The Standard Model of Finance, with an Application of the Shareholder Value Approach

by John C. Edmunds

Over the past half century a consensus has formed among experts about the way to run the finances of a company. During the same time period a consensus also formed about the way to manage a portfolio of stocks and bonds. The principles that have emerged all relate to the relationship between investors and the companies that issue securities. That relationship is subtle and studying it has been fruitful. Each new breakthrough about how to choose securities for a portfolio has had implications for how corporate financial managers should run the finances of a company, and has given insights into which securities the company should issue and which projects it should undertake. The principles of portfolio optimization and the principles of corporate financial management have developed during the same time frame and in tandem with each other. This half-century of development has identified several main principles and each of these principles has shown its validity and its usefulness. Together they constitute a paradigm that has gained widespread acceptance. In this chapter we call that paradigm the Standard Model and we show these principles and how they work. Each individual principle makes sense and there is statistical evidence showing that it adds value. These principles work synergistically with each other, so a company that follows them all does better than a company that follows only one of them.

These principles did not immediately revolutionize the practices of corporate financial managers everywhere. First they gained universal acceptance among theoreticians, and then they gained acceptance among portfolio managers. They gained acceptance among corporate financial managers more slowly.

Among financial managers at large US corporations this set of principles has become the completely dominant view. The recent wave of financial scandals illustrates in a perverse way how completely dominant this view

has become. Managers at Enron and WorldCom were trying so hard to apply the set of principles, and were so determined to be the best at applying them, that they broke laws and reported fraudulent data. They went to extremes to create the appearance that they were especially successful at applying the principles.

As US financial markets attempt to rebuild the credibility they lost and recover from the blows they suffered, and as US corporations attempt to rally their stock prices, leaders reaffirm their conviction that the set of principles is valid. As large US corporations replace top managers and directors, each newly-appointed person makes a point of affirming and endorsing the Standard Model.

Outside the US, top managers of large publicly-traded corporations have been slower to accept the validity of the Standard Model, and some still express disagreement with the principles. They argue that the Standard Model is inappropriate for one reason or another, and condemn the extreme behavior that sometimes occurs when managers slavishly follow the principles. Outside the US, old paradigms of financial management and old rules of thumb still have some shreds of legitimacy. Their days are numbered, however, and the old rules will soon pass from the scene. These non-US managers may express resistance, but despite the merit of some of their arguments, the Standard Model will eventually triumph completely over all competing paradigms that dictate how to run a corporation's financial affairs.

The Standard Model has inexorably become dominant for a simple reason: Applying these principles lowers a company's cost of capital. Every company needs to lower its costs, whether those costs be raw material costs, labor costs, or the cost of obtaining capital. No company can willingly give its competitors a cost advantage, so if one company is lowering its cost of capital, the others in that same industry sector have to lower theirs too.

The first practitioners to adopt the Standard Model were institutional portfolio managers. There are several reasons why they were quicker to grasp its advantages than corporate financial managers. One is that the first breakthrough was a scientific analysis of the tradeoffs involved in selecting securities for a portfolio. Another is that their performance was in plain view, and it was easy to measure and rank. They were supposed to earn

high returns without taking excessive risks. There were hundreds of institutional portfolio managers trying to do the same thing, and trying to outperform each other. Any observer could easily see which ones were particularly successful or unsuccessful. For managing portfolios of securities, the Standard Model's guiding principles are much better and much more helpful than the old rules of thumb that in bygone days institutional portfolio managers attempted to apply. In contrast, the performance of corporate financial managers was harder to observe. Corporate financial managers were not solely responsible for the performance of the companies they worked for, and many corporate financial managers did not have as much autonomy. Many of them were only providing a support function in an industrial corporation that was deriving its profits mostly from some oligopoly advantage or from some patented product. They did not have such clear and powerful incentives to adopt new practices.

The Standard Model is the synthesis of several component models which are well-known in their own right, and which describe how buyers and sellers behave, and how financial markets work. These components form a unified whole, which gives precise numerical answers to all major questions, and which fits together in a logical and mathematically complete way. The Standard Model is so successful that in many sub-fields of finance, researchers are no longer trying to posit new models to supplant it; instead they are studying the mechanisms in the financial markets that have not yet been explained with the methodologies of the Standard Model.

This chapter gives an overview and an example of each of the principles that together constitute the Standard Model of financial management. Then it gives examples of financial decisions that corporate managers face, and shows how the formulas of Standard Model work together synergistically to guide the managers to the correct decisions. Before describing the principles, we need to state what the preconditions are for the Standard Model to deliver its benefits.

