

## ESSAY 3

## Why Derivatives?

In this essay we shall take a look at why derivatives exist. No, this is not some existentialist Monty Python “What is the meaning of derivatives?” treatise. It’s not really that profound. What we want to know is why derivatives exist, which is to say, why people use them and why they are not dominated by other instruments.

To understand this question, we must first look at what derivatives *really* are. Yes, we know they are instruments in which the performance is *derived* from some other instrument or asset. But more fundamentally, we need to see derivatives as instruments that permit the transfer of risk from one party to another. Each derivative transaction has two parties, a buyer and a seller. Typically the buyer pays to transfer the risk to the seller. The seller accepts payment to compensate for the assumption of risk.<sup>1</sup> A description of this sort would apply to an insurance contract, and indeed derivatives should be viewed like insurance. One party pays or gives up something to get another party to accept the risk.

Derivatives are not the only means of transferring risk. For example, an investor could purchase a put option to protect a stock or portfolio against downside loss, a strategy known as a protective put, which we cover in Essay 39. As an alternative, the investor could just liquidate the portfolio and put the money in some other stock, index, bond, or a risk-free asset. In other words, transactions in the actual assets that are exposed to the underlying risk are possible. But transactions in assets can be extremely expensive. The cost of liquidating stocks and bonds is not terribly high, but moving the money to other assets does add another layer of cost. And then at a later date, you might want to reverse the transaction and return to the original

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<sup>1</sup>This description is basically that of an option. Forwards, futures, and swaps do not involve a direct payment from buyer to seller, but they can be viewed as having indirect payments in the form of the buyer promising to give up potential future gains.

position. And transacting in some assets can be quite expensive. Picture the owner of a million barrels of oil selling them. It is not just a matter of signing a few pieces of paper. That heavy oozy stuff has to be moved somewhere. But cost is not the only factor.

Derivatives are generally a much more efficient means of transferring risk. Because derivative markets require so much less capital than do spot markets, they are usually more liquid. Higher liquidity means more efficiency such that prices change more rapidly in response to new information, which is a good thing. Derivatives are also a much easier mechanism with which to sell short. There are significant regulatory impediments to short selling stocks. For some large and heavy assets such as oil and gold, it is very difficult if not impossible to sell short. Yet derivatives on these assets are as easy to sell short as are derivatives on stocks, which are much easier to sell short than are the stocks themselves.<sup>2</sup> Taking a short position can be the only possible way for some to hedge a risk, so this feature of derivatives is a very valuable one.

Thus, derivatives should be viewed primarily as instruments for transferring risk. Given their advantages as noted, we could possibly stop at this point and say that we have now justified why derivatives exist. But we have not answered the more fundamental question of why you would want to transfer risk. Is there some advantage to transferring risk? If there is not, then there is either no justifiable reason for derivatives or risk transfer is not what derivatives are all about.

Let us recall that in competitive markets, you are rewarded for bearing risk. If all capital is invested in the risk-free asset, that capital earns only the risk-free rate. If capital is invested in risky assets, returns fluctuate from period to period, reflecting the fact that the asset is risky. Over the long run, the average returns from risky assets should exceed the risk-free rate.<sup>3</sup> Clearly if the holder of a risky asset decides to engage in a complete hedge

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<sup>2</sup> “Short selling” is a term primarily used with stocks and bonds and means to borrow the asset and sell it in hopes of buying it back at a later date at a lower price. The short seller then returns the borrowed asset to the lender. In derivatives markets, no one actually borrows anything and in fact, the term “short selling” is rarely used. You simply “sell” or “go short” a derivative, which is nothing more than taking the opposite side of the contract from the buyer, thereby guaranteeing to do whatever is obligated by the contract at the later date. This not to say that short selling is not without risk. Most short positions have considerable risk, but the point is that it is much easier to enter into a short position in a derivative than in the underlying asset.

<sup>3</sup> There is no magic wand that makes this happen. Indeed, some investments in risky assets over somewhat long periods of time are outperformed by the risk-free asset. For example, in September 1963 the Standard & Poor’s (S&P) 500 was around

of all risk using a derivative, the investor can expect to earn only the risk-free rate. That begs the question of why anyone would want to hedge. If the risk-free rate is all that you want, then you should simply invest in the risk-free asset.

Well, that is theory and we must acknowledge that theory and reality are not always in line. Some investors want to take risks at certain times and not at others. Some investors want to take certain types of risks and not others. Sometimes certain undesirable risks must be taken in order to take certain risks that are desired. For example, an airline must bear the risk of fuel prices in order to engage in its principal line of business, transporting passengers. The risk of transporting passengers is the risk that airlines should be taking. This risk is one in which airlines should be able to exploit to their advantage. Transporting passengers and their baggage safely and on time is what airlines are good at.<sup>4</sup> Forecasting the price of oil is not. Thus, airlines ought to hedge the price of oil, a risk for which they have no competitive advantage, and take the risks of which they have a competitive advantage. Of course, all airlines do not always hedge. Most hedge a little and some, like Southwest Airlines, hedge a lot. It is probably not a coincidence that the hedgers tend to do better.

