesis

The implications of efficient markets to investment managers and analysts are important because they affect the value of securities and how these securities are managed. Several implications can be drawn from the evidence on efficient markets for developed markets:

- Securities markets are weak-form efficient, and therefore, investors cannot earn abnormal returns by trading on the basis of past trends in price.

¹⁹See Gan, Lee, Hwa, and Zhang (2005) and Raja, Sudhakar, and Selvam (2009).

²⁰Evidence that finds that markets are not strong-form efficient include Jaffe (1974) and Rozeff and Zaman (1988).

- Securities markets are semistrong efficient, and therefore, analysts who collect and analyze information must consider whether that information is already reflected in security prices and how any new information affects a security's value.²¹
- Securities markets are not strong-form efficient because securities laws are intended to prevent exploitation of private information.

3.4.1. Fundamental Analysis

Fundamental analysis is the examination of publicly available information and the formulation of forecasts to estimate the intrinsic value of assets. Fundamental analysis involves the estimation of an asset's value using company data, such as earnings and sales forecasts, and risk estimates as well as industry and economic data, such as economic growth, inflation, and interest rates. Buy and sell decisions depend on whether the current market price is less than or greater than the estimated intrinsic value.

The semistrong form of market efficiency says that all available public information is reflected in current prices. So, what good is fundamental analysis? Fundamental analysis is necessary in a well-functioning market because this analysis helps the market participants understand the value implications of information. In other words, fundamental analysis facilitates a semistrong efficient market by disseminating value-relevant information. And, although fundamental analysis requires costly information, this analysis can be profitable in terms of generating abnormal returns if the analyst creates a comparative advantage with respect to this information.²²

3.4.2. Technical Analysis

Investors using technical analysis attempt to profit by looking at patterns of prices and trading volume. Although some price patterns persist, exploiting these patterns may be too costly and, hence, would not produce abnormal returns.

Consider a situation in which a pattern of prices exists. With so many investors examining prices, this pattern will be detected. If profitable, exploiting this pattern will eventually affect prices such that this pattern will no longer exist; it will be arbitrated away. In other words, by detecting and exploiting patterns in prices, technical analysts assist markets in maintaining weak-form efficiency. Does this mean that technical analysts cannot earn abnormal profits? Not necessarily, because there may be a possibility of earning abnormal profits from a pricing inefficiency. But would it be possible to earn abnormal returns on a consistent basis from exploiting such a pattern? No, because the actions of market participants will arbitrage this opportunity quickly, and the inefficiency will no longer exist.

3.4.3. Portfolio Management

If securities markets are weak-form and semistrong-form efficient, the implication is that active trading, whether attempting to exploit price patterns or public information, is not likely to generate abnormal returns. In other words, portfolio managers cannot beat the market on a consistent basis, so therefore, passive portfolio management should outperform active portfolio management. Researchers have observed that mutual funds do not, on average,

²¹In the case of the Intel example, this implication would mean estimating how the actual filing of the lawsuit and the company's reaction to the lawsuit affect the value of Intel, while keeping in mind that the expectation of a lawsuit was already impounded in Intel's stock price.

²²Brealey (1983).

outperform the market on a risk-adjusted basis.²³ Mutual funds perform, on average, similar to the market before considering fees and expenses and perform worse than the market, on average, once fees and expenses are considered. Even if a mutual fund is not actively managed, there are costs to managing these funds, which reduces net returns.

So, what good are portfolio managers? The role of a portfolio manager is not necessarily to beat the market but, rather, to establish and manage a portfolio consistent with the portfolio's objectives, with appropriate diversification and asset allocation, while taking into consideration the risk preferences and tax situation of the investor.

4. MARKET PRICING ANOMALIES

Although considerable evidence shows that markets are efficient, researchers have also reported a number of potential inefficiencies, or anomalies, that result in the mispricing of securities. These market anomalies, if persistent, are exceptions to the notion of market efficiency. In other words, a **market anomaly** occurs if a change in the price of an asset or security cannot directly be linked to current relevant information known in the market or to the release of new information into the market. Although the list is far from exhaustive, in this section, several well-known anomalies in financial markets are discussed.

