Hedging Policy Consistency Theory vs. Practice: The Role of Management's Expectations in the Implementation of Hedging Policy[1]

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Presented at the:
2011 Enterprise Risk Management Symposium
Society of Actuaries
March 14-16, 2011

1. The content of this paper represents the views of the author only.

Abstract

This paper addresses the contradiction between the financial theory of hedging and management practice. The theory has identified a series of legitimate reasons for companies to hedge and create shareholder value. When these conditions are present, companies are supposed to implement a consistent level of hedging over a period of time. This paper examines how consistent hedging policy is incompatible with management's competencies and role in the company, requiring management to form strong future price expectations. We outline key differences between an insurance decision model and a hedging decision model. Based on these differences, we describe a process that management actually follows when making decisions about hedging and stress the role of the expectations discrepancy in this process. We call this decision process management expectations-based hedging.

Keywords: Hedging, Hedging Policy, Derivatives, Risk Management, Insurance, Management Expectations, Management Expectations-based Hedging.

Theoretical Reasons and Practical Challenges for a Consistent Hedging Policy

Over the past few decades, the explosion of commodity and currency directives traded on exchanges and over the counter has tremendously increased the opportunities for nonfinancial companies to hedge portions of their revenues and/or costs. With hedging, companies are able to lock in a fixed future price. A company can implement a hedging policy for both its outputs and inputs (if derivative contracts are available) and for either its outputs or inputs alone. By choosing the portions of revenues (outputs) and/or cost (inputs) to be hedged, the companies can control the level and volatility of their profits, cash flow and other metrics.

Risk management theory prescribes a few legitimate reasons for management to hedge and reduce income volatility: 1) to reduce the expected direct and indirect cost of financial distress by mitigating the impact of possible negative market conditions; 2) to minimize tax expense by avoiding higher tax brackets due to high income volatility; 3) to optimize capital structure and lower the cost of capital; 4) to decrease the total risk for large undiversified shareholders and stakeholders; and 5) to avoid underinvestment in otherwise profitable projects due to lack of, or the high cost of, external financing.[2] Of course, hedging can be value-destroying and can be done for the wrong reasons, such as corporate hubris (the "company size" hypothesis) or, even worse, an entrenched management's excessive aversion to valuable risk-taking.[3]

To hedge, a company usually enters into an additional futures/forward contract with a counterparty, where the contract creates an opposite exposure to the price risk borne by the company in its natural course of business. For a company's outputs/revenue, the risk is a possible negative deviation of the future spot price against the available futures price today. To hedge this risk, a company sells futures contracts where it would generate profits equal to the losses from a potential price drop below the futures price. Conversely, for a company's inputs/cost, the risk is a possible positive deviation of the future spot price against the available futures price today. To hedge this risk, a company buys futures contracts where it would generate a profit equal to the losses from a potential price increase above the futures price. Futures contracts are free to set up and compensate the counterparty by obligating a company to forgo all possible additional income from a potential price move in a favorable direction.

The same general framework applies not only for product prices but also for the "prices" of currencies, capital and services. If a U.S. company is generating euros by exporting to Europe, it may wish to hedge the "sale" price of its euros for dollars. If a company is borrowing at a variable interest rate, it may wish to enter in a "variable for fixed" interest rate swap. The

2. Thouraya Triki, "Research on Corporate Hedging Theories: A Critical Review of the Evidence to Date" (working paper, May 20, 2005).
3. Aziz A. Lookman, "Does Hedging Increase Firm Value? Comparing Premia for Hedging 'Big' Versus 'Small' Risks" (July 23, 2009), EFA 2004 Maastricht Meetings Paper 5174.

objective of the hedge is for the physical and the paper exposures to cancel out each other and for the company to achieve a fixed transaction price. In cases where there is not a perfect match between the physical and the paper exposure (i.e., the underlying asset for the futures contracts is different from the asset a company is trying to hedge), the company has to bear a basis risk. Here the hedge simply reduces, but does not eliminate, the future price volatility.

In general, companies do not have risk exposure to the volatility of prices but only to potential price changes in a particular direction. A company would experience an increase in its output prices as an opportunity and only a potential decrease would be seen as a risk. Inversely, a possible drop in the prices of inputs would be welcomed, and only a potential increase is a threat that may need to be hedged. Hedging through futures contracts by eliminating both sides of price volatility can be costly, as it provides a company with insurance at a nonspecified price. The company has to pay the counterparty any negative difference between the agreed futures price and the actual spot price.