Also, a risk taker could feel that there are periods of time in which the risk is much greater than normal. During those periods of time, a hedge would be in order. For example, consider a portfolio manager holding a portfolio during the last few weeks of an election when the market is expected to be especially volatile. If the end of the election period corresponds to a critical period for the portfolio, the manager might want to hedge.<sup>5</sup>

Another common portfolio use of derivatives is in asset allocation overlays. Consider a portfolio allocated 75% to stock and 25% to risk-free assets. These two portfolios are managed by separate and independent money management companies. The overseer of the fund decides that the 75–25 allocation is a bit much for stock, so she would like to sell stock and buy bonds. She would much prefer, however, that the two independent fund

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84. In September 1974 it was around 64, a loss of about 24% in 10 years. Risky assets should outperform the risk-free asset over a rather vaguely defined period known as the long run, though that would probably entail several decades. Otherwise, investors would wise up and not invest in the risky asset.

<sup>4</sup> I have a feeling at this point that you are thinking “He must be joking.” Maybe I should restate it as “. . . what airlines *should be* good at.”

<sup>5</sup> As an example, a pension fund manager might be looking at a critical date on which a portion of the portfolio will need to be liquidated to pay out claims. If this date occurs during an especially volatile period, the manager might consider hedging.

managers continue to operate without having to buy and sell additional securities. They are doing a good job of achieving target performance. But the overall portfolio has too much risk for the manager's comfort level. By using derivatives that reduce the stock risk and increase the allocation to the risk-free asset, the overall desired asset allocation can be achieved without disrupting the two individual portfolios. Naturally if the risk needs to be increased later, derivatives can be used to alter that allocation as well.

Finally, let us note that we have been referring to hedging as if it eliminates the risk, leaving only the expectation of a risk-free return. This notion is somewhat theoretical and academic. Complete risk elimination is rarely seen or even desired for it is often far too costly. As humans we generally do not like risk, but we often willingly take it when we could eliminate it.<sup>6</sup> Usually risk takers are willing to accept a small amount of risk. An old saying goes, "The only perfect hedge is in a Japanese garden." Likewise, perfect hedges in the financial world are rare. Risk takers usually view these hedging transactions as attempts to reduce the risk to a tolerable level.

In addition to all of this talk about hedging, we ought to acknowledge that derivatives can enable us to easily *increase* risk. After all, everyone cannot reduce risk at the same time. This is like everyone wanting to dance but no one wanting to partner up. It takes two to tango, as they say. Someone has to be willing to increase risk. These parties are often referred to as *speculators*, but we should be careful about what we call them. In fact, they have been called some pretty bad and unfair names. Many regulators and politicians believe that speculators are bad for markets. They believe that speculators are greedy investors who care nothing about anyone but themselves. Speculators are thought to be very short-term investors who "steal" profits from others. Their actions are often viewed as destabilizing the market.

Speculators are vital to the survival of the market. As noted, everyone cannot reduce risk at the same time. Diversifiable risk is the only risk that everyone can eliminate. If a market is in equilibrium and one investor attempts to reduce his risk, at least one other investor has to increase hers. If hedgers are somehow the "good guys" and speculators are somehow the "bad guys," how is it that good guys are forced to accept risk higher than they desire if the bad guys refuse to dance?

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<sup>6</sup> Let me offer an example. We could in all likelihood completely eliminate the risk that a terrorist would hijack an airplane if we forced every passenger to be strip-searched and all items be removed and inspected from all luggage. I feel pretty certain we would consider the financial and nonfinancial costs of such a policy to be far in excess of the benefits.

A party that increases risk need not even remotely be considered a speculator. Consider a pension fund with \$100 million invested in stock and a \$100 million allocated to risk-free bonds. This is a 50–50 allocation, which is a common target. Such a portfolio has risk of about half that of the market as a whole, which under no stretch of the imagination would make it one of those evil speculators. Suppose the stock market falls in value by 20% while the risk-free portfolio returns 5%. The portfolio now consists of \$80 million of stock and \$105 million of bonds, a 43% allocation to stock and 57% allocation to bonds. The risk of this portfolio has, therefore, fallen below the desired exposure of 50–50. To get back to the target allocation, the portfolio manager needs to sell some bonds and buy some stock. As noted earlier, this can be quite costly. It is much cheaper to do so with derivatives. The derivatives would have to increase the stock market risk, therefore, and in some eyes, that would make this adjustment a speculative one.