Legal and Social Infrastructure

Every business operates in a legal and social environment, and the Standard Model assumes that a sophisticated framework of institutions is in place and is functioning properly. In view of the recent financial scandals, it is

relevant to state several essential characteristics that a country's financial system has to have. There has to be rule of law. White collar criminals have to face prosecution, conviction, and long jail sentences. They also have to face financial penalties large enough to wipe out all their wealth and leave them permanently impoverished. There has to be vigilant regulation of securities markets to prevent manipulation. The rights of minority shareholders have to be paramount. If minority shareholders do not get the returns they are entitled to, the country's capital market will be defective. It will only allocate capital to borrowers who can give strong guarantees. It will not allocate capital to risky projects, and it will not bankroll very many startups or young entrepreneurs with good ideas.

This institutional framework is easy to describe but hard to create. As recent events have shown, the framework is always in danger of assault. Stealing is always a temptation, and every time society becomes complacent, a new generation of scoundrels finds ways of undermining the systems of checks and balances.

The First Principle: Portfolio Diversification

The starting point for the Standard Model is risk aversion and the tradeoff between risk and return. Most market participants are risk averse, and savers have good reasons to be especially risk averse. In the aggregate, the people who supply savings to the markets are more risk averse than the would-be users of other people's savings. This mismatch has been a prime mover for financial innovation, and is a major part of the raison d'etre for financial intermediation. Intermediaries work to remedy the mismatch, and earn profits when they succeed.

Savers put their money in bank accounts, and they also buy bonds and common stocks. They hold a mix of assets, and they vary the mix of assets according to how optimistic or pessimistic they feel about future economic conditions, according to how much risk they can afford to take, and according to how old they are. For them to buy a risky security they have to believe that its future returns will be high enough to compensate them for the risk they are taking.

Finance experts have known those points for centuries. The new discovery came in 1952, and it gives a way of calibrating how risky a security is. The

discoverer, Harry Markowitz, noticed that professional portfolio managers do not invest 100% of a portfolio in the security they think will go up the most. Instead they invest in many different securities, diversifying the holdings among a wide range of different securities.

The breakthrough was that Markowitz computed a measure that nobody had computed before. He measured the amount of risk reduction that this strategy of diversifying the portfolio achieved. He did this with a mathematical technique that is quite simple and easy to illustrate.

To see Markowitz's method, consider a risky security. In this example we use the common stock of an oil company. This company operates in a country with the necessary institutional infrastructure, so the shareholders will get the benefit if the company does well. The company has oil wells, so if the price of oil rises its revenues and profits will rise. The company will pay some of the higher profits to the shareholders, so if the price of oil goes up the stock price will rise. If the price of oil goes down, the stock price will fall, but not by very much. It will only fall a small amount, because the company will survive and will probably continue to pay dividends, and the oil price might rise during some later time period.

To continue with the example, let us suppose that the oil stock is selling at $20 a share at the beginning, before the oil price goes up or down. Let us suppose that if the oil price rises, one year later the stock will have gone up to $28 a share; and if the oil price falls, one year later the stock will have fallen to $18 a share. Assume that these price fluctuations include the cash dividends the oil company pays, so, for example, if the company paid a dividend of $0.50 during the year, the ending stock prices would have been $27.50 and $17.50.

This oil stock is a risky security because its price can go down and also because the range of outcomes is wide for such a short time horizon as one year. A risk-averse investor would not buy this stock, or would buy only a very small amount, so that the stock's fluctuations would not destabilize the entire portfolio.

Now consider another risky security. This second one is the common stock of an airline. This particular airline is more stable than most, and is not facing much risk of bankruptcy, but its operating results are very vulnerable

to fluctuations in the price of jet fuel. Its profits rise and fall with the price of oil. If the price of oil falls, jet fuel will be less expensive, and the airline will do well. If the price of oil rises, the airline will not do as well. Suppose that at the beginning, before the price of oil falls or rises, the airline stock price is $40. If the price of oil falls, the airline stock price will rise to $56 after one year, and if the price of oil rises, the airline stock price will fall to $36 after one year. Again, these ending prices include dividends the airline pays to its shareholders. For example, if the dividend per share were $1, the ending stock prices would have been $55 and $35.

This second security is also quite risky, and a risk-averse investor would not buy it. It is exactly as risky as the oil stock. It can deliver a return of 40% or a loss of 10%.