A company can manage a price risk by directly buying insurance against an undesirable move in the price while preserving all the positive potential of its volatility. For output price, a company can buy put options with a set strike price. If the spot price at the future period falls below the strike price, a counterparty will be obligated to compensate the company with the difference. The put options will provide a company with a set floor price for its output, while preserving all the upside potential in the case of a price increase. Similarly for inputs, a company can buy call options with a set strike price. If the spot price at the future period rises above the strike price, a counterparty will be obligated to compensate the company with the difference. The call options will provide the company with a price ceiling for its input while preserving all the additional savings potential in the case of a price decline.

Buying options contracts, especially for reasonable strike prices (close to “in the money” options) is costly. Here the counterparty bears all the risk and none of the upside and therefore has to be compensated exclusively through the option price. An options contract functions like an insurance contract for a price. It compensates the owner of the contract for losses in the case of a risk event—a price move above or below a strike price. Regular types of insurance such as insurance for cars and homes, protects the buyer against individual and, therefore, diversifiable risk. As a result, in a well-functioning insurance market, the risk premiums should be smaller than the expected losses for the individual. Options, on the other hand, protect the buyer against market and, therefore, mostly nondiversifiable risk. That is why the sellers of options have to be compensated accordingly.

Despite the potentially high cost of hedging, either through futures or options contracts, financial theory implores management to implement and follow a consistent hedging policy if the above-mentioned reasons for hedging are present. A set of assumptions about the future, together with sophisticated calculations, can help management identify the right type and amount of hedging where “on average” it should increase shareholder value. The general logic is similar

to the logic driving insurance decisions—is the expected cost of insurance premiums lower than the expected benefit from the insurance? If the answer is yes, buying insurance is the right decision, even if premiums are paid for years and the risk event never occurs.

If management concludes that hedging is justified, it should implement hedging through a consistent policy with the following characteristics: 1) hedges cover an existing risk exposure; 2) hedges are applied to a significant portion of the company's output or input price risks; 3) hedges are maintained until maturity; and 4) hedging policy is followed consistently over a meaningful period of time. Applying those criteria to current management practice would show that most of the companies do not implement a consistent hedging policy, especially regarding the size of hedges.[4]

4. Wayne Guay and S.P. Kothari, "How Much do Firms Hedge with Derivatives?" (draft, October 2002).

The Hedging Decision Model and its Characteristics

A good way to understand management behavior in applying an inconsistent hedging policy is to outline some key differences between an insurance decision model and a hedging decision model.

Insurance Decision Model	Hedging Decision Model
1. The risk event would have very strong negative impact on the company.	1. The risk event would have only moderate negative impact on the company as market prices tend to return to equilibrium levels.
2. The risk event would be unique and would create a strong disadvantage against competitors.	2. The risk event would be shared with competitors and would not create a strong relative disadvantage.
3. There is no natural hedge for the risk event.	3. Input and output prices may provide a natural hedge for each other.
4. Management does not focus on the probability of the risk event.	4. Most companies forecast input and output prices and implicitly or explicitly have expectations for the likelihood of different price levels.
5. Insurance premiums represent a small portion of operating expenses.	5. Hedging cost can become a significant expense for the company.

Those differences in the decision models drive several very important characteristics of management's behavior with regard to hedging.

1. Management has significant hedging flexibility.

For most companies, even when the reasons for hedging are present, hedging is not an imperative. Price risk is not a binomial event, and price volatility is usually moderate. Companies have operational flexibility to respond to negative price changes by cutting/changing/relocating production and reducing cost. The availability of financial reserves allows companies to absorb temporary losses. Prices of outputs and inputs tend to return to levels where companies can generate a normal profit. Because of the moderate potential impact, management usually

has considerable discretion regarding whether to hedge or not to hedge, and how much, to hedge for a given period.

2. Being right is expected.

Companies develop input and output price forecasts for their planning and strategy formulation processes. Those forecasts are updated continuously and, implicitly or explicitly, include assumptions not only about the expected price levels but also about their volatility. Those price forecasts are a key element of management's overall view of the future. Investors also perceive the ability of management to forecast the prices of key inputs and outputs as a part of their core competencies. So, even though the cash flow from hedge instruments should be considered in combination with the profits and losses from regular business, significant hedging losses would reflect negatively on management and the company.

