

# CHAPTER 5

# The Game and the Real World

## Overview

FG companies operate in an environment that is similar to the operating environment of actual companies. Some of the game conditions described in Chapter 4 are unrealistic, and game participants should be aware of this. Game players also often believe that some FG conditions are unrealistic while these are commonly found in actual companies. To alleviate confusion, similarities and dissimilarities between the game and an actual operating environment are described. The material can also aid the FG manager in transferring, or envisioning how to transfer, knowledge gained from the game to an actual firm.

## General Conditions

The major reasons for divergence between FG and an operating company's conditions and models are explained first. Some of the general environmental conditions outlined in Chapters 1 and 4 are examined for game and real-world differences. The second section of this chapter examines differences in conditions governing specific decisions, financial statement accounts, and performance.

## Why Differences Exist

Some differences between the game and an actual environment exist by intention while others exist due to an inability to duplicate the real world. The intentional differences make the decision environment simpler so that FG managers can derive optimal decisions within the short time span and periods of play experienced in FG.

### *The Use of Simple Models*

Using realistic highly complex multivariate models in a game would increase confusion and decrease effective learning. Consequently, the game is composed of a set of fairly simple models abstracted from the more realistic comprehensive models.

The more complete and complex multivariate models currently available in the fields of finance and economics are not used.

**Example.** The Federal Reserve Board (Fed) might use a complex multivariate model, including possibly dozens of variables, to estimate future interest rates and judge how different Fed policies could affect interest rates. Incorporation of this same model in FG is feasible but not desirable. The game participants in 10 or 15 iterations could not be expected to derive the nature of the underlying model and use it to estimate the economy's impact on their companies' future interest rates, product demand, unit price and cost of machinery and plant.

Purposes and objectives of the game are achieved with less complex models, even though some degree of realism is sacrificed. The substantial number of security valuation, interest rate, price–demand, and cost functions in the game makes the decision requirements sufficiently complex.

### ***Real-World Models—Difficult to Define***

Actual underlying conditions are often too complex to define with any degree of confidence.

- *The number of variables that affect a given dependent variable might be very large.* The ability to specify a model is generally inversely related to the number of variables.

**Example.** A company's interest rates are determined by fiscal and monetary policies, the business cycle, the geographic location of the firm, the industrial sector or sectors the firm operates in, the firm's operating and financial leverage, and a host of other contractual conditions imposed by different security and stakeholders.

- *Each relevant variable can have different lagged effects.* The complexity of the required explanatory model increases even more when conditions of a company are impacted from decisions made earlier in the company's life. The models can explode in size and complexity as all the possible relevant items are considered.

**Example.** Money supply may have a lagged effect on interest rates. These rates could be affected by the money supply in each of the past 48 months. Each month's supply rate could have a different weighted effect on the interest rates. Whereas a simple model would have incorporated one variable for money supply, the more complex one would require 48 separate variables.

- *Many of the determining variables can affect the dependent variable in unanticipated and obscure ways.*

**Example.** The total money supply might directly affect interest rates, while additional effects come from the percent rate of change in the money supply.

### ***Adopting Theoretically Sound Models***

The game has incorporated theoretically sound normative models where real-world models are unknown. The literature in finance includes numerous studies using actual data to test the soundness of theoretically derived models on the effect of company policies. Different studies have supported, rejected, or found inconclusive the proposed models.

Actual conditions are often difficult to duplicate in a game. FG adopts optimal debt leverage and dividend policy models.

**Example.** Conflicting and therefore inconclusive evidence exists on the effect of financial leverage on a company's weighted cost of capital. Some studies have supported the assertion that leverage affects the firm's cost of capital, whereas other empirical studies have refuted the existence of an effect. If there were an effect, the firm's policy on financial leverage would affect both the cost of capital and the total value of the firm. The management planning function is increased when the assumption is adopted that financial leverage affects capital costs, and this is an assumption adopted by most managers. Thus, to increase the participant's exposure to decision making in as many areas as possible, FG adopts an interest rate model for debt and a valuation model for preferred and common stock that is affected by the firm's financial leverage position.

When there is a question in the literature on the choice of explanatory models, FG generally includes the normative model in which the concerned variables affect firm valuation. This is consistent with a major aim of the game to expose FG managers to the most comprehensive decision-making situation possible, given the constraints of both the iterations of play, the participant's time, and prior conditions on limiting the number of affecting variables.

## Uncertainty in the Game

The degree and type of uncertainty in FG provide a decision-making environment quite like that of an actual firm. The greatest uncertainty in the game exists when play first commences.

### *Producing an Unknown Product*

The FG manager is not familiar with the product the firm produces. With knowledge of the type of product—for example, fad-oriented toys or lightbulbs—managers could subjectively assess the reliability of the price and demand forecasts and anticipate the business risk of their firm. For planning purposes, this would decrease the relative uncertainty in the early iterations of the game.

The starting FG manager is given a firm not too unlike a new firm entering a new product area; little is known initially. The product is purposely undisclosed to prevent the game player from drawing on either rules of thumb or specific real-world industry data in initially estimating the reliability of the forecast data provided in the FG quarter 1 statements. No differential advantage is gained by managers seeking information outside the game manual. This requires the manager to focus on information in the quarter 1 statements to derive estimates of the type of product being produced.

The large initial uncertainty provides experience not easily obtained through other sources. The intent is to motivate the manager to find ways of rapidly securing further information to reduce uncertainty and, if necessary, to postpone decisions that might harm the company if there is insufficient information for a reasoned and sound decision. Thus, the game sacrifices some realism to increase demands on planning by the new manager. As the game progresses, managers gain knowledge of both the reliability of the forecast information and the nature of the firm's product. Uncertainty decreases and the game play comes closer to duplicating the decision environment in a real-world established company.

Managers must judge the reliability of the forecasts and seek information on better forecasting.

### **Uncertain Future Product Demand and Price**

A continuing source of uncertainty in the game comes from the varying reliability of the forecasts. Each period's estimated future price and unit demand provide the manager with information used to establish machine and plant purchases and the size and timing of external funding.

The forecast of future prices and unit demand are given for the next four quarters on the FG quarterly Summary Sheet. This deviates from the practice of many actual firms, which project information much further into the future. Again, the nature of the product sold would dictate the relevance of projections over a more lengthy time period.

**Example.** An electric utility company can anticipate quite accurately the increases in demand it will face for several years. On the other hand, a women's clothing manufacturer might have difficulty judging the market response to new garments offered in the coming quarter.

To enable the game to be reused over many semesters, it is purposely constructed to include forecasts with different degrees of reliability along with different price and demand patterns. The instructor can change the simulation to have an environment similar to that found in an electric utility company, a women's clothing manufacturer, or a firm somewhere between the two in terms of demand stability and certainty.

The confidence a manager can place in her decision is directly related to the forecast reliability.

**Example.** A manager could justifiably have different responses to an expanded product demand estimate of 20,000 units. If estimates are accurate, and assuming profitability will be enhanced by sales of an additional 20,000 units, the decision to increase the amount of plant and machinery to meet estimates is justified. Alternatively, if estimates are subject to large error, the actual future demand might be very uncertain. The additional risk associated with the increased fixed costs of possibly idle capacity might encourage the manager to postpone expansion. The increases in risk might outweigh the potential gains from possibly larger sales and profits.

The manager must assess the reliability of the forecast information. A proper strategy places very little confidence in the estimates until their accuracy has been determined. In the game, the accuracy can be increased by the purchase of additional forecasts. After a number of iterations, the manager will gain increased knowledge about forecast reliability.

Forecasting in the game is not limited to the four-quarter projections provided each quarter. If the data were reliable and secular growth or a repetitious pattern of demand changes is evident, the manager might, after several forecasts and several periods of play, project demand and price estimates past the four periods of information provided. This could enhance the long-term planning function for the FG manager.

### **Operating Leverage and the Game**

One approximation of business risk can be derived from the distribution of a company's possible operating profit outcomes. This distribution, in turn, will be derived from the firm's operating leverage, the volatility of product price, the unit demand, and the correlation between movements of product price and unit demand. All these items are primarily determined by the nature of the product being produced and only partially determined by management decisions.

Operating leverage comes from both the company's industry and management decisions.

The major items that affect the firm's operating leverage are not controlled by the FG manager. Unlike many actual managers, the FG manager has no choice of the product being produced. Game rules govern the amount and cost of the plant, machinery, materials, and other fixed and variable inputs required for production. Relatively minor changes in operating leverage can be affected by capital budgeting decisions.

The amount of operating leverage is further influenced by the type of production scheduling used. Operating leverage will be greater for firms that maintain higher capacity levels to produce for maximum demand than for firms that either lose sales in peak demand periods or smooth production and meet peak demand with prior buildups in inventory. With respect to operating leverage, the FG manager must assume a role similar to that of a division manager. He cannot escape the possible problems of volatile earnings, low profitability, and lost liquidity by acquiring a new product line, changing businesses, or finding a new employer.