Markowitz measured the risk of each security by computing a statistical measure of dispersion called the standard deviation. This was a big advance, because previous writers has not used such a precise, easy-to-compute indicator of risk.

The real breakthrough that Markowitz made, however, was to point out that these securities are much less risky if they are combined in a portfolio. He developed a method of computing how much risk the diversified portfolio has, and contrasted the risk of the portfolio with the risk of each individual security in the portfolio.

To see the effect that diversification has on reducing the risk of owning securities, consider a portfolio that has shares of the oil company stock and the airline stock in it, and no other securities. The portfolio is

½ invested in shares of the oil company; and

½ invested in shares of the airline.

Each of these stocks is quite risky by itself, but when they are in this simple portfolio they are much less risky. In fact, in this example, the portfolio's value after one year comes out the same whether the price of oil rises or falls. To verify this, let us compute the value of the portfolio after one year. Suppose that the investor began with $200,000 and at the beginning put $100,000 into each of the two common stocks. The investor would buy

5,000 shares of the oil company stock and 2,500 shares of the airline stock. So the portfolio would consist of

5,000 shares of oil company stock; and

2,500 shares of airline stock.

One year later the portfolio would be worth $230,000 regardless of whether the price of oil rose or fell. The value of each individual stock in the portfolio would have risen or fallen, but the total value of the portfolio would come out to be worth $230,000 in both cases.

If the price of oil rose, the oil stock would have risen to $28, so that portion of the portfolio would be worth $140,000, including the dividend the oil stock paid during the year. The airline stock would have fallen to $36, so that portion of the portfolio would be worth $90,000, including the dividend that the airline stock paid during the year. The total value of the two holdings would be $230,000.

If the price of oil fell, the oil stock would be worth $90,000 and the airline stock would be worth $140,000. Both figures include the dividends the stocks paid during the year. As before, the total value of the two holdings would be $230,000.

In this idealized example the strategy of diversifying the portfolio works so well because the two stocks respond in exactly opposite ways to the oil price. Their returns are perfectly negatively correlated.

Several caveats are in order. First, the portfolio is still vulnerable to other macroeconomic events, so it is not completely risk-free. Second, finding two stocks whose returns are perfectly negatively correlated is difficult in real life.

This first breakthrough had many implications and had a profound effect on financial management. It explained why portfolio investors were willing to buy risky common stocks, despite being quite averse to risk. It explained why some risks did not scare them away, and why other risks, that did not look any greater by themselves, were red flags.

Corporate treasurers gradually learned how to design securities so that portfolio investors would consider the securities attractive. Treasurers revised their view of shareholders. In the centuries before 1950, the dominant view was that shareholders were like business partners. They understood the characteristics of the businesses they invested in, and tolerated the ups and downs of those businesses. If an entire industry sector had a slump because of overcapacity, shareholders understood the situation and rode through the slump, and looked forward to better times. They did not blame the managers of the companies, and did not sell the shares. After Markowitz, corporate treasurers came to understand that shareholders are not business partners. They buy common stocks because they expect that the shares will deliver returns and offset the risks of other shares in their portfolios. They hold the shares as long as the shares perform the role those roles in the investors' portfolios. When the shares cease to perform, or when shares that can perform better become available, the investors sell the shares. They do not feel any sense of shared destiny with the companies or loyalty to the managers of the companies.

There were many implications and there soon appeared specific techniques for calculating whether a security would be attractive to buyers. Portfolio managers used these techniques, and corporate treasurers soon had to master the techniques and apply them to tailor the securities they sought to issue. The ones who did this successfully got more capital for their companies and they got it more cheaply. The ones who did not adopt the new view were still able to get capital for their companies but they got less of it and their companies had to pay more for it.

The Second Principle: Optimizing Capital Structure

The next breakthrough happened in 1958. The typical corporation gets money by borrowing it and by selling shares. Different corporations use these two sources of financing, debt and equity, in different proportions. The old rule of thumb was that companies with stable cash flow could rely more on debt financing, and companies that were more cyclical had to use less debt financing and rely more on funds from shareholders. There was no satisfactory proof of this rule of thumb, beside the experience of the marketplace. Two writers, Modigliani and Miller, sought to understand

why companies choose to obtain capital from these two sources in specific proportions. They observed that companies appear to have an ideal mix of debt and equity financing in mind. The mix of debt and equity financing is called *capital structure*, and when a company sets a target for its mix of debt and equity financing, finance experts say it is making a capital structure decision.