The validity of any evidence supporting the existence of such market inefficiencies must be *consistent* over reasonably long periods. Otherwise, a detected market anomaly may largely be an artifact of the sample period chosen. In the widespread search for discovering profitable anomalies, many findings could simply be the product of a process called **data mining**, also known as **data snooping**. In generally accepted research practice, an initial hypothesis is developed which is based on economic rationale, followed by tests conducted on objectively selected data to either confirm or reject the original hypothesis. However, with data mining the process is reversed where data is often examined with the intent to develop a hypothesis, instead of developing a hypothesis first. This is done by analyzing data in various manners, and even utilizing different empirical approaches until you find support for a desired result, in this case a profitable anomaly. Can researchers look back on data and find a trading strategy that would have yielded abnormal returns? Absolutely. Will this trading strategy provide abnormal returns in the future? Perhaps not. It is always possible that enough data snooping can detect a trading strategy that would have worked in the past, and it is always possible that some trading strategy can produce abnormal returns simply by chance. But in an efficient market, such a strategy is unlikely to generate abnormal returns on a consistent basis in the future. Although identified anomalies may frequently appear to produce excess returns, it is generally difficult to profitably exploit the anomalies after accounting for risk, trading costs, and so on.

Several anomalies are listed in Exhibit 3-3. This list is by no means exhaustive, but it provides information on the breadth of the anomalies. A few of these anomalies are discussed in more detail in the following sections. The anomalies are placed into categories based on the research method that identified the anomaly. Time-series anomalies were identified using time series of data. Cross-sectional anomalies were identified based on analyzing a cross section of companies that differ on some key characteristics. Other anomalies were identified by a variety of means, including event studies.

²³See Malkiel (1995). One of the challenges to evaluating mutual fund performance is that the researcher must control for survivorship bias.

EXHIBIT 3-3 Sampling of Observed Pricing Anomalies

Time Series	Cross-Sectional	Other
January effect	Size effect	Closed-end fund discount
Day-of-the-week effect	Value effect	Earnings surprise
Weekend effect	Book-to-market ratios	Initial public offerings
Turn-of-the-month effect	P/E ratio effect	Distressed securities effect
Holiday effect	Value Line enigma	Stock splits
Time-of-day effect		Super Bowl
Momentum		
Overreaction		

4.1. Time-Series Anomalies

Two of the major categories of time-series anomalies that have been documented are (1) calendar anomalies and (2) momentum and overreaction anomalies.

4.1.1. Calendar Anomalies

In the 1980s, a number of researchers reported that stock market returns in January were significantly higher compared to the rest of the months of the year, with most of the abnormal returns reported during the first five trading days in January. Since its first documentation in the 1980s, this pattern, known as the **January effect**, has been observed in most equity markets around the world. This anomaly is also known as the **turn-of-the-year effect**, or even often referred to as the “small firm in January effect” because it is most frequently observed for the returns of small market capitalization stocks.²⁴

The January effect contradicts the efficient market hypothesis because excess returns in January are not attributed to any new and relevant information or news. A number of reasons have been suggested for this anomaly, including tax-loss selling. Researchers have speculated that, in order to reduce their tax liabilities, investors sell their “loser” securities in December for the purpose of creating capital losses, which can then be used to offset any capital gains. A related explanation is that these losers tend to be small-cap stocks with high volatility.²⁵ This increased supply of equities in December depresses their prices, and then these shares are bought in early January at relatively attractive prices. This demand then drives their prices up again. Overall, the evidence indicates that tax-loss selling may account for a portion of January abnormal returns, but it does not explain all of it.

Another possible explanation for the anomaly is so-called “window dressing,” a practice in which portfolio managers sell their riskier securities prior to 31 December. The explanation is as follows: many portfolio managers prepare the annual reports of their portfolio holdings as of 31 December. Selling riskier securities is an attempt to make their portfolios appear less risky. After 31 December, a portfolio manager would then simply purchase riskier securities in an attempt to earn higher returns. However, similar to the tax-loss selling hypothesis, the

²⁴There is also evidence of a January effect in bond returns that is more prevalent in high-yield corporate bonds, similar to the small-company effect for stocks.

²⁵See Roll (1983).

research evidence in support of the window dressing hypothesis explains some, but not all, of the anomaly.

Recent evidence for both stock and bond returns suggests that the January effect is not persistent and, therefore, is not a pricing anomaly. Once an appropriate adjustment for risk is made, the January “effect” does not produce abnormal returns.²⁶

Several other calendar effects, including the day-of-the-week and the weekend effects, have been found. These anomalies are summarized in Exhibit 3-4.²⁷ But like the size effect, which will be described later, most of these anomalies have been eliminated over time. One view is that the anomalies have been exploited such that the effect has been arbitrated away. Another view, however, is that increasingly sophisticated statistical methodologies fail to detect pricing inefficiencies.