### **Financial Leverage and the Game**

The risk of operating a firm is directly related to the amount of financial leverage the firm uses. This condition is completely controlled by the FG manager. By the issuance or retirement of debt and equity, the manager controls the company's financial leverage. Most of the conditions and rules that govern the various FG debt and equity securities are found in today's operating companies. The constraints on debt and equity placed on the operation of an FG company are generally less stringent than those found in many current companies.

Three restraints generally control the financial leverage of the firm:

- Many companies are kept from increasing financial leverage beyond a prescribed level due to limitations imposed by the debt holder. Debt indentures often specify a maximum debt ceiling and many other earnings and asset restrictions. The restrictions are imposed in an attempt to guarantee adequate interest and principal payments. The contract requirements attempt to protect debt holders from liquidating payments being made to equity holders while the debt holders' future claims will go unsatisfied.
- Specific company managers might be very risk-averse and arbitrarily restrain the firm from taking on judicious amounts of financial leverage. This policy could easily run counter to the wealth maximization of common stockholders if the company fails to have reasonable levels of debt given the operating risk position of the company.
- The shareholder clientele of the firm places restraints by requiring higher returns for their investment in highly leveraged firms. Beyond a point, the gains achieved by substituting lower-yield fixed-cost obligations for equity ownership are not sufficient to cover the shareholders' increasing risks. Beyond this point, increases in leverage will decrease common stockholder wealth.

Managers fully control the financial leverage of their company.

When making decisions on financial leverage, the FG manager must consider how each financial leverage restraint affects the measures of firm performance. The risk aversion of the manager directly enters this process since both the average value and the variability of the performance measures are affected by this decision.

## Constraints on Flexibility

Management options available in the game are more limited than options available to managers in many operating firms. The manager cannot change products, sell excess plant and machinery or stockpile excess materials or inventory in anticipation of price increases, control selling and administration costs, or negotiate loan covenants. These are only a few of the areas in which operating managers often have additional control that is not available in the FG firm. Thus, the game manager has less flexibility than an operating manager.

**Example.** Assume a manager acquires an additional 20,000 units of plant capacity and then finds that the estimated unit demand projections were in error and the projected demand increase is not achieved. An actual firm might find a new market for the additional capacity by repricing the new output at a price exceeding the variable costs. Some contributions to the firm would be obtained even though the return might not match initial expectations. Alternatively, a decision might be made to abandon. The excess plant capacity could be sold immediately. Cash flows would be generated from both the sales value and the tax effect of any loss realized on the sale. As a third alternative, the plant capacity might be left temporarily idle in anticipation of future needs and/or leased. A manager could choose any of these alternatives or possibly a combination. The choice should maximize the position of the common stockholders. A present-value solution would likely be needed to make the expected wealth-maximizing decision. This range of alternatives is not available to the FG manager. The abandonment alternative is not available. Repricing the entire firm's output is the only possible pricing alternative available.

Examples can be found in the real world that are quite similar to the somewhat restrictive environment of the FG manager. The rules of the game correspond to those of an actual firm where price discrimination is limited and where plant capacity is in a highly specialized area and might not have any resale value. The inherent risk attached to a given decision tends to be higher since the options available for cushioning losses are restricted in the game. The negative consequences of a poor decision are likely to be much more dramatic. Deliberate and careful planning is required to evaluate the risk-to-reward potential of all likely outcomes arising from a given decision.

## Decision Requirements

Decisions must be made continuously in an operating company. FG decisions are made quarterly. With the mundane, but very necessary, daily requirements of an operating manager, it is easy to postpone, avoid, and forget to make the long-term decisions specifically required by the FG manager. If the material is in the wrong warehouse for today's production, a manager devotes time to this temporary problem rather than to next quarter's capital budgeting decisions. Day after day, the longer-term decisions are postponed or avoided.

The game reinforces the importance of long-term planning; it does not expose the game participant to the time-management solutions that encourage techniques and skills needed to jointly solve daily and long-term decisions.

In the real world, searching for financial information and preliminary analysis are important.

The likelihood of being locked into a given decision is greater in the game.

FG managers do not have the daily responsibilities that detract from long-term planning.

FG managers enter the decision process after information is already acquired.

**Example.** With actual capital budgeting projects, costs, labor savings, and overhead cost effects are often not easily obtainable while they are given to FG managers. Changes in power consumption, insurance, parts inventory, material waste, and waste disposal are only a few of the items that need to be evaluated for possible inclusion in an actual project evaluation. None of this information is needed by the FG manager.

Decisions are made that require the following five steps:

1. Searching for initial information that affects a decision.
2. Determining the alternative decisions available.
3. Evaluating the alternatives.
4. Deriving the expected best solution.
5. Implementing the decision.

The emphasis in the game is on steps 3 and 4. In real conditions, step 1 and 2 activities are particularly important for proper firm management.

Game managers may gain the false idea that they have learned to properly manage all of a company while they actually have gained the ability to properly make decisions in only a few of the key stages of the decision process. Only limited experience is provided in the game in allocating scarce management skills efficiently to the different stages. Ability in this area often determines the quality of the manager.

Many companies practice the philosophy that only through experience in the firm can one learn how to make correct decisions for the firm. Partial justification for this comes from the requirements of stage 1, 2, and 5 activities. Success depends on an intimate knowledge of the specific firm's communication channels and information sources. A new manager often has difficulty making decisions because of both a lack of previous experiences in stages 1, 2, and 5 and a lack of knowledge of the specific information channels, rules, and conditions within the company.

The FG manager, even without stage 1 and 2 activities, is exposed to a fairly complex set of conditions. This information system must be mastered before the game manager can effectively make decisions in the firm. Barring the exceptions just provided, the FG manager makes decisions in a setting similar to an actual firm.

## Informal Organizational Structure

The game does not directly incorporate the behavioral and interpersonal interaction effects among employees, customers, suppliers, and regulators critical to the successful operation of any organization. In operating firms, this has a comprehensive effect on the decisions.

Increased experience in decision making using interpersonal interaction can be obtained by having FG companies operated by teams of managers. The group must divide task assignments, compromise on decisions and work procedures, and establish its own peer, dominant, and subordinate relationships. These represent critical skills required by today's employers. Most real-world projects are managed by teams, often different teams for different components and stages of the project completion.

Even though it is a gaming situation, the amount of infighting and intra-group rivalry in FG might make one believe that the companies are real. Interaction has completely failed on a few occasions, and the firm has either stopped operation or continued with some of the managers ceasing to contribute. The failure to contribute

was not due to a lack of knowledge or unwillingness to work; it was caused by attitude and personality conflicts. This experience highlights the dynamics of decision making when personal interaction is required in either the game or an actual operating environment.

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## Large and Small Businesses

The skills learned in the game are transferable to both large and small firms. Differences exist in specific financial instruments, account titles, input costs, and revenue sources.

**Example.** A small retail company will not have the options to obtain preferred stock and many of the types of debt available to an FG company. Coordinating the financial leverage of the firm with operating leverage and the risk preference of its owners is still required, even though financial leverage may have to come from short-term loans secured by receivables and inventories. The same capital budgeting techniques should be applied to a delivery truck replacement decision of a small firm or a \$100 million plant for a large company. Even though the FG manager cannot issue commercial paper and equipment trust certificates, a correct strategy for managing the maturity term structure of liabilities is transferable to the large firm from FG.

Many specific skills needed to operate a given firm are not required in FG; they must be learned before a manager can successfully operate an actual firm. The objective of FG is to get the participant more prepared to enter a new and uncertain environment where much is unknown and must be learned very quickly.

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## Financial Statement Accounts and Performance

The remaining sections of this chapter describe the similarities and differences between the rules and types of costs, revenues, assets, and liabilities found in the game and in an actual operating firm. The material is presented in approximately the same order used to prepare financial statements. Income statement items precede coverage of balance sheet items. Performance measures are described last.

### **Revenues**

As in most manufacturing companies, the major revenue-generating source in the game is from the sale of the finished product. A nominal source of income is from short-term investments.

**Product Sales.** There are obvious differences between a one-product, one-market FG company and most operating companies. Few one-product firms exist today due to large and rapid changes in technology and consumer taste. High levels of diversifiable risk exist with a single-product firm due to product obsolescence rates being faster today than in the past. The ability of a one-product firm to adjust to rapidly changing environments is restricted. This risk is reduced in the multi-product firm where the company can respond to technological changes by shifting the mix of the products and constantly developing new products and product lines. The same risk-reduction techniques can be used to counter fads or shifts in demand.



Greater numbers and variations of marketing and sales options exist in the real world.

