

## **Value and Risk: Beyond Betas**

*Aswath Damodaran*

*Stern School of Business*

[adamodar@stern.nyu.edu](mailto:adamodar@stern.nyu.edu)

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## **Value and Risk: Beyond Betas**

Risk can be both a threat to a firm's financial health and an opportunity to get ahead of the competition. Most analysts, when they refer to risk management, focus on the threat posed by risk and emphasize protecting against that threat (i.e. risk hedging). In keeping with this narrow definition of risk management, the risk associated with an investment is almost always reflected in the discount rate in conventional discounted cash flow models. Since we also assume that only market risk affects discount rates, it follows that firms that expend time and resources in hedging firm-specific risk will lose value to the extent that risk management is expensive. Firms that reduce exposure to systematic risk will see no effect on value, if risk-hedging products are fairly priced. In this paper, we consider ways in which we can broaden both the definition of risk management to include ways of exploiting risk to gain a competitive advantage and the analysis of the effects on value. We argue that risk management can affect expected cash flows by altering investment policy and creating competitive advantages, which in turn can have consequences for expected growth rates and excess returns. This offers the potential for a payoff to risk management for many firms that may not benefit from risk hedging. In the closing part of this paper, we consider the steps involved in developing a comprehensive strategy for dealing with risk.

Does the risk associated with an investment affect value? While the answer is obviously yes, risk is narrowly defined in most financial analyses as systematic or non-diversifiable risk and its effects on value are isolated to the discount rate. Generally, the costs of equity and capital are set higher for riskier companies and the resulting value is considered to be risk adjusted. In conjunction, risk management is considered to be primarily defensive where firms protect themselves against risks using risk-hedging products like derivatives and insurance. In this paper, we argue for both a more expansive analysis of risk in valuation and a much broader definition of risk management. We argue that effective risk management can sometimes include aggressively seeking out and exploiting risk and that it can alter investment policy and affect expected cash flows. If we adopt this broader view of risk management, we can make the argument that while risk hedging itself can create value for certain kinds of firms – smaller, closely held firms with significant financial leverage - risk management can have a much larger impact on value for a bigger subset of firms.

### **Risk Management versus Risk Reduction**

The Chinese symbol for risk is a combination of two symbols – one for danger and one for opportunity. While risk can have very negative consequences for those who are exposed to it, risk is also the reason for higher returns to those who use it to advantage. Risk management, as defined by in practice, misses this important duality and focuses on the negative consequences of risk. In fact, when risk management is discussed in corporate offices, consulting firms and investments banks, it is risk reduction, usually through the use of derivatives and insurance, that is being talked about.

While risk reduction is a part of risk management, it is only a part. Risk management has to be defined far more broadly to include actions that are taken by firms to exploit uncertainty. In fact, risk management may involve increasing, rather than decreasing exposure, to at least some types of risks where a firm feels that it has advantages over its competitors. To provide a sense of the difference between risk reduction and risk management, consider the following examples:

- Pfizer buys foreign currency options to protect itself against exchange rate risk; this is risk reduction and the payoff takes the form of smoother earnings and perhaps higher

value. Pfizer restructures its R&D department to ensure that its product pipeline remains full and balanced with a mix of products at different stages in the FDA approval cycle. This is risk management since it could very well be the catalyst that allows Pfizer to dominate its competitors (like Merck and Bristol Myers) who may have let their pipelines run dry or become unbalanced.

- A gold mining company buys futures contracts to protect its earnings from a drop in gold prices; this is clearly risk hedging. The same company revamps its mining facilities to speed up the production and delivery of gold, allowing it to ramp up production if gold prices go up; this is risk management and could be a competitive advantage in the long term.
- A retailer that is planning on expanding its operations in Russia buys insurance against political unrest; this is risk hedging. The same retailer is involved in risk management when it nurtures local management talent and better political connections to protect itself in the event of political unrest.

Looking at these examples, there are two clear differences that should emerge between risk hedging and risk management. The first is that risk hedging is primarily about protecting against risk whereas risk management is about utilizing risk to advantage. The second is that risk hedging is product based and financial – note the use of options, futures and insurance products – whereas risk management is strategic.