EXHIBIT 3-4 Calendar-Based Anomalies

Anomaly	Observation
Turn-of-the-month effect	Returns tend to be higher on the last trading day of the month and the first three trading days of the next month.
Day-of-the-week effect	The average Monday return is negative and lower than the average returns for the other four days, which are all positive.
Weekend effect	Returns on weekends tend to be lower than returns on weekdays. ²⁸
Holiday effect	Returns on stocks in the day prior to market holidays tend to be higher than other days.

4.1.2. Momentum and Overreaction Anomalies

Momentum anomalies relate to short-term share price patterns. One of the earliest studies to identify this type of anomaly was conducted by Werner DeBondt and Richard Thaler, who argued that investors overreact to the release of unexpected public information.²⁹ Therefore, stock prices will be inflated (depressed) for those companies releasing good (bad) information. This anomaly has become known as the overreaction effect. Using the overreaction effect, they proposed a strategy that involved buying “loser” portfolios and selling “winner” portfolios. They defined stocks as winners or losers based on their total returns over the previous three- to five-year period. They found that in a subsequent period, the loser portfolios outperformed the market, while the winner portfolios underperformed the market. Similar patterns have been documented in many, but not all, global stock markets as well as in bond markets. One criticism is that the observed anomaly may be the result of statistical problems in the analysis.

²⁶See, for example, Kim (2006).

²⁷For a discussion of several of these anomalous patterns, see Jacobs and Levy (1988).

²⁸The weekend effect consists of a pattern of returns around the weekend: abnormal positive returns on Fridays followed by abnormally negative returns on Mondays. This is a day-of-the-week effect that specifically links Friday and Monday returns. It is interesting to note that in 2009, the weekend effect in the United States was inverted, with 80 percent of the gains from March 2009 onward coming from the first trading day of the week.

²⁹DeBondt and Thaler (1985).

A contradiction to weak-form efficiency occurs when securities that have experienced high returns in the short term tend to continue to generate higher returns in subsequent periods.³⁰ Empirical support for the existence of momentum in stock returns in most stock markets around the world is well documented. If investors can trade on the basis of momentum and earn abnormal profits, then this anomaly contradicts the weak form of the efficient market hypothesis because it represents a pattern in prices that can be exploited by simply using historical price information.³¹

Researchers have argued that the existence of momentum is rational and not contrary to market efficiency because it is plausible that there are shocks to the expected growth rates of cash flows to shareholders and that these shocks induce a serial correlation that is rational and short lived.³² In other words, having stocks with some degree of momentum in their security returns may not imply irrationality but, rather, may reflect prices adjusting to a shock in growth rates.

4.2. Cross-Sectional Anomalies

Two of the most researched cross-sectional anomalies in financial markets are the size effect and the value effect.

4.2.1. Size Effect

The size effect results from the observation that equities of small-cap companies tend to outperform equities of large-cap companies on a risk-adjusted basis. Many researchers documented a small-company effect soon after the initial research was published in 1981. This effect, however, was not apparent in subsequent studies.³³ Part of the reason that the size effect was not confirmed by subsequent studies may be because of the fact that if it were truly an anomaly, investors acting on this effect would reduce any potential returns. But some of the explanation may simply be that the effect as originally observed was a chance outcome and, therefore, not actually an inefficiency.

4.2.2. Value Effect

A number of global empirical studies have shown that value stocks, which are generally referred to as stocks that have below-average price-to-earnings (P/E) and market-to-book (M/B) ratios, and above-average dividend yields, have consistently outperformed growth stocks over long periods of time.³⁴ If the effect persists, the value stock anomaly contradicts

³⁰Notice that this pattern lies in sharp contrast to DeBonds and Thaler's reversal pattern that is displayed over longer periods of time. In theory, the two patterns could be related. In other words, it is feasible that prices are bid up extremely high, perhaps too high, in the short term for companies that are doing well. In the longer term (three to five years), the prices of these short-term winners correct themselves and they do poorly.

³¹Jegadeesh and Titman (2001).

³²Johnson (2002).

³³Although many studies document a small-company effect, these studies are concentrated in a period similar to that of the original research and, therefore, use a similar data set. The key to whether something is a true anomaly is persistence in out-of-sample tests. Fama and French (2008) document that the size effect is apparent only in microcap stocks but not in small- and large-cap stocks, and these microcap stocks may have a significant influence in studies that document a size effect.

³⁴For example, see Capaul, Rowley, and Sharpe (1993) and Fama and French (1998).

semistrong market efficiency because all the information used to categorize stocks in this manner is publicly available.