Many marketing and sales options used by firms are not available with an FG company:

- Managers cannot offer special services or divide customers into different groups to permit price discrimination and possible higher profits.
- FG does not allow product units to be withheld from sale to achieve expected holding, or windfall, gains from anticipated future price increases since units available for sale will always be used to meet product demand.
- *The pricing and unit supply of other FG firms do not affect the current or future price and unit demand of a specific firm.*
- Unlike many firms, no back-ordering is allowed in the game. Unfilled sales demand in a given period is not added to the following period's demand.

These conditions limit the marketing and product management decision-making requirements of the game to permit a greater concentration of effort on the financial decision variables. The product and market decisions are included in the game to provide the manager with some experience in recognizing the interdependence among financial and other functional area decisions of the firm. The conditions, however, do limit the ability to transfer decision skills gained from the production and marketing segments in FG to the real world.

**Product Sales Estimation.** More accurate demand and price forecasts are generally available to a real company, provided the managers are willing to incur additional time and cost. The FG manager receives the first forecast automatically and can obtain two additional forecasts at higher costs.

In a real situation, the forecasts would be derived from forecasting models based on the general economy, specific lead indicators used in the industrial sector in which the manufacturer is producing, known product life cycle patterns, and possibly direct surveys. Forecast costs may be very substantial depending on the models chosen, the survey techniques and size, and the total data processing requirements.

Game managers have control over only the number of forecasts to be purchased. They cannot control the forecast techniques or the reliability of the forecast. Analysis and judgment are still needed in determining the value of the additional information. A net advantage will come from the difference between the incremental cost of a better forecast and reductions in inventory costs, better capacity usage, and decreases in sales opportunity losses. The analysis of the forecast purchase option needs to be performed regularly since the advantage gained from the additional forecasts can change over time. As game play progresses, the astute player will find lead indicators that provide better estimates than the most expensive forecast, thereby improving forecasting at lower costs and increasing performance relative to less capable managers.

**Cash Flows from Product Sales.** Sales discounts are available to induce earlier payments of receivables. The discounts are used at the wholesale and occasionally the retail levels in many industries. A sales discount is the only accounts receivables policy controllable by an FG manager. The manager does not control the choice of credit customers, the use of quantity discounts, and other legal discriminatory pricing and collection policies that affect marketing and the finance function.

The discount does result in differences in quarterly sales collections and is, therefore, a determinant of the investment balance in accounts receivables. The

Sales discount policy does not affect unit sales in FG.

relationship is realistic to the extent that higher discounts increase receivables collection and decrease the company's investment in accounts receivable.

The effects of the receivables discount policy are somewhat unrealistic. In an actual situation, a change in discount policies often changes the sales demand. Sales demand is not affected by the discount policy in the game. The discount policy is also more flexible in the game. It can be changed quarterly and have no negative consequences on customer loyalty and unit sales levels. In a real-world situation, we would expect negative customer reaction to an uncertain and irregularly changing policy.

**Marketable Securities.** The options available for the temporary investment of excess cash funds are fairly broad for the FG manager. In actual companies, the manager also has a host of possible temporary investment opportunities that enable shifts in both the portfolio's maturity structure and the risk of the underlying securities in the portfolio. All levels of government, special agencies, and private enterprise institutions offer securities of varying maturities. If a security that matures in 90 days is desired, Treasury bills, tax anticipation notes, commercial paper, or many other longer-term securities that have only 90 remaining days to maturity can be used. Both yield and risk vary depending on the financial soundness of the institution issuing or guaranteeing the security.

For either hedging or speculative reasons, the manager could hold a portfolio containing securities with a maturity either longer or shorter than the expected liquidation date of the portfolio. For example, if a manager speculates correctly that long-term interest rates will drop, price appreciation can be gained on long-term bonds purchased for a short-term period. For this reason, long-term bonds, preferred stock, and common stock of other companies are held in temporary investment portfolios by actual companies.

Short-term investment managers must manage the maturity structure, risk, and size of the portfolio. In the game, the size, timing, and risk of the short-term investment are management-controlled decisions. The proper management of temporary funds is stressed.

In FG the yields on short-term marketable securities are quite small relative to the profitability of the product-line investments and the cost of capital. Because of the advantageous profit opportunity of production over marketable securities, the best managers will make the more difficult production decisions and will achieve better performance measures than poorly managed firms that merely place excess funds in marketable securities.

Managers can obtain higher returns in the game by increasing the degree of risk in their short-term investments. The risk could be viewed as coming from selecting securities that have both more credit risk and a longer maturity. In an actual environment, managers can choose both maturity and credit risk with each security purchased, whereas in the game, separate control of the two determinants of risk is not available.

Realism is also lacking because managers cannot obtain longer-term capital gains from their holdings. The game automatically records capital gains and losses at the end of each quarter on short-term investment holdings. In an actual setting, managers could defer the recognition of capital gains or losses to the security sales date and thereby usually obtain a lower effective tax rate.

A penalty for forced liquidation of marketable securities, due to negative ending cash balances in the game, is consistent with what is found in an actual situation. Some large, face-value, short-term securities are not very marketable. For example,

if managers must sell previously purchased tax anticipation notes before maturity, they will often find few buyers who want a note with an identical size, maturity date, and risk. This “thin-market” condition will necessitate a higher yield or a lower selling price, thereby imposing an additional penalty when forced liquidation is required. The game incorporates this penalty to encourage managers to better manage cash and marketable securities. Sound cash management would result in low cash balances, all excess cash invested in short-term marketable securities, and only an occasional forced liquidation of marketable securities and even less often the need for penalty loan financing.

### **Production Costs**

The resources required for production are quite simple in FG. Unlike a multistage product that requires different materials, labor, and equipment at each stage of production, the product is produced in a single stage. The lack of emphasis on decision requirements of a nonfinancial nature is the reason for this simplification.

**Materials, Labor, and Other Overhead Costs.** Early purchase of raw materials in anticipation of cost increases is not allowed in the game. Costs of materials, labor, and other overhead items are also not affected by product demand. Additionally, the manager has no control over cash outflows associated with materials, labor, and other overhead charges. In an actual firm, managers can often postpone cash outflows on some of these items and thus have greater flexibility in maintaining liquidity.

Labor costs per unit vary at different production levels. As production levels increase, the labor costs per unit decrease, first at 60,000 units and again at 100,000. The costs increase at 120,000 units. The underlying nature of the cost function is somewhat realistic. As production increases, fixed levels of employee wages are spread over a larger number of produced units. At high production levels, the costs increase as additional work shifts with less trained employees and higher overtime pay are necessary. The marginal productivity of labor then declines.

In some respects, the changes in labor costs are unlike those in an actual firm. Changes in costs per unit occur at specific per-unit volume levels in discrete, widely spaced steps. A more realistic portrayal might have labor costs decreasing as each additional unit is produced. At a turning point, per-unit cost would gradually increase. Realistic labor cost calculation requirements would be substantial if included in the game. On the other hand, labor contracts with guaranteed minimum hours, minimum overtime guarantees, and specified overtime rate requirements could cause the rate structure to be somewhat like the one used in the game.

**Warehousing Fees.** The financing costs for investment in inventory, as well as the warehousing fees, are carrying costs that need to be considered in formulating production and inventory policies. Storage costs in the game are fully variable. As inventory increases, more expensive facilities or facilities that require greater handling expenses have to be used. A similar cost pattern might be found with a company that rents its needed warehousing space by the square foot. The cost patterns for many firms are quite different from the cost patterns in the game.

- A firm that maintains its own facilities would have fixed warehouse costs. On an average per-unit cost basis, the rate decreases initially as the fixed costs are spread over increasing numbers of units.

Single-stage production and a single product make FG planning much simpler than production in a real company.

- Warehousing costs are normally based on an average daily, monthly, or quarterly inventory base and not exclusively on the quarterly ending levels.
- Many inventory carrying costs are not addressed in FG. Insurance, breakage, spoilage, and obsolescence are not directly included. The warehousing fees could represent costs like the insurance component but not the wastage and spoilage costs since units of product are not lost in a FG company's inventory.

**Machinery and Plant Costs.** As in the real world, the FG manager must maintain plant and machinery capacity levels adequate for the firm's production levels. Both expiration and increases in unit demand may warrant additional purchases of plant and machinery. There are several areas where the conditions that govern the FG firm can vary from conditions that affect a specific company or industry.