Using derivatives to manage risk is nothing more than engaging in transactions that align the actual level of risk with the desired level of risk. Academic theory often touches little on the practical impediments to doing this alignment. It mostly assumes that all portfolios are properly positioned at the desired level of risk. In the absence of these practical impediments, derivatives might well not exist. After all, virtually anything that can be done with a derivative can be done using the underlying assets and no derivative. But practical differences do matter. As we have noted, derivatives are usually cheaper, much more liquid, and easier to sell short.

Opponents of derivatives are quick to argue that hedging or the more broadly defined “risk management” is just a type of financial transaction. The celebrated Modigliani-Miller (M&M) theory of capital structure says that a firm cannot increase shareholder wealth, the ultimate objective, by rearranging its capital structure. They argue that value is created only by the investments that firms make in their assets. Capital structure, the mix of debt and equity, simply divides up the claims on the assets but cannot make the value of the claims any higher.

The problem with this argument is that it assumes away the same impediments, which economists refer to as “market imperfections,” that make derivatives valuable. Moreover, derivatives can make investments in assets more valuable. Remember how an airline can create value by flying passengers and their baggage safely and timely to the desired destinations.<sup>7</sup> But airlines cannot be expected to create value by forecasting energy prices. Thus, energy hedging makes sense for airlines. Other firms can hedge raw

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<sup>7</sup>It does happen on occasion.

material prices and use those raw materials to create value by providing products and services.

The M&M arguments also provide a safe haven for derivatives to exist when we consider market imperfections. M&M show that if corporate taxes are considered, debt is preferred over equity because of the tax deductibility of interest. But debt is preferred to equity only to the extent that the expected costs of bankruptcy do not exceed the value of the interest tax deduction.<sup>8</sup> By hedging, a firm can reduce the likelihood of bankruptcy, thereby reducing the expected bankruptcy costs, while using more debt and benefiting from the interest tax deduction.

Hedging also makes creditors and potential creditors happy. Lenders always prefer that borrowers take as little risk as possible. Typically more credit is available to those companies that keep their risks low. Access to credit is considered a valuable thing to have. Companies with unexpected needs or cash deficiencies rely heavily on short-term unplanned loans.

Most companies turn first to internally generated cash flows to finance growth.<sup>9</sup> Indeed, some pharmaceutical companies finance their research and development (R&D) exclusively with cash flows from their foreign operations. When their domestic currency increases in value, their foreign cash flows generate fewer units of their domestic cash, thereby forcing them to reduce R&D. For pharmaceutical companies, that means a slowdown at the beginning of a very long and costly pipeline. So you can figure that 10 years or so later, some new drugs will not be on the market and some people will die. OK, I know I am overdramatizing this point, but it is not far from the truth. If cash flows are needed to fund R&D, then R&D will suffer when cash flows are down, and that definitely means some drugs will not come to the market as early. Infer what you want about life and death.

Fortunately, most pharmaceutical firms recognize this problem and wisely hedge this risk. They reason that they cannot forecast exchange rates, so they should not take these kinds of risks. So in this manner, firms can use derivatives to make their assets more productive and that, according to M&M, is where value is created.

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<sup>8</sup> The “expected costs of bankruptcy” refers to the costs that firms incur paying the legal system to adjudicate a bankruptcy process. The legal system effectively has a claim on firms without putting any capital at risk. Recognizing expected bankruptcy costs in the M&M framework means that companies take on as much debt as possible to benefit from the tax deductibility of interest but only to a point where the benefits do not exceed these costs.

<sup>9</sup> Corporate finance theory refers to this priority as the pecking order. Internal equity is the first choice of financing, followed by debt and then by external equity. See any corporate finance text for an explanation.

Hedging also makes financial planning much easier. Recall again the airlines that hedge the price of fuel. It is much easier for them to plan for the next year if they know what their fuel costs will be. Suppose an airline is planning to add a new international route. It cannot add the route overnight. Plans must be made a year or so in advance. The airline would like to do some advance promotions featuring their attractive fares. It can do this much easier knowing what its costs will be. There are surely other benefits, however hard to quantify, of being able to plan with more certainty.

Hedging and risk management, if conducted on a broad basis, promotes a greater awareness of risk within a firm. This “risk culture,” as we might call it, can permeate the organization at all levels and lead to a greater recognition of what risks every employee should take and what risks it should eliminate. Risk taking is, after all, everywhere within a company. Of course, it is hard to quantify these benefits, but they too are surely there.

Risk management and hedging also facilitate the measurement of risk so as to incorporate risk into performance evaluation. Divisions of a company that take varying degrees of risk must be evaluated on a risk-adjusted basis. Companies that make an effort to identify risks and take only those risks they are comfortable with are far more likely to be able to adjust for risk in performance evaluation.