To probe the underlying rationale for choosing debt or equity financing, Modigliani and Miller used a method of analysis that in mathematics is called *proof by contradiction*. They started out by asking whether it makes any difference whether the company uses debt financing or equity financing. They asserted, as a way of challenging the old rule of thumb, that companies would not be worth any more or any less whether they were financed 100% with debt or 100% with stockholders' equity. Then they began testing this bold assertion to see whether it is true or false.

Their initial assertion triggered a healthy debate among finance experts, and by 1962 a much deeper understanding of the capital structure decision had emerged. The debate revealed that capital structure does matter – a company can be worth more if it uses debt and equity financing in the appropriate proportions. The debate also revealed that if a company is using too much equity financing, it can raise its stock price by borrowing money and then using the money to buy back some of its shares in the open market. This maneuver changes its capital structure, and raises its ratio of debt to equity financing. Many companies have done this, and the maneuver is now called a *common stock buyback*.

Many seasoned executives were skeptical of this maneuver. They did not se why the company should be worth more after it alters its mix of debt and equity financing. They thought the company's stock price went up only because the company was buying its own shares. Some of them believed the maneuver was a manipulation and denied that it creates real value. As the debate among experts continued, however, these executives finally had to admit that capital structure does make a difference.

There are many ways of understanding why optimizing a company's capital structure creates value. All of these ways rest on a premise that needs to be stated clearly at the beginning. The premise is that investors are not buying the *whole company*; they are only buying small amounts of its stock or

bonds. If an investor is buying the whole company, its value depends on how the company will fit with the investor's other businesses and operations. An investor who is only buying a small amount of the company's stock or bonds thinks of different issues. If the investor is buying the company's bonds, he or she judges how risky the bonds are, and tries to assess whether the projected yield is high enough to compensate for the risk. If the investor is thinking of buying the company's common stock, he or she judges how risky the stock is by itself, and how risky it will be in his or her portfolio. Once this premise is stated, the assertion that a company's capital structure affects its value sounds more reasonable. Once everyone agrees that the entire company is not for sale, and that it is a going concern, then everyone agrees the company will raise new funds from time to time. They buyers will be passive portfolio investors, who are not going to try to exercise control over the company, and who are only going to put the securities in their portfolios. Then it makes sense to talk about how many bonds the company should try to sell during a given time interval, relative to the amount of stock it has outstanding. The company finances itself by offering two classes of securities, bonds targeted to risk-averse investors and common stock targeted to risk-tolerant investors. It puts out amounts of each type according to the demand. If it tries to put out too many bonds, investors will refuse to buy, or demand a higher coupon rate. If it puts out too much stock, the market price of the stock will decline.

The Third Principle: Pricing Risky Securities

The Markowitz technique gave a method of figuring out how risky each security is, relative to another individual security, but it did not give a calibration for the risk of each security vis-à-vis a standard benchmark of risk. Beginning in 1966, Sharpe and three other writers put forward methods that calibrate how risky an individual security is. They distinguished two types of risk: a type that can be eliminated by diversification, like the vulnerability to fluctuations in the price of oil in the example above; and risk that cannot be eliminated by diversification. They called these two types of risk unsystematic and systematic, or diversifiable and undiversifiable. The model they put forward is called the Capital Asset Pricing Model. Its key parameter is the measure of risk of an individual security, and they used the Greek letter Beta to represent that.

The Capital Asset Pricing Model was a breakthrough because it simplified Markowitz's method. After it came out, more portfolio managers could apply scientific portfolio selection criteria. It helped in two other ways that were equally important. It allowed independent observers to calibrate whether one portfolio manager was taking more risk than another. In the past, there had been star managers who took big risks, and sometimes made big returns for their clients. The Capital Asset Pricing Model allowed observers to tell whether these star managers had achieved their superior performance by selecting mostly risky stocks, or whether they were selecting safer stocks. Managers who take bigger risks sometimes do well, but are more likely to have periods of really bad performance. The other way it helped was to give analysts a formula that could predict what the effect would be on a company's stock price if it acquired another company, or sold off a division, or issued bonds and then bought back its common stock, or took any other major step.