- Most actual companies have some variability in their production capacity level. With specific plant and machinery, an actual company might have a maximum capacity of between 90,000 and 110,000 units depending on varying conditions. Weather, employee attitudes, and slight variances in material quality can change the maximum capacity. FG companies have a constant maximum capacity. The game thus has a more certain environment with this factor of production.
- Management often has options on the lead-time requirements of capacity increases in plant and machinery. By either paying bonuses or receiving discounts, a manager can affect the lead time. No options are available in the game to adjust the two-quarter lead time for plant and the one-quarter lead time for machinery. Restrictions on lead time are found in actual situations to justify their use in the game.
- A cash outflow equivalent to the total purchase price of ordered machinery or plant is required in the game. An operating firm manager has many options from postponing payment until the machinery or plant is operating to obtaining percentage-of-completion loans that fund the actual cash outflows as they occur. The FG requirement is intentional. FG managers must actively control the liquidity of the firm while also making the capital structure decisions required when major replacement or expansion is occurring. The availability of specific funding packages attached to plant or machine purchases has a strong tendency to distract the manager from actively controlling the capital structure decision.
- One simplifying yet highly unrealistic condition in the game is that the depreciable life and the useful life of equipment and plant are identical. One unit of machine capacity can be used to produce one unit in each of the eight quarters of its useful and depreciable life. Most firms have buildings, machinery, and equipment operating from several periods to decades past their original depreciable life. This might not speak too well for the accepted accounting depreciation techniques, but it is found in nearly every firm. The game retains the restrictive assumption mainly to simplify both the rules for operating the game and the record keeping of the FG manager.
- Machinery and plant expire over time whether they are used or not. Nonuse does not postpone the expiration of machine potential. Technical obsolescence and wear that are a function of time rather than of use explain this condition in an actual firm. Automatic expiration through time is used

in the game to provide a larger penalty for overcapacity than would be the case if useful life were a function of units produced.

- Gains can be obtained by postponing tax payments. Accelerated depreciation methods are widely used by most firms to defer tax payments. The less advantageous straight-line method is used to minimize game complexity. This simplification decreases the manager's required bookkeeping calculations over the requirements of the accelerated depreciation techniques while also decreasing the NPV of any long-term acquisitions. The straight-line method is consistent with Generally Accepted Accounting Principles (GAAP) and gives rise to deferred income taxes payable as a liability. Thereby, companies have two sets of accounting "books," one for the tax purposes that report the actual tax cash flows and the other for GAAP, which tries to better match expenses and revenues over the long term. The simpler FG rule has the GAAP and tax "books" identical.
- Sale, abandonment, or removal before the end of the estimated useful life of plant and machinery is not allowed in the game.

The major rationale for the deviations between the game and actual operating conditions remain the same as enumerated either earlier in this chapter or in the discussions of specific conditions in Chapter 4.

**Capital Budgeting Projects.** Capital budgeting projects generated in the game are sufficient to approximate very simple actual projects. There are few material differences between the projects in the game and the projects found in an actual firm. A few of the restrictive conditions just covered under plant and machinery also apply to the capital budgeting projects; these are not restated.

Decision-making requirements are often not obvious when presented in a complex, unfamiliar setting. Without previous explanation by the instructor, few prior game players have accurately estimated the projects' NPVs. Most quarterly sets of projects A and B should be evaluated as independent projects. Projects are independent for capital budgeting purposes when the acceptance of the second project does not affect changes in the expected cash flows of the first project evaluated. This leads to the condition where the decision of A is not dependent on either the acceptance or rejection of B.

### ***Selling and Administrative Expenses***

FG managers do not control most of their company's selling and administrative expenses. Managers have no control over policy in distribution channels, management centralization, and most other areas of the marketing and management functions.

### ***Advertising***

Managers do have control of the company's advertising expenses. The advertising expenditure represents an aggregate of separate decisions made in real companies. There is no control over establishing the characteristics of an advertising campaign. The mix of advertising mediums, from Internet and print to radio and TV and billboards, is not determined by the manager. Because the events that determine an advertising strategy are not under the control of the FG manager, the decision in the game is a financial variable optimization issue and not a marketing decision.

FG managers have very limited control of selling and administrative costs relative to a real company.

### **Financial Expenses**

Proper management of the capital structure is a major determinant of common stockholders' accumulated wealth maximization in FG. A comprehensive knowledge of the rules that affect both equities and debt is necessary for successful decisions. The general rules affecting all debt items are evaluated. Next, the rules that affect specific debt items are examined.

**Maturity and Debt Costs.** In the game, the required yield rate can be positively related, inversely related, or unrelated to the original life of the debt issue. The instructor controls the slope of the underlying yield curve and even may change the slope while the game is under way. If the inverse relationship between yields and maturities holds, a short-term loan requires a higher return than intermediate-term loans or long-term debt. This condition implies that the FG environment has a decreasing yield curve. A tight money policy of the Federal Reserve Board could cause a negatively sloped yield curve similar to the one incorporated into the game.

When a negatively sloped yield curve is used in the game, managers are rewarded for accepting both a decrease in flexibility and the increased planning requirements necessitated by accepting longer-maturity debt. The reward is in the form of expected lower interest costs for the same total amount of funding. A higher expected return will accrue to the residual equity holder. Not surprisingly, the basic tenant in finance holds that greater expected return, in this case from lower interest costs, brings greater risk. The longer-term debt commitment has greater risk since the future management options are reduced, unexpected interest rate decreases would lead to large opportunity losses, and refunding of the bonds with their high call premium can be costly.

**Example.** Assume an FG manager selects bonds over short-term securities for anticipated lower costs. Contrary to expectations, interest on all new debt items, including long-term bonds, decreases in the next period. The original decision results in committing the company to higher costs for 39 additional quarters. Alternatively, the high-cost bonds can be called at an 8 percent premium and a new, lower-cost issue authorized. In both alternatives, the company incurs substantially higher costs than would have been accepted if a shorter-term loan were originally used.

Rewards are consistent with maximum flexibility and greater liquidity management when a positively sloped yield curve is used. Larger short-term debt balances then increase the planning and management time required in continual debt-refunding requirements. Additionally, for a given level of outstanding debt, the per-period principal payments are larger with shorter maturity debt. A company with uncertain cash flows then has a greater insolvency risk. Since insolvency cannot occur in FG, instead very expensive new loans and low-priced stock would serve as the only means of replacing maturing debt that cannot be paid with internally generated cash flows. In extreme cases a \$2 to \$3 share price is not an uncommon outcome.

**Debt Costs and the Business Cycle.** Interest costs are directly related to the general economic condition. The demand for investment funds is greater in an expanding economy than in an economic downturn. This tends to place upward pressure on all interest rates. To reflect this condition, an FG company's interest rates are also affected by an underlying economic indicator. This indicator also

Managers need to consider the yield curve in determining the mix of the types of debt to use.

affects demand, the valuation of stock, and the cost of plant and machinery. As in an actual company, the manager must analyze and attempt to determine the relationship among interest rates, unit demand, unit price, machinery cost, plant cost, and interest rates. An ability to estimate future shifts in the firm's interest rates will also greatly enhance decisions relating to debt issuance, selection of debt maturity, issuance of equity and plant and machinery purchases.

**Risk of Insolvency.** Two risk factors, defined in Chapter 4, are used to derive the yield premium for insolvency. The first factor estimates the firm's long-run ability to meet its debt commitments. The effect of this factor on risk premiums in FG and the real world needs to be constantly considered by managers. This condition indicates the importance of closely controlling the combination of operating and financial leverage in the game and in an actual firm. A firm evaluated as being very risky may have prohibitive interest rates of 5 percent or more per quarter. Not like in FG, in an actual situation, a very risky firm would be constrained from obtaining additional debt. The high possible rate in the game serves as a substitute for the actual world constraint. Other than being more sensitive, the insolvency factor's effect on yield is similar to the real-world effect.

The second factor adjusts for intra-quarter debt changes. Directly related to the size of a new offering, the factor would be found in an actual environment where there are thin markets or possibly high agency costs in obtaining external funds. In capital markets the size of the United States or Canada, no one company is so large that it causes a material shift in the market-wide rates of interest. The supply of one new security by even a corporate giant is not sufficient to cause a significant rightward shift in the supply curve of securities and, thereby, an increase in the cost of funds.

For debt holders, an agency cost arises because of the possible wealth transfer from them to the managers or common stockholders. (See the "Common Stock" subsection later in this chapter for more information on agency costs and signaling effects.) This phenomenon explains the game's 0.125 percent size-of-offering premium per million dollars of each quarter's new external debt financing. Empirical evidence on this relationship of agency cost to the size of a debt offering holds when a company issues debt that substantially increases the company's financial leverage. In a similar example, home mortgage rates are an inverse function of the percent of equity used to finance the purchase.

The size of offering is often contrary to what is found with the usual debt issuances of an established company with a large debt offering if it does not substantially change the firm's financial leverage. Then the percentage of proceeds can increase as the offering size increases due to the spreading of fixed offering costs. This results in a slightly decreasing percent yield as offering size increases.

It is the manager's responsibility to estimate the relationship between the company's cost of each specific type of debt and each of the three yield determinants of maturity, business cycle, and risk of insolvency. This information should be used in first deriving and then adjusting both the maturity pattern and percentage of financial leverage used by the firm.

