third, under ideal circumstances, market efficiency suggests that the estimated K reflects returns in investments of similar risks, since observed stock prices reflect information about possible alternative investments with different risks and returns.

There is yet another justification for using current stock prices. In measuring K as the sum of dividend yield and growth, the period used in measuring the dividend yield component must be consistent with the estimate of growth that is paired with it. Since the current stock price P_0, is caused by the growth foreseen by investors at the present time and not at any other time, it is clear that the use of spot prices is preferable.

A frequent objection to the use of current stock prices is that they may reflect abnormal conditions, making it more useful to use average prices over a period of time for purposes of estimating the cost of capital. Average stock prices is appropriate during volatile market periods, when stock prices experience large random fluctuations. Visual inspection of a chart of daily closing prices over the last few weeks should reveal whether the current stock price is representative or is an outlier. If the current stock price is not an outlier, the use of the current stock price is corroborated. If the current stock price is indeed an outlier there is some justification for averaging over several trading days to smooth out market aberrations, as would be the case after a stock goes ex-dividend or after a large block sale of stock held by a financial institution, for example. But the longer the past period over which stock prices are averaged, the more severe the violation of market efficiency. A stock price dating back to the previous year, as some analysts advocate, reflects stale information and is not representative of current market conditions.

An analogy with interest rates will clarify this point. If, for example, interest rates have climbed from 10% to 12% over the past 6 months, it would be incorrect to state that the current interest rate is in the range of 10% to 12% just because this is the interest rate range for the past 6 months. Analogously, it is incorrect to state that the cost of equity, which has also risen along with interest rates, is in some given 6-month range. Just as the current interest rate is 12%, the cost of equity is currently that which is obtained from the standard DCF using current spot prices.

To guard against the possibility that the current stock price reflects abnormal conditions or constitutes a temporary aberration, while at the same time retaining the spirit of market efficiency, averaging stock prices over several recent trading days is a reasonable compromise. When estimating a current or near-term cost of equity, averaging stock prices over a short period is appropriate. The average closing stock price calculated over the most recent 10 trading days period at the time of estimating the cost

of equity is a reasonable procedure. A similar average computed over a 1-month period rather than a 10-day period would not be unreasonable. Averaging the high and low stock prices for the most recent month is also a reasonable procedure. Closing stock prices can be obtained via modem from Dow Jones News Retrieval's Historical Quotes service or from Standard & Poor's Stock Guide.

It should be pointed out that averaging stock prices in periods when stock prices are rising will understate the stock price and overstate the current cost of common equity, and conversely.

In the special case of certain utility stocks traded over the counter, an estimate of current price may be obtained by averaging the most recent bid and ask prices. If the stock is thinly traded, there is some justification for averaging over several trading days, at the expense of market efficiency.

One compromise approach that eliminates the bias caused by averaging stock prices and yet is consistent with market efficiency principles is the random-walk model. Under this statistical approach, the correct price is the current observable price. The variability of stock price, as measured by the standard deviation of the residuals from the model, measures the stability of the stock price. The random-walk model takes the following form:

$$P_t = P_{t-1} + \varepsilon \qquad (5\text{-}2)$$

where P_t = stock price in period t

P_{t-1} = stock price in period t–1

ε = forecast error

In words, the random-walk model asserts that the best forecast of today's stock price is yesterday's stock price, along with some forecasting error, and not some combination of previous stock prices. In practice, the analyst observes the current stock price, along with its volatility over the past year, as measured by the standard deviation. The standard deviation around the current stock price provides a 95% confidence interval. For example, if the current stock price is $50 and the standard deviation measured over the last year is $3.00, the random-walk model would employ a stock price ranging from $47 to $53. An example and exposition of this approach is found in Kihm and Rankin (1988).

FIFTH EDITION

PRINCIPLES OF CORPORATE FINANCE

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the vocabulary of financing has to be acquired. You will learn about *tombstones, red herrings, balloons, sinking funds,* and many other exotic beasts—behind each of these terms lies an interesting story.