3. Being wrong is costly.

Unlike insurance, hedging can add significant additional costs to a company and alter its relative profitability. If properly designed, a hedging policy should create incremental value over time. However, in the short term, it can produce a significant cost disadvantage. Because in most industries hedging is not a standard practice, a company that would hedge consistently could create a profitability pattern very different from the rest of the industry. This can have significant consequences, not only in terms of investor perception, but also can create a real competitive challenge. For example, if an airline locks into a jet fuel price for its supply and later the price drops, it can find itself at a severe disadvantage against competitors that did not hedge.

Management's Decision Process Regarding Hedging

Management's process of evaluating the possibility to hedge a given price risk starts with developing a view about the likely level and volatility of the price for the period under consideration. This view can be formalized in a company's forecasting or independent of it. Corporate forecasting can be a much slower process and lag behind the latest insights of management. Formal forecasts can perform functions other than serving as accurate predictions. Forecasts can be used to motivate employees, negotiate with counterparties, and communicate with investors and rating agencies.

To understand the hedging behavior of companies, one has to appreciate how critical those price expectations are for management's thinking and actions. The leadership of companies is usually comprised of seasoned industry veterans and experts. They have observed industry dynamics, including prices, for years, often for decades. They also understand, or believe they understand, the actual factors and interconnections that drive prices in the industry. For these individuals, it is virtually impossible not to have strong views on the future of key prices. From a practical operational point, the price forecasts for the company's outputs and inputs form one of the bases for its capital budgeting, operational and commercial planning and strategy formulation processes. A high level of conviction in the price forecast is a prerequisite for the normal unfolding of these processes. Given the importance of management's price expectations, the theoretical prescription that companies should just keep hedging and accept the futures prices provided by the derivatives markets is highly impractical.

We can describe management's expectations with the expected price level (P_E) and expected standard deviation (σ_E) of the probability distribution[5] (Figure 1).

Figure 1

Management Price Expectations

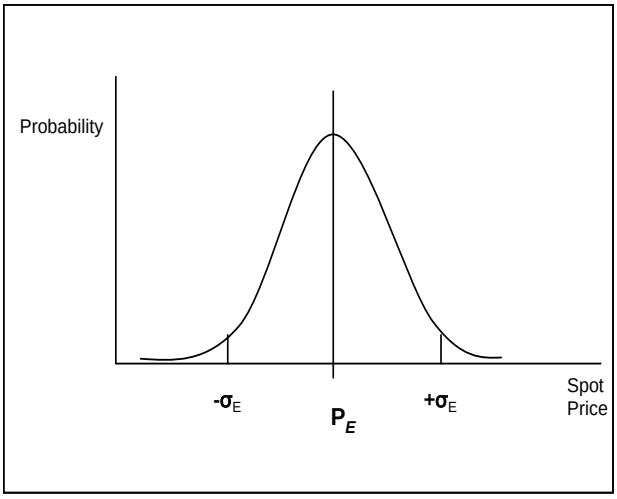
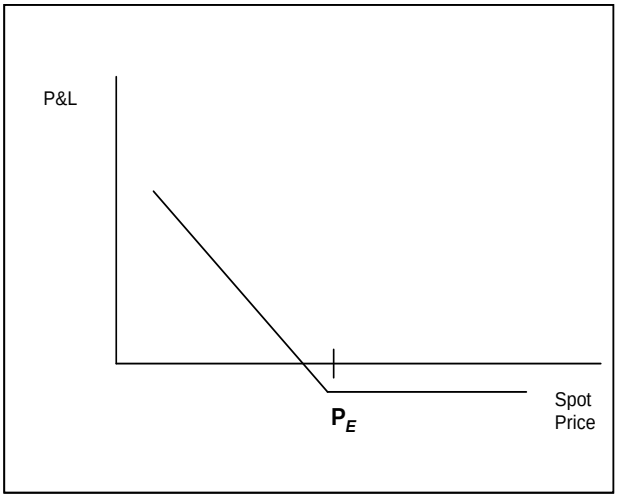


Figure 2
Put Options with Management Expected Strike Price



5. Here we assume a normal distribution for the sake of clarity.

If the price is a company output price, the risk for management is that the actual spot price at the future period turns out to be lower than the level management expects. Because the risk is asymmetric, the natural hedging instrument should be price insurance. This insurance would guarantee the company its expected price level as a floor, while protecting the upside from a possible price increase. To get this insurance, a company has to buy put options with a strike price equal to its expected price for the projected quantity of its output (Figure 2). If the price drops below management's expectations, the proceeds from the option contract would fully compensate the company, and, if the price turns out to be above that level, the incremental gains are completely unencumbered. For the reasons discussed earlier, acquiring those put options is usually very costly and requires an immediate cash expense.[6] Such an expense is hard to justify in the regular course of business, and management has to look for a cheaper way if this price risk is to be hedged. At the time of a hedging decision, management observes the futures price for contracts available for the same period (P_F). Entering into such contracts would allow the company to lock the price of its output at this level (Figure 3).