Fama and French developed a three-factor model to predict stock returns.³⁵ In addition to the use of market returns as specified by the capital asset pricing model (CAPM), the Fama and French model also includes the size of the company as measured by the market value of its equity and the company's book value of equity divided by its market value of equity, which is a value measure. The Fama and French model captures risk dimensions related to stock returns that the CAPM model does not consider. Fama and French find that when they apply the three-factor model instead of the CAPM, the value stock anomaly disappears.

4.3. Other Anomalies

A number of additional anomalies have been documented in the financial markets, including the existence of closed-end investment fund discounts, price reactions to the release of earnings information, returns of initial public offerings, and the predictability of returns based on prior information.

4.3.1. Closed-End Investment Fund Discounts

A closed-end investment fund issues a fixed number of shares at inception and does not sell any additional shares after the initial offering. Therefore, the fund capitalization is fixed unless a secondary public offering is made. The shares of closed-end funds trade on stock markets like any other shares in the equity market (i.e., their prices are determined by supply and demand).

Theoretically, these shares should trade at a price approximately equal to their net asset value (NAV) per share, which is simply the total market value of the fund's security holdings less any liabilities divided by the number of shares outstanding. An abundance of research, however, has documented that, on average, closed-end funds trade at a discount from NAV. Most studies have documented average discounts in the 4–10 percent range, although individual funds have traded at discounts exceeding 50 percent and others have traded at large premiums.³⁶

The closed-end fund discount presents a puzzle because conceptually, an investor could purchase all the shares in the fund, liquidate the fund, and end up making a profit. Some researchers have suggested that these discounts are attributed to management fees or expectations of the managers' performance, but these explanations are not supported by the evidence.³⁷ An alternative explanation for the discount is that tax liabilities are associated with unrealized capital gains and losses that exist prior to when the investor bought the shares, and hence, the investor does not have complete control over the timing of the realization of gains and losses.³⁸ Although the evidence supports this hypothesis to a certain extent, the tax effect is not large enough to explain the entire discount. Finally, it has often been argued that the discounts exist because of liquidity problems and errors in calculating NAV. The illiquidity

³⁵Fama and French (1995).

³⁶See Dimson and Minio-Kozerski (1999) for a review of this literature.

³⁷See Lee, Sheifer, and Thaler (1990).

³⁸The return to owners of closed-end fund shares has three parts: (1) the price appreciation or depreciation of the shares themselves, (2) the dividends earned and distributed to owners by the fund, and (3) the capital gains and losses earned by the fund that are distributed by the fund. The explanation of the anomalous pricing has to do with the timing of the distribution of capital gains.

explanation is plausible if shares are recorded at the same price as more liquid, publicly traded stocks; some evidence supports this assertion. But as with tax reasons, liquidity issues explain only a portion of the discount effect.

Can these discounts be exploited to earn abnormal returns if transaction costs are taken into account? No. First, the transaction costs involved in exploiting the discount—buying all the shares and liquidating the fund—would eliminate any profit.³⁹ Second, these discounts tend to revert to zero over time. Hence, a strategy to trade on the basis of these discounts would not likely be profitable.⁴⁰

4.3.2. Earnings Surprise

Although most event studies have supported semistrong market efficiency, some researchers have provided evidence that questions semistrong market efficiency. One of these studies relates to the extensively examined adjustment of stock prices to earnings announcements.⁴¹ The unexpected part of the earnings announcement, or **earnings surprise**, is the portion of earnings that is unanticipated by investors and, according to the efficient market hypothesis, merits a price adjustment. Positive (negative) surprises should cause appropriate and rapid price increases (decreases). Several studies have been conducted using data from numerous markets around the world. Most of the results indicate that earnings surprises are reflected quickly in stock prices, but the adjustment process is not always efficient. In particular, although a substantial adjustment occurs prior to and at the announcement date, an adjustment also occurs after the announcement.⁴²

As a result of these slow price adjustments, companies that display the largest positive earnings surprises subsequently display superior stock return performance, whereas poor subsequent performance is displayed by companies with low or negative earnings surprises.⁴³ This finding implies that investors could earn abnormal returns using publicly available information by buying stocks of companies that had positive earnings surprises and selling those with negative surprises.

Although there is support for abnormal returns associated with earnings surprises, and some support for such returns beyond the announcement period, there is also evidence indicating that these observed abnormal returns are an artifact of studies that do not sufficiently control for transaction costs and risk.⁴⁴

4.3.3. Initial Public Offerings (IPOs)

When a company offers shares of its stock to the public for the first time, it does so through an initial public offering (or IPO). This offering involves working with an investment bank

³⁹See, for example, the study by Pontiff (1996), which shows how the cost of arbitraging these discounts eliminates the profit.