**Short-Term Loans.** The loan is similar to a short-term bank loan repayable in four equal installments. Like a bank loan based on the prime rate, the interest rate charged on the outstanding loans in each period is derived from the current money market rates and the firm's risk of insolvency premium. The prime rate is for loans

to firms with a very high credit standing. A firm with greater operating and/or financial risk than the highly rated firm must pay an additional premium.

An actual company would have some type of prepayment arrangement. Prepayment of the short-term loan is not available in FG. To limit confusion and complexity, commitment fees, compensating balances, subordination, collateral, and other contractual requirements often used by banks for a line of credit are not included in the game.

**Intermediate-Term Debt.** The game's intermediate-term debt, usually referred to as *term debt*, is very similar to short-term debt except for the longer life of the loans and the ability to retire them before maturity without a penalty. Interest rates on intermediate-term debt vary from those on short-term notes in accordance with the conditions affecting yields specified earlier.

Term debt in a real-world situation is somewhat different from term debt in the game.

- Term debt generally is used to fund a specific project. In the game, there are no restrictions on the issuance of term debt. One new loan for each possible maturity can be issued each quarter, thus continually renewing earlier issues and providing a permanent source of funding that often is also found in a real environment.
- Collateral is commonly pledged for a term loan in a real situation especially for smaller capitalized companies. The game does not include a method of pledging assets or establishing collateral loans.
- The average yield on the remaining outstanding debt is not affected by retirement. In a real situation, the average yield might well be affected. A manager could specifically identify loans taken out in previous periods and retire those that most reduce interest costs.
- Retirements occur starting with the most current principal and including the most recent remaining installments in order.

**Long-Term Bonds.** Long-term bonds have a 40-quarter life. The conditions that affect intermediate-term debt, covered in Chapter 4, also apply to bonds with the following exceptions:

- A call premium is required for the retirement of bonds, while there are no costs of retiring intermediate-term debt.
- The most distant payments are retired first, whereas the nearest future payment is retired first with intermediate-term debt.
- A fixed \$50,000 flotation cost is charged for each bond offering. No fixed fees are charged for the issuance of intermediate-term debt.

These three conditions increase the planning requirements in bond decisions over the decision requirements of short- or intermediate-term debt.

**Call Premium.** First, there is an additional charge for the option to retire a previous debt-offering decision by retiring the issue. The call premium determines this cost. The need to retire bonds can come from an overleveraged capital structure. Overleveraging may result from either a previous management error or a change in the operating risk of the firm. The shift in operating risk may be induced by either external environmental changes or internal firm management. An overleveraged



capital structure problem can be rectified by debt retirement and/or equity offerings. The choice should be made after carefully considering the net operating funds needed by the company over the next several quarters.

Bond retirement can also be desirable if a substantial downward shift in interest rates has occurred. A replacement of the old bonds with new ones may be desirable if a change is not needed in either the percentage of financial leverage or the general maturity structure of the outstanding debt. With a refunding decision, the manager must determine and evaluate differences in cash flows and costs that will result if a refund is made. The proper NPV evaluation procedure is included in most introductory texts in finance.

Due to the input decision limitations of the game, both a repurchase and an issuance in the same period are not possible. If the manager wishes to refund debt, the debt will have to be retired in one period and new debt issued in the next period. A temporary source of external funds might be needed to cover the temporary reduction in total long-term debt. An intermediate-term debt would probably be best since it can be issued for the needed quarter and retired in the following period with no penalty charge.

The call feature is realistic since almost every bond indenture contains a call provision. The premium is fixed at 8 percent in the game. In a real situation, the call premium rate on new issues can vary depending on the financial position of the company, the relative level of debt interest rates, and the supply and demand of funds in the bond market. The call rate on a given actual bond usually declines in stated increments at specific points in time over the life of the bond.

**Retirement of Principal.** The 40-quarter life of a bond substantially exceeds the number of periods the manager will play the game. Planning for cash management will be substantially reduced if retirement of bonds started with the most recent quarter.

**Example.** Assume a manager wishes to avoid the quarterly debt-funding decision. The first step would be to float a larger bond than necessary and then temporarily invest the excess in marketable securities or reduce term debt. In the following quarter, excess funds from the original offering would be used to retire the first 12 to 15 quarterly installments. For the rest of the game (12 to 15 quarters), the manager will not have to be concerned with quarterly debt payments. Payments will be effectively postponed until after the manager leaves the firm. This financing decision is especially desirable if interest rates are expected to increase materially. A longer duration debt issued at a low rate will have a greater opportunity wealth gain if interest rates increase.

The game does not reduce the need for refunding of prior bond installments since the most distant ones are retired first when a retirement is initiated. This condition is not applied with the term loans since their three-year maximum life falls within the manager's operating time horizon.

**Fixed Flotation Fee.** The inclusion of a fixed flotation fee should lead a manager to consider applying an economic order quantity (EOQ) model in determining the issuance size and frequency of bond offerings. One clearly will not offer \$10,000 in bonds in a quarter if there is a \$50,000 cost just to have an offer. Actual flotation fees have underlying fixed- and variable-cost components. An actual manager's net proceeds per bond increase as the offering size increases. In the game, the size of offering premium is a variable-cost component; the debt's

percent rate of interest implicitly includes this variable cost component based on the total debt offered in a quarter.

**Other Bond Similarities and Differences.** Bonds in the game are similar to serial bonds. An issue contains bonds with several different maturity dates; they mature periodically until final maturity. The bond characteristics are not standard in a few minor respects. Most serial bonds have semiannual interest and principal repayments. The game uses a quarter of a year as the time increment. The FG bonds have a life of 10 years. Most general bonds have lives of from 20 to 30 years. The 10 years extend sufficiently beyond the manager's operating time horizon of 10 to 15 quarters so that a longer maturity is not necessary.

Debt conditions in the game are the same as an actual firm can have with privately placed debt. Intermediate debt can be repurchased at the option of the company at the issuance price. With bonds, the call premium must also be paid.

If the debt items were offered through a public offering, there would be an extra option not available in the game; the firm can repurchase its debt in the open market at currently prevailing prices. Thus, increasing market yields effect an increase in the company's debt yield rates, and the market price of the debt instruments can fall below the original issue price. If there is an adequate return for refunding or a need for decreasing financial leverage, there is an advantage in using open market purchases if interest rates have increased rather than using a call.

An option for allowing either open market purchases or a call, though not available with the various debt instruments, is available in FG with preferred stock repurchase.

In summary, managers in the game are responsible for determining the degree of financial leverage and the maturity structure of their firm's outstanding debt. The rules and conditions that specify both the general environment framework for debt and the specific types of debt are fairly realistic. The decision options available to the manager are similar to those found in an actual firm, although the manager does not obtain the experience with many of the specific conditions and options often faced in an actual company.

**Short-Term Penalty Loans.** The short-term penalty loan is a special FG debt instrument that is not found in actual companies. Negative cash balances at the end of the FG quarter are first covered by liquidating marketable securities and next by the issuance of a penalty loan. The loan issuance can be either unplanned or planned. Unexpected events can cause the issuance of loans. The unexpected negative cash balance could come from faulty cash flow planning, unexpected increases in cash outflows, or unexpected decreases in cash inflows. By negatively affecting profitability, the penalty loan rewards accurate and penalizes poor cash flow management.

The use of the penalty loan can also be intentional. Rather than maintaining large permanent precautionary cash balances (at an average quarterly cost of the firm's cost of capital), the manager can intentionally ignore precautionary balances and rely on the penalty loan to supply funds when an unexpected negative balance occurs. The long-run cost might be less with the penalty-loan alternative. This depends primarily on the likelihood and size of possible negative balances. Also, the penalty loan can be a source of funds "of last resort." If the yield rates of other debt choices exceed the penalty-loan rate of 8 percent quarterly and equity prices are seriously depressed, the penalty loan can be a viable short-run source of funds.

FG managers do not need to control for intra-quarter cash shortages as they would have to in the real world.

**Intra-quarter Cash Flows.** In a real firm, the manager has intra-period knowledge of cash inflows and outflows. A liquidity problem can be avoided by intra-period acquisition or investment of funds. The intra-period operations of FG are not like those of an actual firm. The maintenance of liquidity or cash solvency is the major difference.

Negative cash balances are not generally found in an operating firm; the cash inflows have to ensure the maintenance of positive cash balances every day. In the game, cash balances are checked only after all other quarterly transactions are recorded. If a negative cash balance then exists, a cash inflow offsetting the negative balance is generated by the issuance of a penalty loan. During the quarter, negative cash balances can exist and subsequently be eliminated, and a penalty loan will not be issued in FG; this would not be possible for a real company.

**Example.** A firm has \$1,000,000 in cash at the beginning of a quarter and immediately spends \$4,000,000 on capital investment, materials, and labor costs. If revenues collected at the end of the quarter are sufficient to offset the initial \$3,000,000 cash deficit, a penalty loan will not be issued. Clearly, an actual firm is not able to carry large intra-period cash deficits.