In this paper, we will consider both risk reduction and risk management. We will argue that the payoff to risk reduction is likely to be small even for those firms where it makes sense to reduce risk and can be negative for a wide group of firms. Risk management, on the other hand, while more difficult to evaluate, is not only the source of substantial value, but may, in fact, be the key competitive advantage in volatile businesses with significant excess returns.

## **Defining and Measuring Risk**

Much of what we know about risk in finance comes from the path breaking work done by Harry Markowitz and others studying portfolio theory in the 1950s and 1960s. In the process of considering how diversification affects portfolio risk, they considered the relationship between the expected returns on investments and their risk. In keeping with

this tradition, we still adjust the returns expected by equity investors in a stock (i.e., the cost of equity) for the risk of the stock and the returns demanded by lenders to the firm (i.e., cost of debt) for the default risk of the firm. In other words, the risk adjustment in valuation is entirely in the discount rate.

### **Risk and the Cost of Equity**

To demonstrate how risk is related to the cost of equity, we will present risk analysis in three steps. First, we will define risk in terms of the distribution of actual returns around an expected return. Second, we will differentiate between risk that is specific to one or a few investments and risk that affects a much wider cross section of investments. We will argue that in a market where the marginal investor is well diversified, it is only the latter risk, called market risk that will be rewarded. Third, we will look at alternative models for measuring this market risk and the expected returns that go with it.

#### ***I. Defining Risk***

While a number of alternative measures of risk exist, the search for quantitative estimates for risk quickly led to statistical measures. In particular, the standard deviation or variance of actual returns around an expected return became the most widely accepted measure of risk. With this framework, where expected returns measure reward and the standard deviation measures risk, investments that generate higher expected returns with lower standard deviations in these returns are better investments.

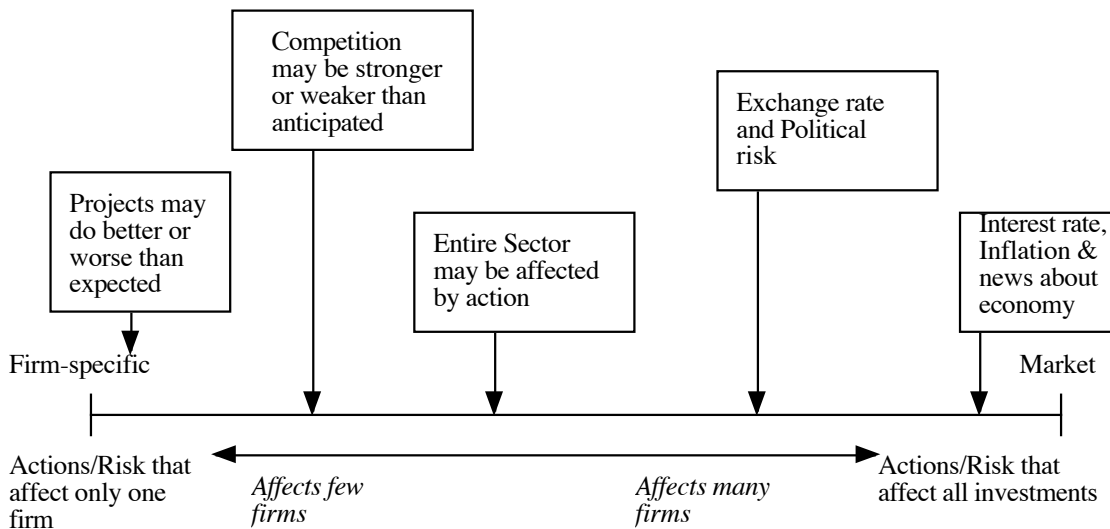
What are the limitations of using variance as the only measure of risk? The first is that it is computed using variations from the mean and is thus a function of both upside and downside variations. A stock that has gone up significantly in the recent past can therefore look just as risky, based upon standard deviation, as a stock that has gone down significantly. The second is that when assessing the desirability of investments, investors may consider more than just the expected return and variance. In particular, they may value the possibility of large payoffs (skewness) and dislike big price jumps (kurtosis).