⁴⁰See Pontiff (1995).

⁴¹See Jones, Rendleman, and Latané (1984).

⁴²Not surprisingly, it is often argued that this slow reaction contributes to a momentum pattern.

⁴³A similar pattern has been documented in the corporate bond market, where bond prices react too slowly to new company earnings announcements as well as to changes in company debt ratings.

⁴⁴See Brown (1997) for a summary of evidence supporting the existence of this anomaly. See Zarowin (1989) for evidence regarding the role of size in explaining abnormal returns to surprises; Alexander, Goff, and Peterson (1989) for evidence regarding transaction costs and unexpected earnings strategies; and Kim and Kim (2003) for evidence indicating that the anomalous returns can be explained by risk factors.

that helps price and market the newly issued shares. After the offering is complete, the new shares trade on a stock market for the first time. Given the risk that investment bankers face in trying to sell a new issue for which the true price is unknown, it is perhaps not surprising to find that, on average, the initial selling price is set too low and that the price increases dramatically on the first trading day. The percentage difference between the issue price and the closing price at the end of the first day of trading is often referred to as the degree of underpricing.

The evidence suggests that, on average, investors who are able to buy the shares of an IPO at their offering price may be able to earn abnormal profits. For example, during the Internet bubble of 1995–2000, many IPOs ended their first day of trading up by more than 100 percent. Such performance, however, is not always the case. Sometimes the issues are priced too high, which means that share prices drop on their first day of trading. In addition, the evidence also suggests that investors buying after the initial offering are not able to earn abnormal profits because prices adjust quickly to the “true” values, which supports semistrong market efficiency. In fact, the subsequent long-term performance of IPOs is generally found to be below average. Taken together, the IPO underpricing and the subsequent poor performance suggests that the markets are overly optimistic initially (i.e., investors overreact).

Some researchers have examined closely why IPOs may appear to have anomalous returns. Because of the small size of the IPO companies and the method of equally weighting the samples, what appears to be an anomaly may simply be an artifact of the methodology.⁴⁵

4.3.4. Predictability of Returns Based on Prior Information

A number of researchers have documented that equity returns are related to prior information on such factors as interest rates, inflation rates, stock volatility, and dividend yields.⁴⁶ But finding that equity returns are affected by changes in economic fundamentals is not evidence of market inefficiency and would not result in abnormal trading returns.⁴⁷

Furthermore, the relationship between stock returns and the prior information is not consistent over time. For example, in one study, the relationship between stock prices and dividend yields changed from positive to negative in different periods.⁴⁸ Hence, a trading strategy based on dividend yields would not yield consistent abnormal returns.

4.4. Implications for Investment Strategies

Although it is interesting to consider the anomalies just described, attempting to benefit from them in practice is not easy. In fact, most researchers conclude that observed anomalies are not violations of market efficiency but, rather, are the result of statistical methodologies used to detect the anomalies. As a result, if the methodologies are corrected, most of these anomalies disappear.⁴⁹ Another point to consider is that in an efficient market, overreactions may occur, but then so do underreactions.⁵⁰ Therefore, on average, the markets are efficient. In other words, investors face challenges when they attempt to translate statistical anomalies

⁴⁵See Brav and Gompers (1997) and Brav, Geczy, and Gompers (1995).

⁴⁶See, for example, Fama and Schwert (1977) and Fama and French (1988).

⁴⁷See Fama and French (2008).

⁴⁸Schwert (2003, Chapter 15).

⁴⁹Fama (1998).

⁵⁰This point is made by Fama (1998).

into economic profits. Consider the following quote regarding anomalies from the *Economist* (“Frontiers of Finance Survey,” 9 October 1993):

Many can be explained away. When transactions costs are taken into account, the fact that stock prices tend to over-react to news, falling back the day after good news and bouncing up the day after bad news, proves unexploitable: price reversals are always within the bid-ask spread. Others such as the small-firm effect, work for a few years and then fail for a few years. Others prove to be merely proxies for the reward for risk taking. Many have disappeared since (and because) attention has been drawn to them.

It is difficult to envision entrusting your retirement savings to a manager whose strategy is based on buying securities on Mondays, which tends to have negative returns on average, and selling them on Fridays. For one thing, the negative Monday returns are merely an average, so on any given week, they could be positive. In addition, such a strategy would generate large trading costs. Even more importantly, investors would likely be uncomfortable investing their funds in a strategy that has no compelling underlying economic rationale.