There are also ways in which financing decisions are much easier than investment decisions. First, financing decisions do not have the same degree of finality as investment decisions. They are easier to reverse. In other words, their abandonment value is higher. Second, it's harder to make or lose money by smart or stupid financing strategies. In other words, it is difficult to find financing schemes with NPVs significantly different from zero. That reflects the nature of the competition.

When the firm looks at capital investment decisions, it does *not* assume that it is facing perfect, competitive markets. It may have only a few competitors that specialize in the same line of business in the same geographical area. And it may own some unique assets that give it an edge over its competitors. Often these assets are intangibles, such as patents, expertise, reputation, or market position. All this opens up the opportunity of making superior profits and of finding projects with positive NPVs. It also makes it difficult to tell whether any specific project truly has a positive NPV.

In financial markets your competition is all other corporations seeking funds, to say nothing of the state, local, and federal governments, financial institutions, individuals, and foreign firms and governments that also go to New York, London, or Tokyo for financing. The investors who supply financing are comparably numerous, and they are smart: Money attracts brains. The financial amateur often views capital markets as *segmented,* that is, broken down into distinct sectors. But money moves between those sectors, and it moves fast.

Remember that a good financing decision generates a positive NPV. It is one in which the amount of cash raised exceeds the value of the liability created. But turn that statement around. If selling a security generates a positive NPV for you, it must generate a negative NPV for the buyer. Thus, the loan we discussed was a good deal for your firm but a negative NPV investment from the government's point of view. By lending at 3 percent, it offered a $43,012 subsidy.

What are the chances that your firm could consistently trick or persuade investors into purchasing securities with negative NPVs to them? Pretty low. In general, firms should assume that the securities they issue are fairly priced.

Efficient Capital Markets

We are leading up to the fundamental financial concept of **efficient capital markets:** *If capital markets are efficient, then purchase or sale of any security at the prevailing market price is never a positive-NPV transaction.* Does that sound like a sweeping statement? It is. That is why we have devoted all the rest of this chapter to the history, logic, and tests of the efficient-market hypothesis.

You may ask why we start our discussion of financing issues with this conceptual point, before you have even the most basic knowledge about securities, issue procedures, and financial institutions. We do it this way because financing decisions seem overwhelmingly complex if you don't learn to ask the right questions. We are afraid you might flee from confusion to the myths that often dominate popular discussion of corporate financing. You need to understand the efficient-market hypothesis not because it is *universally* true but because it leads you to ask the right questions.

13-2 WHAT IS AN EFFICIENT MARKET?

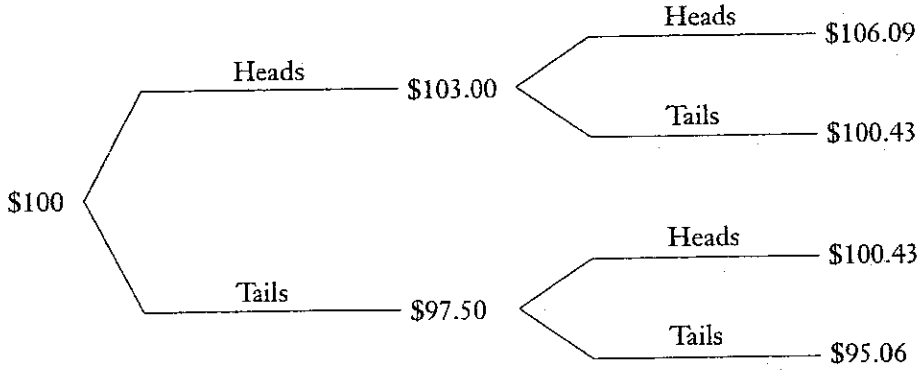
When economists say that the security market is "efficient," they are not talking about whether the filing is up to date or whether desktops are tidy. They mean that information is widely and cheaply available to investors and that all relevant and as-

certainable information is already reflected in security prices. That is why purchases or sales in an efficient market cannot be positive-NPV transactions.