#### ***II. Diversifiable and Non-diversifiable Risk***

When an investor buys stock or takes an equity position in a firm, he or she is exposed to many risks. Some risk may affect only one or a few firms and it is this risk

that we categorize as *firm-specific risk*. Within this category, we would consider a wide range of risks, starting with the risk that a firm may have misjudged the demand for a product from its customers; we call this project risk. The risk could also arise from competitors proving to be stronger or weaker than anticipated; we call this competitive risk.. In fact, we would extend our risk measures to include risks that may affect an entire sector but are restricted to that sector; we call this sector risk. For instance, a cut in the defense budget in the United States will adversely affect all firms in the defense business, but there should be no significant impact on other sectors, such as food and apparel. What is common across the three risks described above – project, competitive and sector risk – is that they affect only a small sub-set of firms. There is other risk that is much more pervasive and affects many, if not all, investments. For instance, when interest rates increase, all investments are negatively affected, albeit to different degrees. Similarly, when the economy weakens, all firms feel the effects, though cyclical firms (such as automobiles, steel and housing) may feel it more. We term this risk *market risk*. Finally, there are risks that fall in a gray area, depending upon how many assets they affect. For instance, when the dollar strengthens against other currencies, it has a significant impact on the earnings and values of firms with international operations. If most firms in the market have significant international operations, it could well be categorized as market risk. If only a few do, it would be closer to firm-specific risk. Figure 1 summarizes the break down or the spectrum of firm-specific and market risks.

*Figure 1: A Break Down of Risk*



As an investor, you could invest your entire portfolio in one stock. If you do so, you are exposed to both firm specific and market risk. If, however, you expand your portfolio to include other assets or stocks, you are diversifying, and by doing so, you can reduce your exposure to firm-specific risk. There are two reasons why diversification reduces or, at the limit, eliminates firm specific risk. The first is that each investment in a diversified portfolio is a much smaller percentage of that portfolio than would be the case if you were not diversified. Thus, any action that increases or decreases the value of only that investment or a small group of investments will have only a small impact on your overall portfolio. The second reason is that the effects of firm-specific actions on the prices of individual assets in a portfolio can be either positive or negative for each asset for any period. Thus, in very large portfolios, this risk will average out to zero and will not affect the overall value of the portfolio. In contrast, the effects of market-wide movements are likely to be in the same direction for most or all investments in a portfolio, though some assets may be affected more than others. For instance, other things being equal, an increase in interest rates will lower the values of most assets in a portfolio. Being more diversified does not eliminate this risk.

The argument that diversification reduces an investor's exposure to risk is clear both intuitively and statistically, but risk and return models in finance go further. The models look at risk through the eyes of the investor most likely to be trading on the investment at any point in time, i.e. the marginal investor. They argue that this investor, who sets prices for investments, is well diversified; thus, the only risk that he or she cares about is the risk added on to a diversified portfolio or market risk. This argument can be justified simply. The risk in an investment will always be perceived to be higher for an undiversified investor than for a diversified one, since the latter does not shoulder any firm-specific risk and the former does. If both investors have the same expectations about future earnings and cash flows on an asset, the diversified investor will be willing to pay a higher price for that asset because of his or her perception of lower risk. Consequently, the asset, over time, will end up being held by diversified investors.

### ***III. Models Measuring Market Risk***

While most risk and return models in use in corporate finance agree on the first two steps of the risk analysis process, i.e., that risk comes from the distribution of actual

returns around the expected return and that risk should be measured from the perspective of a marginal investor who is well diversified, they part ways when it comes to measuring non-diversifiable or market risk. Consider some standard models for risk in finance.