5. BEHAVIORAL FINANCE

Behavioral finance is a field of financial thought that examines investor behavior and how this behavior affects what is observed in the financial markets. The behavior of individuals, in particular their cognitive biases, has been offered as a possible explanation for a number of pricing anomalies. In a broader sense, behavioral finance attempts to explain why individuals make the decisions that they do, whether these decisions are rational or irrational. The focus of much of the work in this area is on the cognitive biases that affect investment decisions.

Most asset-pricing models assume that markets are rational and that the intrinsic value of a security reflects this rationality. But market efficiency and asset-pricing models do not require that each individual is rational—rather, only that the market is rational. This leaves a lot of room for individual behavior to deviate from rationality. Even if individuals deviate from rationality, however, there may still be no room for profitable arbitrage for any observed mispricing in the financial markets.

5.1. Loss Aversion

In most financial models, the assumption is that investors are risk averse. **Risk aversion** implies that, although investors dislike risk, they are willing to assume risk if adequately compensated in the form of higher expected returns. In the most general models, researchers assume that investors do not like risk, whether the risk is that the returns are higher than expected or lower than expected. Behavioralists, however, allow for the possibility that this dislike for risk is not symmetrical. For example, some argue that behavioral theories of loss aversion can explain observed overreaction in markets, such that investors dislike losses more than they like comparable gains.⁵¹ If loss aversion is more important than risk aversion, researchers should observe that investors overreact.⁵² Although this can explain the

⁵¹See DeBondt and Thaler (1985) and Tversky and Kahneman (1981).

⁵²See Fama (1998).

overreaction anomaly, evidence also suggests that underreaction is just as prevalent as overreaction, which counters these arguments.

5.2. Overconfidence

One of the behavioral biases offered to explain pricing anomalies is overconfidence. If investors are overconfident, they place too much emphasis on their ability to process and interpret information about a security. Overconfident investors do not process information appropriately, and if there is a sufficient number of these investors, stocks will be mispriced.⁵³ But most researchers argue that this mispricing is temporary, with prices correcting eventually. The issues, however, are how long it takes prices to become correctly priced, whether this mispricing is predictable, and whether investors can consistently earn abnormal profits.

Evidence has suggested that overconfidence results in mispricing for U.S., U.K., German, French, and Japanese markets.⁵⁴ This overconfidence, however, is predominantly in higher-growth companies, whose prices react slowly to new information.⁵⁵

5.3. Other Behavioral Biases

Other behavioral theories that have been put forth as explaining investor behavior include the following:

- **Representativeness**, with investors assessing probabilities of outcomes depending on how similar they are to the current state.
- **Gambler's fallacy**, in which recent outcomes affect investors' estimates of future probabilities.
- **Mental accounting**, in which investors keep track of the gains and losses for different investments in separate mental accounts.
- **Conservatism**, where investors tend to be slow to react to changes.
- **Disposition effect**, in which investors tend to avoid realizing losses but, rather, seek to realize gains.
- **Narrow framing**, in which investors focus on issues in isolation.⁵⁶

The basic idea of these theories is that investors are humans and, therefore, imperfect and that the beliefs they have about a given asset's value may not be homogeneous. These behaviors help explain observed pricing anomalies. But the issue, which is controversial, is whether these insights help exploit any mispricing. In other words, researchers can use investor behavior to explain pricing, but can investors use it to predict how asset prices will be affected?

⁵³Another aspect to overconfidence is that investors who are overconfident in their ability to select investments and manage a portfolio tend to use less diversification, investing in what is most familiar. Therefore, investor behavior may affect investment results—returns and risk—without implications for the efficiency of markets.

⁵⁴Scott, Stumpp, and Xu (2003) and Boujelbene Abbas, Boujelbene, and Bouri (2009).

⁵⁵Scott, Stumpp, and Xu (2003).

⁵⁶For a review of these behavioral issues, see Hirshleifer (2001).

5.4. Information Cascades

One application of behavioral theories to markets and pricing focuses on the role of personal learning in markets, where personal learning is what investors learn by observing trading outcomes and what they learn from “conversations”—ideas shared among investors about specific assets and the markets.⁵⁷ This approach argues that social interaction and the resultant contagion is important in pricing and can explain such phenomena as price changes without accompanying news and mistakes in valuation.