**Bankruptcy and Liquidation.** Unlike a real firm, an FG firm cannot go bankrupt. First, penalty loans will always be issued to forestall technical insolvency. Second, the common stock price will always remain positive. External funds can always be obtained by the issuance of common stock. This condition is not available for actual firms. They would be unable to find either lenders of funds or underwriters and investors in stock issues if the prospects for future restoration to profitability were very unlikely.

An FG firm can be liquidated. The conditions on plant, machinery, debt, and equity will have to be reviewed to determine the sequence of decisions necessary for liquidation.

**Example.** Due to dividend payout restrictions, debt and preferred stock must be retired before substantial liquidating dividends can be distributed. Other conditions require plant and machinery capacity to go to zero before other overhead and fixed selling and administrative costs cease.

The liquidation of an FG or actual company can be a sound decision if the long-run return from continuing the company is less than the return obtained from external investment of the net liquidation proceeds. The management must be quite certain that the declining firm performance is permanent and not due to a recession or short-run demand decrease.

Liquidation in the game is similar to that of a real firm. All assets either expire or can be converted to cash. After eliminating all other obligations, the remaining cash can be used for the distribution of common stock liquidating dividends. A manager must decide on the combination of stock repurchase and liquidating dividends to be used. In the game, at least one share of stock must remain outstanding even if all assets are distributed. The firm automatically retains one share even if an attempt is made for its retirement.

### Taxes

The corporate income tax model used in the game is very much like an actual federal income tax. The major exception is that the game assumes an unlimited ability to recognize losses. In a real firm, if the income earned in the previous three years

totals \$3,000,000, a maximum income loss for tax purposes of \$3,000,000 could be taken in the loss year. Any additional loss would be carried forward to be offset against positive taxable income in each of the next seven years. In the game, an automatic rebate equal to the tax rate times the quarterly loss is obtained in the quarter the loss occurs. Since a tax rebate will always partially offset a loss, the earnings loss used for income tax reduction is more favorable in FG than in an actual firm.

### **Equities**

An FG company has a minimum common stock value in the \$3.00 to \$5.00 range, can always issue stock, and can't go bankrupt.

The conditions and rules that govern common and preferred stock in the game make them similar to actual securities. The business cycle and measures of risk of the firm are used in the preferred and common stock valuation models. The specific measures of risk with preferred and common stock are different.

**Preferred Stock.** Preferred stock issuance is often avoided in financial decision making in the United States today. Based on current U.S. tax rules, it is most often a poor means of obtaining external funds. Interest on debt is tax deductible while preferred dividends have to be paid with after-corporate-tax dollars. Due to this, U.S. firms would prefer to use subordinated bonds, often convertible to equity, as a substitute for preferred stock issuance. Due to the tax disadvantage, the before-tax cost of preferred stock is substantially higher than low-rated subordinated debt. It is cost efficient to even issue “junk bonds” in lieu of preferred stock; the financial leverage effect for common stockholders is much lower per dollar of external funds received with using low-rated subordinated debt. Preferred stock issuance is often preferred to low-rated subordinated debt in England and other countries that allow the tax deductibility of preferred dividends. It is not a very useful source of additional financial leverage in the United States relative to debt financing, but it is included in the game to expose the participants to possible decision making in this area.

Preferred stock in a real situation is very similar to the stock included in the game. Most issues have a cumulative feature and are issued and repurchased using the same set of rules incorporated into the game. However, one condition is not realistic. In a real situation, the company's managers can decide to forgo preferred dividends even if bond indenture requirements are met. In the game, there is no control over preferred dividends. They are automatically paid or not paid depending on the debt and earnings position of the firm. The condition requiring adjusted operating income after financial expenses to exceed the before-tax cost of preferred dividends is quite restrictive. Dividend restriction covenants in real debt indentures as applied in FG are common. Often a bond indenture will specify a series of conditions that must be met before any distribution to equity holders is allowed. Specific hurdles are often required on a times-interest-earned ratio, a fixed-cost-coverage ratio, and a dividend-to-earnings payout rate. The amount of dividends that can be paid based on prior and current earnings is also a possible restriction. The restriction used in the game is intended to partially protect debt holders from companies providing cash flows to equity holders when earnings deteriorate.

**Common Stock.** The manager can issue cash dividends and sell or repurchase stock. These three decisions give the manager control over the firm's common stock equity policies.

**Dividends.** The cash dividend decision in the game is like the dividend decision in a real company. Dividends declared on a quarterly input sheet are paid in the same quarter. Since the game does not have specific shareholders and intra-quarter decisions are not made, a specific dividend declaration date, date of record, and payment date are not used.

Stock dividends, splits, and reverse splits are not available options. Options on stock dividends and splits have no value in FG since common stock value is not affected by the price level of a share. A condition where the marketability of a share decreases due to either very high or very low per-share dollar values is considered valid by many finance academicians and practitioners. The maintenance of a common stock trading range is achieved in the real world with stock dividends, splits, and reverse splits.

**Stock Issuance.** Stock issuance in the game is in the form of a new “best effort” offering through an investment banker. The per-share offering price in the game closely duplicates the conditions of an actual share offering. The model includes several value-affecting components.

- The fixed- and variable-cost components cause the per share receipts to increase as the offering size increases. This results from a further spreading of the initial fixed cost over a larger number of shares.
- The security risk decreases as a function of a decrease in financial leverage. The decrease in security risk lowers the investors’ required rate of return on common stock and contributes to higher prices for larger offerings.
- Expected earnings dilution from sharing future projects’ NPVs with additional shareholders contributes to a smaller receipt per share. This occurs only if the market is inefficient in containing an unbiased estimate of the expected NPVs from the company’s current and future investment projects.
- Price pressure exists if the market cannot easily absorb larger quantities of a security without share price decreases. The “imperfect substitute’s hypothesis” can cause this condition, which results in lower proceeds per share as offer size increases.
- Signaling of new information by managers to shareholders can also occur with common stock offerings. Insiders, including managers, have more information about the future prospects of their firm than outside investors. Managers’ decisions to issue securities may signal the future prospects of the company. Academic studies show a relationship between common stock offers and future company operating risk increases and lower than previously expected earnings. Given this information, it is not surprising that the average common stock price response to an equity-offer announcement is negative; shareholders lose wealth. This condition does not mean that managers should not issue these securities. The risk would increase or expected earnings would decrease in the future even if the stock issue did not occur. The issue is just a harbinger of future bad news. Thus, shareholders’ wealth would probably still decrease, but just not as soon.
- Agency costs for external issues of debt and equity could cause the cost of funds to increase still further for larger-sized issues. Agency costs arise when investors underestimate the true value of the firm because of both incomplete information and an expectation that the insider, in this case the manager, will transfer wealth away from them.

**Example.** An analogy to this phenomenon is with the sale of a used car. The buyer wants a quality car in good operating condition that will need minimal repairs. The buyer also knows that the seller must be selling the car for a reason, the expectation of large future repairs being one possible motivation for the sale. The buyer is at a disadvantage because the seller has asymmetric (insider) information about the car's quality. Due to this potential for getting a "lemon," the buyer is only willing to give a low bid. The bid would be lower than the bid on an average car due to the likelihood that the car for sale is below average quality—otherwise it would not be for sale. The same phenomenon holds with security issues. If a manager, operating in the wealth-maximizing interest of current stockholders, is selling securities, they are likely to be a "lemon" and be overvalued. The outside investor then marks down the bid to reflect the likelihood that the security is overvalued. If the car or security seller could guarantee the quality of the offer, the underbidding would not occur.

All of the above conditions are likely to affect the discount from current common share price required to sell new shares. They can all be viewed to affect the issue share price discount used in FG.

In an actual issuance, managers may specify a minimum price they are willing to accept. This permits the company and the investment banker to terminate the planned issuance if market conditions are too poor. Managers in the game do not have this option. The investment banker will market the entire issue at a market-determined price. The FG company does not have the opportunity to set an offering price range based on the demand for the securities offered.

**Stock Repurchase.** Stock repurchase in FG is initiated through a tender offer. The manager specifies both an offering price and the number of shares tendered. The fees and transaction costs of a successful tender are covered by the spread between the tender price and the current stock price at the time of the decision input. Also, the spread is directly related to the percentage of the outstanding stock tendered. This premium will be higher when part of the original 1,000,000 shares is being tendered. Shares issued since quarter 1 require a smaller spread.

In an actual situation as in FG, longer-term security holders often require higher-priced premiums before selling than do more recent stockholders. A tender by management can signal a revision of investor expectations and pressure for higher share prices. The premium is also affected by the per-share dollar value. The price volatility of lower-priced stocks is greater—generally because such firms' future earning potential is more uncertain. To have a successful tender, a higher markup is necessary with the lower-priced stock.