The risk and return model that has been in use the longest and is still the standard in most real world analyses is the *capital asset pricing model* (CAPM). It assumes that there are no transactions costs, that all assets are traded and investments are infinitely divisible (i.e., you can buy any fraction of a unit of the asset) and that everyone has access to the same information. Making these assumptions allows investors to keep diversifying without additional cost. At the limit, their portfolios will not only include every traded asset in the market but will have identical weights on risky assets – the *market portfolio*. The risk of any individual asset or stock becomes the risk that it adds on to the market portfolio and it is measured with a beta, measured against this portfolio:

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f)$$

where,

$E(R_i)$  = Expected Return on asset i

$R_f$  = Risk-free Rate

$E(R_m)$  = Expected Return on market portfolio

$\beta_i$  = Beta of investment i

In the capital asset pricing model, all the market risk is captured in the beta, measured relative to a market portfolio, which at least in theory should include all traded assets in the market place held in proportion to their market value.

The restrictive assumptions on transactions costs and private information in the capital asset pricing model and the model's dependence on the market portfolio have long been viewed with skepticism by both academics and practitioners. Like the capital asset pricing model, the *arbitrage pricing model* begins by breaking risk down into firm-specific and market risk components. As in the capital asset pricing model, firm specific risk covers information that affects primarily the firm. Market risk affects many or all firms and would include unanticipated changes in a number of economic variables, including gross national product, inflation, and interest rates. Unlike the CAPM, though, the arbitrage pricing model allows for multiple sources of market-wide risk and measures



the sensitivity of investments to changes in each source. Therefore, with  $n$  market risk factors, the expected return on an asset can be written as

$$E(R) = R_f + \beta_1[E(R_1) - R_f] + \beta_2[E(R_2) - R_f] + \dots + \beta_n[E(R_n) - R_f]$$

where

$R_f$  = Expected return on a zero-beta portfolio

$\beta_j$  = Sensitivity of the asset to market risk  $j$  ( $j = 1, 2, \dots, n$ )

$E(R_j)$  = Expected return on a portfolio with a factor beta of 1 for factor  $j$  and zero for all other factors.

The terms in the brackets can be considered to be risk premiums for each of the factors in the model.

*Multi-factor models* are estimated using historical data, rather than economic modeling. Once the number of factors has been identified in the arbitrage pricing model, their behavior over time can be extracted from the data. The behavior of the unnamed factors over time can then be compared to the behavior of macroeconomic variables over that same period to see whether any of the variables is correlated, over time, with the identified factors. For instance, Chen, Roll, and Ross (1986) suggest that the following macroeconomic variables are highly correlated with the factors that come out of factor analysis: industrial production, changes in default premium, shifts in the term structure, unanticipated inflation, and changes in the real rate of return. These variables can then be correlated with returns to come up with a model of expected returns, with firm-specific betas calculated relative to each variable.

$$E(R) = R_f + \beta_{GNP}[E(R_{GNP}) - R_f] + \beta_I[E(R_I) - R_f] + \dots + \beta_o[E(R_o) - R_f]$$

where

$\beta_{GNP}$  = Beta relative to changes in industrial production

$E(R_{GNP})$  = Expected return on a portfolio with a beta of one on the industrial production factor and zero on all other factors

$\beta_I$  = Beta relative to changes in inflation

$E(R_I)$  = Expected return on a portfolio with a beta of one on the inflation factor and zero on all other factors

In an alternate form, multi-factor models are estimated using cross sectional data on individual companies. Fama and French, in a highly influential study of the capital asset pricing model in the early 1990s, noted that actual returns between 1963 and 1990 have been highly correlated with book to price ratios<sup>1</sup> and size. High return investments, over this period, tended to be investments in companies with low market capitalization and high book to price ratios. Fama and French suggested that these measures be used as proxies for risk and report the following regression for monthly returns on stocks on the NYSE:

$$R_t = 1.77\% - 0.11 \ln(MV) + 0.35 \ln\left(\frac{BV}{MV}\right)$$

where

MV = Market Value of Equity

BV/MV = Book Value of Equity / Market Value of Equity

The values for market value of equity and book-price ratios for individual firms, when plugged into this regression, should yield expected monthly returns.

While much is made about the differences across these models, what they share in common –the assumption that the marginal investor is well diversified and that the only risk that therefore matters is market risk – vastly exceeds the differences across them.