The first question management would consider is how the futures price compares to its own expectations. If the futures price is significantly lower than the expected price ($P_F < P_E$), hedging would mean an immediate acceptance by the company of a loss compared to expected revenues. Two factors that will influence a hedging decision in general will be important for management's final determination here. Those factors are the expected price volatility (σ_E) and the potential cost to the company from not hedging. Higher expected price volatility and the

Figure 3

Payout Function of Available Futures Contract

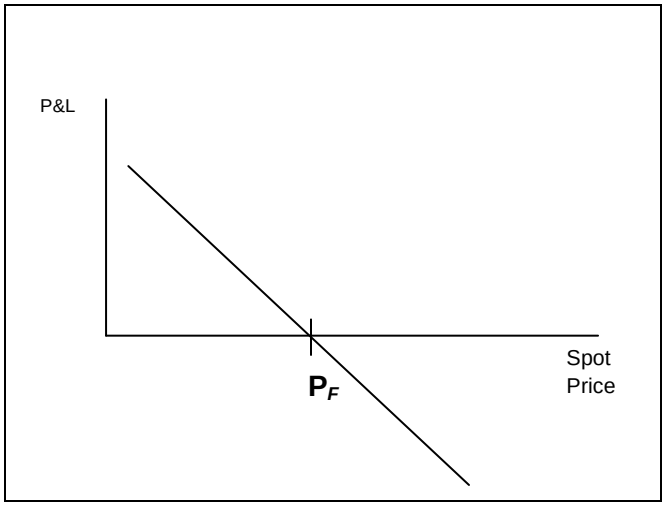
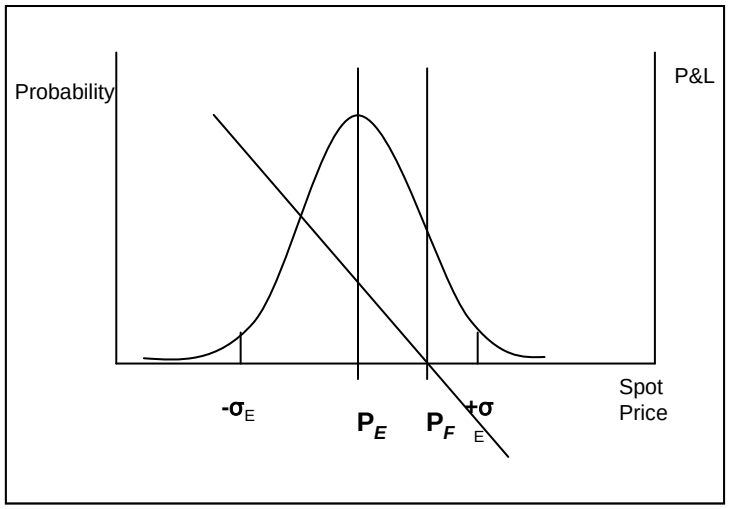


Figure 4
Payout Function of Available Futures Contract with Management Price Expectations



6. Management can reduce the cost of hedging with options by selling out of the money call options. This, of course, means that management gives away some of the upside potential and mimics a futures contract.

higher potential cost of not hedging would influence management to enter into futures contracts even when the price is below its own expectations. Under normal volatility and the moderate cost of not hedging, management would usually choose not to hedge and take the price risk with the expectation of realizing higher revenue.

If the futures price is higher than management's expected price ($P_E < P_F$), management would consider hedging (Figure 4). If management is to hedge, it would lock in a price higher than its forecast and thus secure incremental revenue. However, this fact alone is not enough to determine a hedging decision. Management is conscious that an up movement in the price could generate a significant cash expense for the company. That is why it would apply two additional decision filters: 1) expected negative payout for the futures contract; and 2) value at risk assessment for the futures contract. Once again, financial theory teaches that the profit and loss of a hedge instrument should be evaluated together with the profit and loss of the covered exposure. We contend that for all the reasons in the hedge decision model, managers consider and evaluate the profit and loss of the hedge instrument separately.