This breakthrough accelerated several trends in portfolio management and corporate financial management. It gave the scientific portfolio managers another advantage over the old portfolio managers that relied on rules of thumb. It broke the remaining ties of loyalty that were still remaining between stockholders and corporate treasurers. Professional portfolio managers attracted more money, and individual investors handed over more and more of their assets to professionals and paid them to manager the assets. Corporate treasurers learned quickly that they had to offer securities with attractive features, or they would have difficulty placing the securities. Buyers were experts, and they eyeballed each new issue critically before deciding whether to buy any of it. There were no longer as many gullible buyers, no captive buyers, and no buyers who would subscribe to a new issue for reasons of loyalty. The new formula made it too easy to compute what the correct price of the security should be, and if the company was trying to get a price higher than that, the buyers would shun the issue.

The Fourth Principle: Pricing Options

In the period 1972-73 there was a fateful coincidence. Three developments happened in a short span of time, and together they spawned a revolution in

corporate finance. The pressures on corporate financial managers until that time were intensifying, but the events of 1972-73 ratcheted up the intensity.

The events began when Black and Scholes published a formula for valuing the price of an option. This formula used more advanced mathematics than the three breakthroughs that preceded it. Time might have elapsed before the formula would have come into widespread use, but the other two events put the formula to work almost immediately. Hewlett-Packard began marketing a high-end hand-held calculator that could find solutions to the formula quickly. The calculator was expensive, and many scientists did not buy it because they could solve formulas on their mainframe computers. But the third event was that the Chicago Board of Trade launched a new category of product, options on common stocks. These were different from futures contracts, which were what the Board of Trade had offered before. These options on common stocks were difficult to value, and the young traders who acted as market makers knew that. Some of them found the Black-Scholes formula and the new Hewlett-Packard calculators, and as soon as they had those two tools they were able to buy options that were underpriced and sell options that were overpriced. Other market makers who did not use those two tools were trying to do the same thing, and their methods were less accurate. Option trading is a fast-moving game, and a market maker can make hundreds or thousands of trades a week. The people who used the formula and the calculator had an advantage, and made fewer errors, and higher average profits on each trade. In a very short time the formula and the calculator were absolute requirements for survival.

Trading volume in options grew rapidly. Portfolio managers and individual investors found ways of using the Chicago Board of Trade options. The options allowed them to alter the risk characteristics of their portfolios, and to stabilize the rates of return their portfolios delivered. By using the options correctly, a sophisticated investor could buy risky securities with high expected yields but high volatility, and convert them into a portfolio that was quite stable. The options added stability to portfolios that had already been made as stable as Markowitz's and Sharpe's techniques could make them.

Corporate treasurers saw what was happening, and some of them began to investigate ways of applying the new options to improve the financial stability of their companies. For them the new options were another kind of

hedging product. There had been hedging products before the new options came along. For example, foreign exchange hedging products had existed for centuries, and corporate treasurers had used them extensively. There had also been a wide range of insurance policies, and corporate treasurers had bought those to protect their companies.

Corporate treasurers as a group were slow to take advantage of the new options. They faced restrictions and had to wait until new hedging products appeared. The success of the Chicago Board of Trade options showed that there is demand for new hedging products, and financial institutions began to offer innovative products. The result has been called the Derivatives Revolution. The term *derivative* is a catch-all that includes options, futures contracts, and swaps. All these products have some common elements, despite having evolved separately. They all protect against one risk or another. In that sense they are all like specialized insurance policies that pay off when some specific event occurs. A company can buy them individually or in combinations, or it can sell one and use the proceeds to buy another. As these products began to appear in large numbers and variations, corporate treasures had a complicated but potentially rewarding task. They had to choose which ones to use, and they had to keep reviewing the ones they were using, and replacing some of the ones that expired. The name of the task is *risk management*. Companies that are good at risk management show steady growth despite the volatility of the industry sectors they operate in. They use risk management products to smooth the ups and downs of the underlying commodity cycles. In that fashion they deliver stable, growing returns to shareholders. Among investors there is always a strong demand for shares that do not fluctuate violently, but instead rise steadily, with few bumps along the way. The companies that are able to deliver that performance succeed and their shares rise in the market. The companies quickly gain leadership status, and often are able to raise enough capital to buy their competitors. Stock market performance gives them the advantage they need to acquire dominance in their industry sector.

A Simple Application of the Standard Model, Showing the Shareholder Value Criterion

This narrative has shown how the Standard Model of Finance came into existence, as each of its pillars appeared and achieved widespread success.

Now we can look at a business decision and see how the Standard Model guides corporate financial managers to the correct decision.

Suppose that there is a petrochemical company that processes crude oil and makes it into several different plastics. The company is known for the high quality of its products and is successful. It sells to over 175 different customers and no customer accounts for more than 2% of its annual sales, so in that sense it is stable. It does not rise or fall with any industry sector because its customers are in many different industries.