A tender in the game is automatically exercised by management if less than the total number of originally desired shares is tendered. In an actual situation, the manager has the option to refuse repurchase of shares if the entire number of shares desired is not tendered. Additionally, real-world managers have an option to extend the tender date or modify the tender offer if the desired number of shares are not tendered. Alternatively, the FG manager can issue a revised tender offer every quarter.

**Valuation.** The stock valuation model is sufficiently complex, as in a real situation, to prohibit the manager from determining its exact nature. The game purposely does not define the common stock valuation model. Through testing and analysis, managers can assess the importance and possibly determine the effect of changes in the variables that affect common stock price. The inability to understand

the model arises from the interdependence of many variables, including:

1. Historical and projected earnings per share.
2. Anticipated earnings per share growth.
3. The economic environment.
4. Uncertainty of future earnings.
5. The dividend payout.
6. The stability of the dividends.

**Example.** The positive effect of an increase in earnings per share can be less than the negative effect of concurrent changes in (1) the economic environment, (2) the uncertainty of future earnings, and (3) both the stability and payout of dividends. Thus, a decrease in share price can occur even though the earnings per share are increasing. This is commonly found in actual stock price movements. In a second example, the price of the stock will increase if earnings per share sustain a higher growth rate than has been obtained historically, earnings' uncertainty decreases, or a proper shift in the dividend payout and stability policy is achieved.

The variables incorporated into the game's common stock valuation model are the ones that investment services and investors have historically stated they use in determining the value of a company. Here are four common factors:

- Historical earnings and earnings growth trends are used in estimating the future earnings, dividends, and price appreciation of a company's common stock. The use of earnings growth trends in the valuation model reduces the effects of temporary or short-run conditions on the share prices.
- Uncertainty affects shareholders' valuation of shares. Uncertainty implies a greater risk of not obtaining the expected earnings and earnings growth rate. The firm with a less certain future would have to offer higher expected returns to command the same share price. In the game, a firm that maintains a stable earnings and earnings growth is viewed as having a more certain future than a firm with a more volatile or erratic history.
- The general level of business activity and inflation affect the market's valuation of all equities and thus should impact a given company's stock price. This condition is consistent with research indicating that most share price changes are closely correlated to a general market index.
- Dividend policy also affects valuation. A following section on dividend yield discusses dividend policy more completely.

The variables included in the FG valuation model provide share price and share price movements somewhat similar to those found in current markets. Again, emphasis in the game is on forming a valuation model that differentiates between varying levels of performance. A partial loss of realism holds.

**Short-Term Share Value.** Share price changes required for a tender or stock offering are only temporary and do not directly affect the quarter's ending price. The tender or issuance can indirectly affect prices through the valuation conditions just outlined. The issuance and tender result in short-term supply and demand shifts that cause the stock price to vary from its long-run underlying value. The quarterly ending price assumes a restoration to the long-run supply and demand equilibrium and the stock's true long-run value. Evidence is consistent with short-term price pressure existing on stock issuance and purchase in the real world.

The numerous rules and conditions that govern FG common stock are fairly complex, enabling stock prices to behave much like securities in public trading. Decision alternatives available to the game participant closely duplicate the alternatives available to an operating manager.

### **Performance Information**

The performance measures provided quarterly in the game are to be used to assess a manager's effectiveness in operating the company. Most measures generated in the game are commonly found and used in the evaluation of actual companies.

Multiple performance measures should be used as a set in evaluating performance.

The performance measures should be used as an integrated set. Different types of period-to-period variations can temporarily distort specific measures. By viewing the measures collectively, the manager can determine whether systematic shifts of several measures are occurring and why specific measures are changing. This analysis should be used to verify the consistency of actual results with the firm's objectives and, if they are not consistent, to determine what corrective actions are appropriate. To be successful, the manager in an FG firm must perform the same type of analysis required in an actual company. Greater uncertainty arising from less reliable performance measures makes the actual manager's task more difficult.

As in an actual company, a manager's performance should be measured relative to other companies' performance and relative to the historical position of the firm. An absolute measure has little real meaning either in the game or in an actual firm.

**Example.** A firm that maintains 10 percent compounded growth in accumulated wealth performs poorly if all other firms obtain 20 percent. Alternatively, a 10 percent growth rate might be excellent performance if the next-best firm obtains a 5 percent rate. If a business recession is used in FG, the highest-performing company may still have a material loss of wealth. Superior management skills would be demonstrated if this company outperformed the other firms by having the smallest losses and having shareholders with the greatest accumulated wealth per share at the end of the game.

A manager often has difficulty disregarding preconceived notions of appropriate performance. This can have negative effects on attitudes, analysis, the formulated company plan, and future performance. The FG manager should maintain objectivity by judging the firm's performance relative to other firms, not by an arbitrary rule of thumb from outside the game. This same objective approach is appropriate for use in managing a real company.

The stability of the more reliable performance measures increases as game play progresses. Initially, a firm might be ranked first in accumulated wealth and in the next quarter be ranked last. If firms are operating in a fairly stable economy, changes in ranking among firms over time will be both less dramatic and less frequent. This is especially true with accumulated wealth. Conversely, a more unstable business environment increases the likelihood of more random rank changes. The largest daily stock price changes indicate this condition is fairly realistic; it can be frustrating to the competent manager when the company's stock price does not appear to consistently reflect its high performance measures.

The specific performance measures incorporated into the summary sheet and the overall performance report each quarter are now examined. For many reasons noted in the following sections, the measures are potentially more reliable in the game than in the evaluation of actual firms.



Accumulated wealth is the best single measure of performance in both FG and the real world. Performance evaluation in FG should be estimated relative to other companies.

**Accumulated Wealth.** Accumulated wealth is a hybrid performance measure developed for use in the game. At the start of the game, all companies have the same share price. Managers' decisions affect both stock price and dividend payout, which are the two items of information needed to calculate accumulated wealth. Management decisions and environment conditions determine this performance measure.

Stock price is the major item that affects the accumulated wealth measure early in the game since there are no initial accumulated dividends or investment returns on previous dividends. The quarterly cash dividends accumulate and have an increasing effect as the simulation progresses through successive iterations. This effect is increased by the quarterly compounded earnings rate applied to all previously paid-out dividends in deriving the accumulated wealth measure. Since accumulated wealth is dominated by share price earlier in the game, its stability is almost completely dependent on the volatility of the share price. Shifts in company ranking with accumulated wealth can be both frequent and large. As accumulated dividends and earnings on previous dividends increase, and as the company builds its long-term performance (good or bad) the accumulated wealth measure gains stability and reliability.

The major cause of the measure's instability is short-term stock price changes, which can vary from the long-run trend for price changes. Even unsound decisions can have temporary effects on stock prices and the accumulated wealth figure.

**Example.** Instability could be caused by excess production. If a firm overproduces, the per-unit production cost for the period can often be decreased. Spreading the fixed costs over a larger number of units causes this to occur. With a lower cost per unit matched against revenues, the firm can have higher earnings in the quarter than it would have obtained with lower production levels. The larger ending inventory then carries a larger proportion of the current period's fixed costs to the next period. Temporarily, earnings per share and the earnings-per-share growth rate are favorably affected and a greater positive change in stock prices might be gained. The long-term effect might be negative since the fixed costs in the higher inventory eventually end up negatively affecting earnings in the future period when the inventory is reduced. Astute informed investors would likely decrease the stock value of the company when the inventory expansion occurred; naïve investors might falsely bid the share price in the first period and then bid it down when the true impact of the event is found in a later period. In FG, investors are more naïve than in the real world. Security markets in the real world are more efficient in incorporating the long-term effects of a management outcome, like the inventory overstocking. There, analysts specializing in evaluating a small number of industry-related stocks would spot the excess inventory problem and project the consequences of this problem on current and future earnings using pro forma statements similar to the ones used in FG.

The manager is cautioned against accepting accumulated wealth or any other single measure in judging the overall performance of the companies in the game. In the example just covered, the inventory buildup should have warned the management of a possible temporary upward bias in accumulated wealth. An examination of the other measures and the contents of the financial statements should be made by the managers to disclose impending permanent future changes in accumulated wealth.

**Example (continued).** The pro forma planning for the next period of play that appropriately brings the company's inventory back to its optimal safety-stock level would capture the negative earnings impact from the excess inventory problem of the current period. This process is followed by many actual companies that provide new

or revised earnings per share (EPS) estimates for the next period when they announce their current earnings. If the manager had a reasonable valuation model, like the one that the above analyst would use, the stock price correction that would likely occur now due to the impact of excess inventory on current and future earnings would also be estimated for internal planning purposes, including a possible revision in expected future cash flows and the company's WACC.