Biases that investors possess, such as framing or mental accounting, can lead to herding behavior or information cascades. Herding and information cascades are related but not identical concepts. **Herding** is clustered trading that may or may not be based on information.⁵⁸ An **information cascade**, in contrast, is the transmission of information from those participants who act first and whose decisions influence the decisions of others. Those who are acting on the choices of others may be ignoring their own preferences in favor of imitating the choices of others. In particular, information cascades may occur with respect to the release of accounting information because accounting information is noisy. For example, the release of earnings is noisy because it is uncertain what the current earnings imply about future earnings.

Information cascades may result in serial correlation of stock returns, which is consistent with overreaction anomalies. Do information cascades result in correct pricing? Some argue that if a cascade is leading toward an incorrect value, this cascade is “fragile” and will be corrected because investors will ultimately give more weight to public information or the trading of a recognized informed trader.⁵⁹ Information cascades, although documented in markets, do not necessarily mean that investors can exploit them as profitable trading opportunities.

Are information cascades rational? If the informed traders act first and uninformed traders imitate the informed traders, this behavior is consistent with rationality. The imitation trading by the uninformed traders helps the market incorporate relevant information and improves market efficiency.⁶⁰ The empirical evidence is consistent with the idea that information cascades are greater for a stock when the information quality regarding the company is poor.⁶¹ Hence, information cascades are enhancing the information available to traders.

5.5. Behavioral Finance and Efficient Markets

The use of behavioral theories to explain observed pricing is an important part of the understanding of how markets function and how prices are determined. Whether there is a behavioral explanation for market anomalies remains a debate. Pricing anomalies are continually being uncovered, and then statistical and behavioral explanations are offered to explain these anomalies.

On the one hand, if investors must be rational for efficient markets to exist, then all the foibles of human investors suggest that markets cannot be efficient. On the other hand, if all that is required for markets to be efficient is that investors cannot consistently beat the market on a risk-adjusted basis, then the evidence does support market efficiency.

⁵⁷Hirshleifer and Teoh (2009).

⁵⁸The term used when there is herding without information is “spurious herding.”

⁵⁹Avery and Zemsky (1999).

⁶⁰Another alternative is that the uninformed traders are the majority of the market participants and the imitators are imitating not because they agree with the actions of the majority but because they are looking to act on the actions of the uninformed traders.

⁶¹Avery and Zemsky (1999) and Bikhchandani, Hirshleifer, and Welch (1992).

6. SUMMARY

This chapter has provided an overview of the theory and evidence regarding market efficiency and has discussed the different forms of market efficiency as well as the implications for fundamental analysis, technical analysis, and portfolio management. The general conclusion drawn from the efficient market hypothesis is that it is not possible to beat the market on a consistent basis by generating returns in excess of those expected for the level of risk of the investment.

Additional key points include the following:

- The efficiency of a market is affected by the number of market participants and depth of analyst coverage, information availability, and limits to trading.
- There are three forms of efficient markets, each based on what is considered to be the information used in determining asset prices. In the weak form, asset prices fully reflect all market data, which refers to all past price and trading volume information. In the semistrong form, asset prices reflect all publicly known and available information. In the strong form, asset prices fully reflect all information, which includes both public and private information.
- Intrinsic value refers to the true value of an asset, whereas market value refers to the price at which an asset can be bought or sold. When markets are efficient, the two should be the same or very close. But when markets are not efficient, the two can diverge significantly.
- Most empirical evidence supports the idea that securities markets in developed countries are semistrong-form efficient; however, empirical evidence does not support the strong form of the efficient market hypothesis.
- A number of anomalies have been documented that contradict the notion of market efficiency, including the size anomaly, the January anomaly, and the winners–losers anomalies. In most cases, however, contradictory evidence both supports and refutes the anomaly.
- Behavioral finance uses human psychology, such as cognitive biases, in an attempt to explain investment decisions. Whereas behavioral finance is helpful in understanding observed decisions, a market can still be considered efficient even if market participants exhibit seemingly irrational behaviors, such as herding.

PROBLEMS

1. In an efficient market, the change in a company's share price is *most likely* the result of:
 - A. Insiders' private information.
 - B. The previous day's change in stock price.
 - C. New information coming into the market.
2. Regulation that restricts some investors from participating in a market will *most likely*:
 - A. Impede market efficiency.
 - B. Not affect market efficiency.
 - C. Contribute to market efficiency.
3. With respect to efficient market theory, when a market allows short selling, the efficiency of the market is *most likely* to:
 - A. Increase.
 - B. Decrease.
 - C. Remain the same.