Some academics believe that hedging has certain tax advantages. It has been noted that the progressive tax schedule in the United States and most other countries penalizes companies with volatile income. When a company has a good year and is in a high tax bracket, it pays a lot of taxes. When it has a bad year and is in a low tax bracket, it pays a small amount or no taxes. Because of the progressive tax rate, the low taxes in a bad year do not offset the high taxes in a good year. Consequently, the firm pays a higher tax rate over time than it would pay on its average level of income. In addition, income in bad years, such as years in which there is a loss, cannot always be used to offset future taxes. In principle, hedging by stabilizing income can be used to alleviate this problem. By keeping income at a low level of volatility, firms do not jump back and forth into different tax brackets. This argument has much appeal, but, unfortunately, it does not hold up well in practice. There is only a small degree of progression in corporate tax rates. The income of most firms does not fluctuate much over the different tax brackets. Empirical evidence shows that taxes are not a major issue in hedging decisions.

Finally, we have to acknowledge somewhat reluctantly that there are some not-so-good reasons for hedging. As we know, the boards of directors of companies constantly strive to align the interests of managers with that of shareholders. While some progress can be made on that front, I believe we have to recognize that this is somewhat the old case of forcing a square

peg into a round hole. *Managers are not shareholders, even if they are shareholders.* I know that sounds weird. Let me explain.

With the exception of a few incredibly ignorant or stupid shareholders, we can assume that shareholders hold diversified portfolios. Managers, however, hold highly undiversified portfolios. Even newly hired managers with broadly diversified personal portfolios will soon have rather undiversified portfolios. They will receive stock and options in large enough quantities that it will skew their portfolios so that they are more highly exposed to the employer firm than they should be. In addition, the managers' wealth accounted for by their human capital—that is, the present value of all of their expected future earnings from the firm—will be exclusively concentrated in that one firm. Finally, the managers bear a high degree of reputational risk. If the company performs poorly while they are at the helm, their ability to obtain attractive future employment is jeopardized.

Thus, managers do not bear the same type of risk as investors. Managers hold highly undiversified portfolios, especially after accounting for human capital and reputational risk. To reduce this risk, managers will naturally want to make the company less risky. Wouldn't you? Hence, we often observe companies engage in diversifying mergers. Why did a company like General Electric buy a stockbroker named Paine Webber, then an entertainment company named RCA, and eventually be called a conglomerate? Now you know.

Managers also will tend to hedge to reduce risk. In fact, hedging is surely a much easier way to reduce risk than buying another company. Thus, we can reasonably surmise that managers do a great deal of hedging to help themselves. Shareholders, however, should want their managers to focus on taking the risks they should be good at taking. If investors wanted a hedge, they would do it themselves.<sup>10</sup>

This conflict between managers and shareholders can be alleviated somewhat by the awarding of stock options, a topic we take up in Essay 65. The holder of a call option will naturally benefit if the underlying has more risk. Hence, options should induce managers to get their companies to take more risk, although it does not always work that way. And stock options have their own problems, as we shall see in Essay 65.

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<sup>10</sup>This is the essence of the M&M argument: If a company cannot do anything for its shareholders that they cannot do for themselves, then no value is created. Hedging is certainly something that shareholders can do for themselves, but again we have to recognize the practical impediments. Shareholders of airlines can hedge the price of fuel, but it is difficult for the shareholders to obtain the information they need, such as how much fuel the airline needs and when it is needed, to be able to implement effective hedges.

Let us end this essay with a short recap. Derivatives are tools for transferring risk. They generally work well and at low cost. Risk transfer, if done properly, is nothing more than an alignment of the risks taken with the desired risks. Sometimes that means reducing risk by hedging and sometimes it means increasing risk, which means speculating or whatever nasty or benign term you want to use. Although there are a variety of reasons why derivatives are good instruments and risk management is a worthwhile activity, the most important one encapsulates all of the others. *Taking the amount of risk you are comfortable with is more important than anything else.* Using a derivative to do this is an easier and cheaper way than transacting in the underlying asset.

And to paraphrase Martha Stewart, “That’s a good thing.”

### **FOR MORE READING**

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Smithson, Charles W. *Managing Financial Risk: A Guide to Derivative Products, Financial Engineering, and Value Maximization*, 3rd ed. New York: McGraw-Hill, 1998, chap. 20.

Stulz, René. *Risk Management and Derivatives*. Mason, OH: Thomson South-Western, 2003, chap. 3.

### **TEST YOUR KNOWLEDGE**

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1. What is the primary reason for using derivatives?
2. If a hedge is put in place and the risk is completely eliminated, the hedger earns the risk-free rate. Why would a hedger do this when it could earn the risk-free rate by investing directly in the risk-free asset? Why go to so much trouble to put on a hedge?
3. What role do speculators play in derivatives markets?
4. Why does risk management not always involve hedging?
5. For what personal reason do managers sometimes make their companies hedge?