Expected Payouts for the Futures Contract

The payout function of the futures contract for the company at settlement is the difference between the futures price (P_F) and the spot price at the time (P_S) times the hedged quantity (Q_H):

$$g(P_F, P_S) = (P_F - P_S)Q_H$$

Using its own expected price probability distribution (P_E, σ_E), management assesses the expected payout of the futures contract. The expected price distribution defines a probability density function for the spot price at settlement (f_E):

$$f_E = \Pr ob(a \le P_S \le b) = \int_a^b f_E(P_S)dP_S$$

This function is different from the probability density function (f_F) one can derive from the market's expectation probability distribution embedded in the futures price and implied volatility from derivatives (P_F, σ_F).

Based on the futures contract payout function and its own probability density function, management can assess the expected negative payout of the contract (ENP):

$$ENP = E[g(P_F, P_S)] = \int_{P_F}^{+\infty} f_E(P_S) * g(P_F, P_S)dP_S = \int_{P_F}^{+\infty} f_E(P_S) * (P_F - P_S) * Q_H dP_S$$

This expected negative payout is perceived by management as the "cost of buying insurance" for that particular price risk. Obviously, the lower the expected negative payout, the more likely that management would decide to hedge its price exposure. Here managers can use

some maximum cost rule of thumb or a more complex consideration. One possibility is to construct a payout ratio (PR) for the futures contract (the ratio of the expected positive payout [EPP] over the expected negative payout [ENP]). The value of this ratio will equal one if the market probability density function (f_F) is used. The expected positive and negative payouts will be equal, and that is why the value of the futures contract at signing is zero. Using management's expectations (f_E), the ratio will be bigger than one.

Management can use an easy method to calculate the expected positive payout as simply the difference between the futures price and its own expected price:

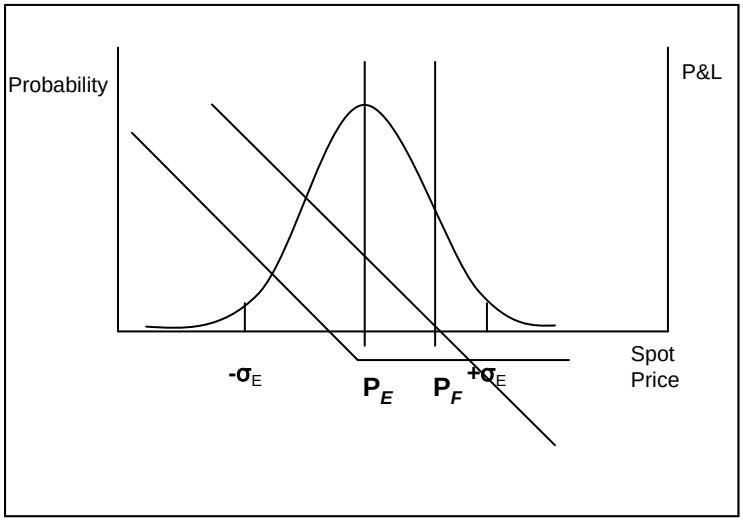
$$EPP = \left(P_F - P_E\right) * Q_H$$

Or it can use a more sophisticated expectations function:

$$EPP = E\left[g(P_F, P_S)\right] = \int_{-\infty}^{P_F} f_E\left(P_S\right) * g(P_F, P_S) dP_S = \int_{-\infty}^{P_F} f_E\left(P_S\right) * (P_F - P_S) * Q_H dP_S$$

The larger the payout ratio, the more likely management would approve a hedging decision. The payout of a futures contract with the price significantly above management's expectation looks increasingly like the payout of an in-the-money call option (Figure 5). The futures contract has the additional attraction of not requiring up-front cash payment but only a small possible negative payout.

Figure 5
Payout Functions of an Available Futures Contract and a Put Option with Management Price Expectations



In the case of a favorable discrepancy between the market consensus reflected in the futures prices (P_F) and management's expected price (P_E), management uses the futures contracts for hedging as a much cheaper substitute for option contracts with a strike price equal to its expectations. As this cheap alternative is not always available, management refrains from hedging consistently.

Value at Risk Assessment for the Futures Contract

Management can run its hedging decision through a second filter assessing what can be the worst payout from the futures contract for a given certainty level. Here again, management would use its own expectations (P_E, σ_E). For example, assuming the probability distribution of the expected price is normal, one can construct a 95 percent confidence interval for the spot price at the future period:

$$P_E - 1.96 * \sigma_E \leq P_S \leq P_E + 1.96 * \sigma_E$$

Now management can easily calculate the expected negative payout from the futures contract for a 2.5 percent probability of occurrence:

$$VAR = \left(P_F - P_E + 1.96 * \sigma_E\right) * Q_H$$

One can easily see that for a given management expectations price and volatility (P_E,σ_E), the higher the available futures price, the smaller the VAR. Here again, management can use some maximum threshold level for VAR as a decision filter regarding whether to hedge or not to hedge a price exposure.