### **Risk and the Cost of Debt**

There is a subtle difference in how risk affects the costs of equity and the costs of debt. Equity risk comes from the cash flows on investments being different from expected cash flows. With debt, the cash flows are promised when the investment is made and the risk arises from the possibility that the borrower will be unable to make the promised payments. The cost of debt is therefore a direct function of the credit or default risk or a borrower; borrowers with higher default risk should pay higher interest rates on their borrowing than those with lower default risk. In contrast to the general risk and return models for equity, which evaluate the effects of market risk on expected returns, models of default risk measure the consequences of firm-specific default risk on promised returns. While diversification can be used to explain why firm-specific risk will

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<sup>1</sup> The book to price ratio is the ratio of the book value of equity to the market value of equity.

not be priced into expected returns for equities, the same rationale cannot be applied to debt which has limited upside potential and much greater downside potential from firm-specific events. To see what we mean by limited upside potential, consider investing in the bond issued by a company. The coupons are fixed at the time of the issue and these coupons represent the promised cash flow on the bond. The best-case scenario for you as an investor is that you receive the promised cash flows; you are not entitled to more than these cash flows even if the company is wildly successful. All other scenarios contain only bad news, though in varying degrees, with the delivered cash flows being less than the promised cash flows. Consequently, the expected return on a corporate bond is likely to reflect the firm-specific default risk of the firm issuing the bond.

The default risk of a firm is a function of two variables. The first is the firm's capacity to generate cash flows from operations and the second is its financial obligations including interest and principal payments<sup>2</sup>. Firms that generate high cash flows relative to their financial obligations should have lower default risk than firms that generate low cash flows relative to their financial obligations. In addition to the magnitude of a firm's cash flows, the default risk is also affected by the volatility in these cash flows. The more stability there is in cash flows the lower the default risk in the firm. Firms that operate in predictable and stable businesses will have lower default risk than will otherwise similar firms that operate in cyclical or volatile businesses. Most models of default risk use financial ratios to measure the cash flow coverage (i.e., the magnitude of cash flows relative to obligations) and control for industry effects to evaluate the variability in cash flows. For firms that issue bonds, the most widely used measure of a firm's default risk is its bond rating, estimated by independent agencies such as Standard and Poor's and Moody's. The bond ratings assigned by ratings agencies are primarily based upon publicly available information, though private information conveyed by the firm to the rating agency does play a role. The rating assigned to a company's bonds will depend in large part on financial ratios that measure the capacity of the company to meet debt payments and generate stable and predictable cash flows. If the rating is a good measure

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<sup>2</sup> Financial obligation refers to any payment that the firm has legally obligated itself to make, such as interest and principal payments. It does not include discretionary cash flows, such as dividend payments or new capital expenditures, which can be deferred or delayed, without legal consequences, though there may be economic consequences.

of the default risk, higher rated bonds should be priced to yield lower interest rates than would lower rated bonds. In fact, this default spread will vary by maturity of the bond and can also change from period to period, depending on economic conditions.

## **Risk and Value: The Conventional View**

How does risk show up in conventional valuations. To answer this question, we will look at the two most common approaches to valuation. The first is intrinsic or discounted cash flow valuation, where the value of a firm or asset is estimated by discounting the expected cash flows back to the present. The second is relative valuation, where the value of a firm is estimated by looking at how the market prices similar firms.

### **Discounted Cash flow Valuation**

In a conventional discounted cash flow valuation model, the value of an asset is the present value of the expected cash flows on the asset. In this section, we will consider the basic structure of a discounted cash flow model, discuss how risk shows up in the model and consider the implications for risk management.

#### *Structure of DCF Models*

When valuing a business, discounted cash flow valuation can be applied in one of two ways. We can discount the expected cash flow to equity investors at the cost of equity to arrive at the value of equity in the firm; this is equity valuation.

$$\text{Value of Equity} = \sum_{t=1}^{t=\infty} \frac{\text{Expected Cashflow to Equity in period } t}{(1 + \text{Cost of Equity})^t}$$

Note that adopting the narrowest measure of the cash flow to equity investors in publicly traded firms gives us a special case of the equity valuation model – the dividend discount model. A broader measure of free cash flow to equity is the cash flow left over after capital expenditures, working capital needs and debt payments have all been made; this is the free cash flow to equity.