The petrochemical company's capital structure is optimal. Its management confers frequently with investment bankers, and as market sentiment changes, the company tailors each new issue of securities to stay in step with what the market wants. The company sometimes buys back its common shares, and sometimes uses the shares it has bought back to pay for an acquisition.

Despite the quality of its products and its other advantages, the petrochemical company's share price is not very high. Its earnings are too volatile, and its capacity to pay dividends is too low. The company operates in a mature industry, and investors see that it should have the capacity to generate steady earnings. They also see that it does not deliver stable performance, so they only buy its shares at times when the shares are relatively cheap.

The company's earnings are unstable because the price of crude oil fluctuates, and the company is not able to raise the prices of the plastics it sells every time the price of crude rises. The company tries to hedge its exposure to the fluctuations in the price of crude, but its hedging is not very successful. The company is underhedged, and so its earnings fluctuate too much.

Now suppose that there is an opportunity to buy a company that has oil wells. These are good wells, with many years of reserves, and they are located near the company's petrochemical plants. From a strategic point of view, buying the oil company looks like a good decision. The petrochemical company would integrate vertically, and its cost of crude oil would no longer fluctuate. The petrochemical company would buy 100% of the shares of the oil company and then consolidate the oil company's

accounts into its own. The petrochemical company's balance sheet would then show its original assets and liabilities together with the assets and liabilities of the oil company.

The acquisition might be a bad idea from a financial point of view. To see how financial considerations could block this acquisition that sounds so logical from a strategic point of view, suppose that the oil company owed $900 million. Also suppose that its equity is only worth $100 million. To complete the beginning assumptions, suppose that the petrochemical company owed $500 million and its equity was worth $500 million. Also suppose that the petrochemical company would issue new shares in exchange for 100% of the shares of the oil company. Before the merger, the petrochemical company has 10 million shares issued and outstanding and its shares are trading at $50 a share. It would issue 2 million new shares and give those to the owners of the oil company, so after the merger there would be 12 million shares outstanding.

The petrochemical company's stock price would probably go down as soon as it announced the transaction. This is normal, because investors would be able to see that 2 million new shares are going to come into existence, so they would be wary of buying until they have seen whether the owners of the oil company decide to keep the shares of the oil company or sell them.

The big question that the Standard Model can answer is whether the shares of the petrochemical company would rise in the weeks and months following the merger. In this case the shares probably would not rise back to $50. Instead they might fall. The reason is that after the merger the petrochemical company would owe too much money. It would owe the $500 million it owed before the merger and it would also owe the $900 million the oil company owed. To complete the merger the petrochemical would have had to assume the oil company's debt. Its consolidated debt position would be $1.4 billion. If market participants considered that amount of debt prudent for the consolidated company, the market value of its equity would be $600 million. If market participants felt that the consolidated company was going to be safer and more profitable after the merger, the market value of its equity could be greater than $600 million. Its stock price could rise above $50 a share in the months following the merger.

The more likely outcome, however, is that market participants would feel that $1.4 billion is too much debt for the consolidated company to bear prudently. In that case they would be wary of buying the shares, so they would fall on the announcement of the merger and not rise later. They might fall to $40 a share, and not rise until the consolidated company had paid back enough of the debt so that its debt burden once again looked prudent.

The calculations to determine ahead of time whether the merger would raise the petrochemical company's stock price of lower it are quite simple. The data inputs needed are also simple to obtain. Any junior analyst can quickly get the data and do these calculations.

What does the Standard Model suggest that the petrochemical company should do if the merger would lower its stock price? The answer is the petrochemical company should improve its hedging. It can purchase a *cap*. This is a contract that puts a ceiling on the price the petrochemical company pays for crude oil. For example, if the petrochemical company buys a 5-year cap with a price ceiling of $25 a barrel, and the price of crude oil rises above $25 a barrel, the counterparty that issued the cap will have to pay the excess over $25 a barrel to the petrochemical company. If the price of cured oil rises to $28 a barrel, the counterparty would have to pay $3 a barrel to the petrochemical company. Caps are now easy to buy and there are several major financial houses that offer them.

This example shows that financial considerations now influence whether deals are done, and it shows that the main consideration is what the effect of the deal will be on stock prices. The example also how that new risk management products have appeared in the market. These new products meet the needs for hedging that are now greater because old-fashioned strategies such as vertical integration are not always helpful since shareholders do not tolerate volatility.

END