A Startling Discovery: Price Changes Are Random

As is so often the case with important ideas, this concept of efficient markets was a by-product of a chance discovery. In 1953 the Royal Statistical Society met in London to discuss a rather unusual paper.[2] Its author, Maurice Kendall, was a distinguished statistician, and the subject was the behavior of stock and commodity prices. Kendall had been looking for regular price cycles, but to his surprise he could not find them. Each series appeared to be "a 'wandering' one, almost as if once a week the Demon of Chance drew a random number . . . and added it to the current price to determine the next week's price." In other words, prices seemed to follow a *random walk*.

If you are not sure what we mean by "random walk," you might like to think of the following example: You are given $100 to play a game. At the end of each week a coin is tossed. If it comes up heads, you win 3 percent of your investment; if it is tails, you lose 2.5 percent. Therefore, your capital at the end of the first week is either $103.00 or $97.50. At the end of the second week the coin is tossed again. Now the possible outcomes are:



This process is a random walk with a positive drift of .25 percent per week.[3] It is a random walk because successive changes in value are independent. That is, the odds each week are 50 percent, regardless of the value at the start of the week or of the pattern of heads and tails in the previous weeks.

If you find it difficult to believe that there are no patterns in share price changes, look at the two charts in Figure 13-1. One of these charts shows the outcome from playing our game for 5 years; the other shows the actual performance of the Standard and Poor's index for a 5-year period. Can you tell which one is which?[4]

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[2]See M. G. Kendall, "The Analysis of Economic Time-Series, Part I. Prices," *Journal of the Royal Statistical Society*, 96:11–25 (1953).

[3]The drift is equal to the expected outcome: 1/2 (3) + 1/2 (−2.5) = .25%

[4]The top chart in Figure 13-1 shows the real Standard and Poor's index for the years 1980 through 1984; the bottom chart is a series of cumulated random numbers. Of course, 50 percent of you will have guessed right, but we bet it was just a guess. A similar comparison between cumulated random numbers and actual price series was first suggested by H. V. Roberts, "Stock Market 'Patterns' and Financial Analysis: Methodological Suggestions," *Journal of Finance*, 14:1–10 (March 1959).

ILLINOIS COMMERCE COMMISSION
STAFF DATA REQUEST

Utility Company: AQUA ILLINOIS, INC.

Docket No.: 06-0285 Date Submitted: 09/15/06

Submitted By: Pauline M. Ahern, AUS Consultants (856) 234-9200

FD 7.02 Please provide the NAIC debt ratings for each Aqua America, Inc. subsidiary that is not rated by Standard & Poor's. Include supporting documentation in the response.

Answer: The bonds issued in a private placement by Aqua Illinois, Aqua New Jersey, Aqua Maine and Aqua Ohio are rated NAIC-2. Other subsidiaries are not rated by NAIC.

ILLINOIS COMMERCE COMMISSION
STAFF DATA REQUEST

Utility Company: AQUA ILLINOIS, INC.

Docket No.: 06-0285 Date Submitted: 09/15/06

Submitted By: Pauline M. Ahern, AUS Consultants (856) 234-9200

FD 7.03 Please specify which of the companies listed on Aqua Exhibit 3, Appendix A, and Company response to Staff data request FD 4.05 are subsidiaries of Aqua America, Inc.

Answer: The Companies in Appendix A which are subsidiaries of Aqua America, Inc. are:

Aqua Illinois, Inc.
Aqua Virginia, Inc.
Consumers Illinois Water Company (now Aqua Illinois, Inc.)
Consumers Maine Water Company
Consumers New Jersey Water Company (now Aqua New Jersey, Inc.)

The companies in Attachment FD 4.05 which are subsidiaries of Aqua America, Inc. are;

Aqua New Jersey, Inc. (formerly Consumers New Jersey Water Co.)
Aqua Illinois, Inc. (formerly Consumers Illinois Water Co.)
Consumers Maine Water Company
Aqua Virginia, Inc.