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4. Which of the following regulations will *most likely* contribute to market efficiency?
Regulatory restrictions on:
 - A. Short selling.
 - B. Foreign traders.
 - C. Insiders trading with nonpublic information.
 5. Which of the following market regulations will *most likely* impede market efficiency?
 - A. Restricting traders' ability to short sell.
 - B. Allowing unrestricted foreign investor trading.
 - C. Penalizing investors who trade with nonpublic information.
 6. If markets are efficient, the difference between the intrinsic value and market value of a company's security is:
 - A. Negative.
 - B. Zero.
 - C. Positive.
 7. The intrinsic value of an undervalued asset is:
 - A. Less than the asset's market value.
 - B. Greater than the asset's market value.
 - C. The value at which the asset can currently be bought or sold.
 8. The market value of an undervalued asset is:
 - A. Greater than the asset's intrinsic value.
 - B. The value at which the asset can currently be bought or sold.
 - C. Equal to the present value of all the asset's expected cash flows.
 9. With respect to the efficient market hypothesis, if security prices reflect *only* past prices and trading volume information, then the market is:
 - A. Weak-form efficient.
 - B. Strong-form efficient.
 - C. Semistrong-form efficient.
 10. Which one of the following statements *best* describes the semistrong form of market efficiency?
 - A. Empirical tests examine the historical patterns in security prices.
 - B. Security prices reflect all publicly known and available information.
 - C. Semistrong-form efficient markets are not necessarily weak-form efficient.
 11. If markets are semistrong efficient, standard fundamental analysis will yield abnormal trading profits that are:
 - A. Negative.
 - B. Equal to zero.
 - C. Positive.
 12. If prices reflect all public and private information, the market is *best* described as:
 - A. Weak-form efficient.
 - B. Strong-form efficient.
 - C. Semistrong-form efficient.

13. If markets are semistrong-form efficient, then passive portfolio management strategies are *most likely* to:
 - A. Earn abnormal returns.
 - B. Outperform active trading strategies.
 - C. Underperform active trading strategies.
14. If a market is semistrong-form efficient, the risk-adjusted returns of a passively managed portfolio relative to an actively managed portfolio are *most likely*:
 - A. Lower.
 - B. Higher.
 - C. The same.
15. Technical analysts assume that markets are:
 - A. Weak-form efficient.
 - B. Weak-form inefficient.
 - C. Semistrong-form efficient.
16. Fundamental analysts assume that markets are:
 - A. Weak-form inefficient.
 - B. Semistrong-form efficient.
 - C. Semistrong-form inefficient.
17. If a market is weak-form efficient but semistrong-form inefficient, then which of the following types of portfolio management is *most likely* to produce abnormal returns?
 - A. Passive portfolio management.
 - B. Active portfolio management based on technical analysis.
 - C. Active portfolio management based on fundamental analysis.
18. An increase in the time between when an order to trade a security is placed and when the order is executed *most likely* indicates that market efficiency has:
 - A. Decreased.
 - B. Remained the same.
 - C. Increased.
19. With respect to efficient markets, a company whose share price reacts gradually to the public release of its annual report *most likely* indicates that the market where the company trades is:
 - A. Semistrong-form efficient.
 - B. Subject to behavioral biases.
 - C. Receiving additional information about the company.
20. Which of the following is *least likely* to explain the January effect anomaly?
 - A. Tax-loss selling.
 - B. Release of new information in January.
 - C. Window dressing of portfolio holdings.
21. If a researcher conducting empirical tests of a trading strategy using time series of returns finds statistically significant abnormal returns, then the researcher has *most likely* found:
 - A. A market anomaly.
 - B. Evidence of market inefficiency.
 - C. A strategy to produce future abnormal returns.

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22. Which of the following market anomalies is inconsistent with weak-form market efficiency?
- A. Earnings surprise.
 - B. Momentum pattern.
 - C. Closed-end fund discount.
23. Researchers have found that value stocks have consistently outperformed growth stocks. An investor wishing to exploit the value effect should purchase the stock of companies with above-average:
- A. Dividend yields.
 - B. Market-to-book ratios.
 - C. Price-to-earnings ratios.
24. With respect to rational and irrational investment decisions, the efficient market hypothesis requires:
- A. Only that the market is rational.
 - B. That all investors make rational decisions.
 - C. That some investors make irrational decisions.
25. Observed overreactions in markets can be explained by an investor's degree of:
- A. Risk aversion.
 - B. Loss aversion.
 - C. Confidence in the market.
26. Like traditional finance models, the behavioral theory of loss aversion assumes that investors dislike risk; however, the dislike of risk in behavioral theory is assumed to be:
- A. Leptokurtic.
 - B. Symmetrical.
 - C. Asymmetrical.