Accumulated wealth measures provide the same information used by actual investors in determining their return on investment. Appreciation or depreciation of a share's price plus dividends is divided by the initial investment per share to give a percent gain or loss from the investment. Since all FG companies start with the same price per share, or initial investment, there is no need to divide this into the gains or losses in obtaining a number to compare the relative position. Furthermore, a dollar of cash dividend in quarter 1 must be worth more than a dollar of cash dividend in quarter 15 because the investor can invest the first dollar and obtain compounded interest and/or appreciation for 14 quarters.

To recognize the opportunity return available to investors, accumulated wealth each period is adjusted by multiplying previously distributed dividends by the yield on risk-free marketable securities that is adjusted upward by a 1.5 percent premium. The marketable security rate plus 1.5 percent is an after-tax return to the investor and is an implied opportunity rate of return available to investors. This rate is a risk-free after-tax opportunity cost that can be used by management in judging whether they are efficiently utilizing funds not needed for efficient operation of the firm. Internal funds that do not earn at least the risk-adjusted equivalent to the external opportunity rate should be returned to investors by retirement of debt, repurchase of equities, or payment of extra dividends to common stockholders. Either excess retention or excess distributions would result in a lower accumulated wealth figure.

The accumulated wealth figure provides a useful measure of the manager's ability to operate in the wealth-maximizing interest of the common shareholder. It is also the best single measure of a company's performance in the game.

**Quarterly Earnings.** The quarterly earnings per share (EPS) is a short-run performance measure. It is weak as an overall measure of performance for several reasons:

- Many of the valuation factors discussed previously are not incorporated in EPS.
- The current EPS change can be in the opposite direction from the true change in long-term shareholder wealth.

**Example.** In an expanding economy, an excessive increase in financial leverage will immediately increase EPS. The current EPS change does not reflect the increased risk resulting from excessive financial leverage. This increased risk might more than offset the higher temporary EPS.

- Due to the heavy operating leverage of an FG firm, the EPS is quite unstable. It can vary significantly with changes in the business cycle.
- EPS is subject to substantial management manipulation. EPS levels and stability can be affected by period-to-period shifts in production levels and discretionary management-controlled costs.

These four reasons make EPS an unreliable performance measure even though some added information might be obtained by using it with other performance

measures. The use of EPS as a performance measure in the real world suffers from the same weaknesses found in the game.

**Dividend Yield.** Dividends are a very important valuation component for mature or low-growth firms. Dividend yields can be used as an appropriate performance measure for firms that have low expected rates of growth. An increasing yield induced by a price decrease would indicate either a general market shift in required long-term return rates or a specific negative shift in shareholders' evaluation of the value of the firm that may be either short term or long term. The second condition should initiate management analysis to determine what has caused the shift and if the cause represents a long-term phenomenon.

The reliability of dividend yield as a performance measure decreases as the importance of dividends decreases or as price volatility increases. The importance of dividends is inversely related to the earnings growth rate of a firm. Therefore, a high-growth firm could be operating counter to the wealth-maximizing interests of its shareholders if it distributes cash in dividends. The dividends could possibly earn more if retained by the firm than if distributed to investors. In this case, a dividend yield will be inversely related to shareholder wealth and will not be a valid measure of performance.

As price volatility increases, there is a direct increase in the volatility of the dividend yield performance measure, assuming dividends remain stable. Comparability is lost if the rate and direction of the shift in prices are not the same each period for all companies being evaluated. This condition occurs frequently in the game and in the real world. A secondary problem occurs if, with volatile prices, the manager attempts to maintain a constant dividend yield. Both a loss in dividend stability and a volatile dividend payout will result. Since valuation is affected by both items, the maximization of common stockholder wealth can be substantially reduced. This type of problem is common when a manager attempts to focus too much attention on the maintenance or enhancement of a given performance measure without considering the underlying policies being affected.

**Price-Earnings (P/E) Ratio.** The P/E ratio is commonly used by investors as an indicator of the "quality" of a company's current earnings. Investors are willing to pay higher ratios for higher-quality earnings. The variables used in the game's valuation of common stock more rigorously define the rather vague term *quality* used by investors. Current EPS, projected EPS, expected growth, and expected certainty of future earnings are the key earnings factors that affect valuation. Investors' expectations concerning these factors are mainly formed from historical evidence of earnings growth and the stability of the growth. The game duplicates this type of environment.

The ability to compare the P/E ratios of different firms and the reliability of this ratio are both suspect. The problems come from the two components—price and earnings—used in the definition of the P/E ratio. The earnings per share used in the denominator of the ratio has several weaknesses just covered in the "Quarterly Earnings" section. The weaknesses result in earnings figures that cannot be reliably used in determining long-run performance. Additionally, price volatility decreases the stability of the ratio through time, which further lessens the reliability of the quarterly P/E ratio. Though it is probably better than dividend yield as a performance measure, the P/E ratio still has many weaknesses that restrain a manager from placing much confidence in it whether in the game or in the actual analysis of companies.

**Return on Investment and Return on Equity.** Return on investment (ROI equals earnings/assets) and return on equity (ROE equals earnings/equity) measures are commonly used in evaluating the performance of divisions, product areas, and entire companies. Several weaknesses restrict their value as successful measures of performance.

- The inclusion of the expected future earnings stream is avoided since only current earnings are used. Investors will be more concerned with the firm's future prospects for generating funds since their wealth maximization comes from maximizing future earnings on their invested capital.
- Both ROI and ROE include the weaknesses found in using quarterly earnings as a measure of performance described earlier. This occurs since earnings are used in the numerators of both ROI and ROE.
- The ROI and ROE performance measures also do not incorporate any measure of risk or uncertainty. For comparability between firms, ROI and ROE figures are not modified to reflect either the stability or the reliability of future earnings.
- Problems also arise in the denominator. Particularly in a real situation, the investment bases of the different firms are often not comparable. This arises from inappropriately using historical costs or adjusted historical costs in measuring total investment.

**Example.** If net assets (original cost less accumulated depreciation) are used, a new facility with larger amounts of undepreciated new equipment would have a much larger investment base than an older firm with almost completely depreciated facilities. In this case, the new facility's ROI and ROE could be substantially below those of the older plant, not because of differences in management performance but because of differences in the life of the equipment. Alternatively, if gross assets or original costs were used in the definition of ROI and ROE, the older facility's performance measure could be unrealistically low due to the technological disadvantage of the old as opposed to the new facility.

ROI and ROE generally are more reliable performance measures in the game than in an operating environment. The investment or asset base of ROI and ROE is initially the same for all firms in FG. Since equipment replacement and heavy capital acquisitions are required in approximately the same time pattern, major divergences in average asset life and therefore in net asset value are uncommon even after several quarters. Distortions in comparability can occur if the quantity and type of capital budgeting additions vary materially. Distortions may be caused by major differences in total investment and different patterns of cash flows that result from different selections. Furthermore, the firms in FG are in the same industry and have the same business risks and relative earnings instability. Thus, ROE and ROI can provide the FG manager with additional partially reliable information for assessing performance—information often not available with an actual company.

**Review of Performance Measures.** The performance measures just reviewed are all commonly found and widely used in actual companies. In both FG and an actual company, the set of performance measures is used by management in assessing the relative performance of the company both over time and in comparison to other companies. An analysis of the financial statements and additional summary data are also required for estimating the firm's historical performance and its prospects for continued achievement of performance goals. Along with comparing

performance, the above measures can signal to managers that their previous decisions or strategies might need revision.

### ***Extraordinary Items, Fires, and Strikes***

Increased uncertainties and new decision situations are faced by the manager when the instructor initiates any of these options: extraordinary items, a fire, or a labor strike. Extraordinary losses charged in the game have the same effects that expropriation, embezzlement, default, or one of many other windfall loss events may have on the financial statements, performance measures, and management decision requirements of an actual firm. A positive extraordinary gain has the same effect as a favorable lawsuit settlement or a windfall gain on the sale of assets.

The fire is less realistic. First, it would take a busy arsonist to strike all firms in the same quarter. Second, if this did occur, we would also expect many changes in future unit demand and prices due to shortages. There are no carry-forward effects of this nature. Third, only inventory and machinery are affected. The plant that contains these items remains undamaged. This unrealistic condition was incorporated so that production limitations would last only the one quarter needed to rebuild machinery.

The strike contains probability estimates and costs not normally available or determinable in an actual strike situation. In the game, this reduces the strike problem to one of risk rather than uncertainty, and it enables currently available solution techniques to be used in making a decision. Strikes also have an indeterminate life, which adds to the manager's risk. In FG, only a one-period strike occurs unless the instructor initiates multiple contiguous-period strikes.

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## **Conclusion**

Most of the definitions, analytical tools, and solution techniques learned in game play are transferable to the real world. Many specific rules and conditions found in the actual environment are not included in FG. By recognizing why and how decisions are different, managers can greatly enhance their ability to transfer knowledge gained from game play to analysis and decision making in an actual company.