This decision rationale looks a lot like speculation and stresses once again the key argument of this paper—that given management's competence and role, it is highly unlikely it can continuously engage in passive hedging with regard to key price risks. Management decides whether to enter into futures contracts speculatively based on its market view and expectations for standalone profitability. However, when it decides to enter into these contracts, management does not speculate as it covers a physical price risk exposure. We call this decision process management expectations-based hedging.

Management Expectations-based Hedging and the Empirical Evidence

The key implication of our arguments is that companies will engage in significant scale hedging only when there is a favorable discrepancy between their internal future price expectations and the market consensus price reflected in the available futures contracts. Derivatives markets play a key role in integrating individual expectations into collective ones and making them explicit. The market consensus both incorporates individual expectations and has a strong feedback influence on those expectations. As a result, a significant discrepancy between the market and individual management expectations would be relatively rare. A positive discrepancy, statistics would suggest, would be even rarer. Therefore, management very rarely would have the reason, according to its expectations, to engage in significant hedging. This is consistent with the empirical results presented by Guay and Kothari, "Our results suggest that the magnitude of the derivatives positions held by most firms is economically small in relation to their entry-level risk."[7]

According to our argument, management will hedge if its expected price for an output is significantly lower than the available future price, and conversely, when the expected price for an input is significantly higher than the available futures price. In other words, hedging is consistent with management's expectations when the markets are overly optimistic and expect higher output prices and/or lower input prices. Each of these situations or their combination implies a market overvaluation of the company itself. A company is more likely to be over-valued when the ratio of its market value to book value is higher. Consistent with this hypothesis, the empirical results presented by Guay and Kothari state that "hedging intensity increases with the ratio of market value to book value of assets."[8]

Specific cases of management's decision to hedge or not to hedge are popularized in the business press only when the consequences of these decisions prove to be "unexpectedly" large in hindsight. Only then are companies praised for being right (e.g., Southwestern Airlines and the fuel hedge of 2008) or admonished for being wrong. A description of one of those cases illustrates the thrust of our argument. In the first half of 1995, Daimler-Benz lost 1.5 billion Deutschmarks (DM) from its exposure to the U.S. dollar when the dollar unexpectedly dropped to 1.38 DM.

> "Why did Daimler-Benz not hedge? According to *Risk Magazine*, Daimler-Benz claimed its banks' 'forecasts for the dollar/Deutschmark rate for 1995 were so diverse that it held off hedging large portions of its foreign exchange exposure. It claims 16 banks gave exchange rate forecasts ranging from DM 1.20 to DM 1.70 per dollar.' *Some analysts explained the lack of hedging by their understanding that Daimler-Benz had a view that the dollar would not fall below DM 1.55. With this view, hedging would have been expensive—it would have had to sell dollars*

7. Wayne Guay and S.P. Kothari, "How Much do Firms Hedge with Derivatives?" (draft, October 2002).
8. Ibid.

> *at a cheaper price than it expected to get without hedging.* Daimler-Benz's view turned out to be wrong since the dollar fell to DM 1.38. However, the company blamed its losses on its bankers."[9] [Emphasis added]

As this case illustrates, Daimler-Benz management's expectation about the "price" of the DM played the decisive role in its decision not to hedge. The logic that Daimler-Benz management purportedly followed matches the logic decision process outlined above. The case also illustrates how hard it is to verify statements related to management's expectations. For competitive and valuation reasons, those expectations are kept secret, and often this is accomplished by not having a formal process or documentation for the formulation and status of those expectations.

9. René M. Stulz, *Risk Management and Derivatives*, 1st ed. (Thomson Southwestern Publishing Co., 2002).

Conclusion

Over the past 20 years, financial theory has made significant progress in identifying reasons companies should hedge. At the same time, most of the empirical testing designed to prove the validity of those reasons for hedging in management practice has been inconclusive. This suggests that hedging theory is still not fully developed and remains incomplete. New reasons for why companies decide to hedge (and how much) or not to hedge have to be identified and prove consistent with management practice. This article stresses the role of management's own expectations regarding the level and volatility of future prices in its decision process regarding whether to hedge a particular risk exposure. The management expectations-based hedging hypothesis seems to be consistent with some strong empirical results and requires further research and testing.

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