Alternatively, we can discount the cash flows generated for all claimholders in the firm, debt as well as equity, at the weighted average of the costs demanded by each – the cost of capital – to value the entire business.

$$\text{Value of Firm} = \sum_{t=1}^{t=\infty} \frac{\text{Expected Free Cashflow to Firm}_t}{(1 + \text{Cost of Capital})^t}$$

We define the cash flow to the firm as being the cash flow left over after operating expenses, taxes and reinvestment needs, but before any debt payments (interest or principal payments).

Free Cash Flow to Firm (FCFF) = After-tax Operating Income – Reinvestment Needs

The two differences between cash flow to equity and cash flow to the firm become clearer when we compare their definitions. The free cash flow to equity begins with net income, which is after interest expenses and taxes, whereas the free cash flow to the firm begins with after-tax operating income, which is before interest expenses. Another difference is that the FCFE is after net debt payments, whereas the FCFF is before net debt cash flows. What exactly does the free cash flow to the firm measure? On the one hand, it measures the cash flows generated by the assets before any financing costs are considered and thus is a measure of operating cash flow. On the other, the free cash flow to the firm is the cash flow used to service all claim holders' needs for cash – interest and principal payments to debt holders and dividends and stock buybacks to equity investors.

Since we cannot estimate cash flows forever, we usually simplify both equity and firm valuation models by assuming that we estimate cash flows for only a period of time and estimate a terminal value at the end of that period. Applying this to the firm valuation model from above would yield:

$$\text{Value of firm} = \sum_{t=1}^{t=N} \frac{\text{Expected Cashflow to Firm}_t}{(1 + \text{Cost of Capital})^t} + \frac{\text{Terminal Value of Business}_N}{(1 + \text{Cost of Capital})^N}$$

How can we estimate the terminal value? While a variety of approaches exist in practice, the approach that is most consistent with a discounted cash flow approach is based upon the assumption that cash flows will grow at a constant rate beyond year N and estimating the terminal value as follows:

$$\text{Terminal value of business}_{t=N} = \frac{\text{Expected Cashflow in year } N + 1}{(\text{Cost of Capital} - \text{Stable (Constant) Growth Rate})}$$

A similar computation can be used to estimate the terminal value of equity in an equity valuation model.

### ***Risk Adjustment in Discounted Cash flow Models***

In conventional discounted cash flow models, the effect of risk is isolated to the discount rate. In equity valuation models, the cost of equity becomes the vehicle for risk

adjustment, with riskier companies having higher costs of equity. In fact, if we use the capital asset pricing model to estimate the cost of equity, the beta used carries the entire burden of risk adjustment. In firm valuation models, there are more components that are affected by risk – the cost of debt also tends to be higher for riskier firms and these firms often cannot afford to borrow as much leading to lower debt ratios – but the bottom line is that the cost of capital is the only input in the valuation where we adjust for risk.<sup>3</sup>

The cash flows in discounted cash flow models represent expected values, estimated either by making the most reasonable assumptions about revenues, growth and margins for the future or by estimating cash flows under a range of scenarios, attaching probabilities for each of the scenarios and taking the expected values across the scenarios.<sup>4</sup> In summary, then, table 1 captures the risk adjustments in equity and firm valuation models:

*Table 1: Risk Adjustment in a DCF Model: Equity and Firm Valuation*

	<i>Expected Cash flows</i>	<i>Discount Rate</i>
Equity DCF Model	Not adjusted for risk. Represent expected cash flows to equity.	Cost of equity increases as exposure to market (non-diversifiable) risk increases. Unaffected by exposure to firm specific risk.
Firm DCF Model	Not adjusted for risk. Represent expected cash flows to all claimholders of the firm.	In addition to the cost of equity effect (see above), the cost of debt will increase as the default risk of the firm increases and the debt ratio may also be a function of risk.

There are some proponents of the adjusted present value model who argue that it offers more flexibility when it comes to dealing with risk. In the full form of the model, where the value of a firm is written as the sum of the unlevered firm value and the expected tax

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<sup>3</sup> Even this adjustment becomes moot for those who fall back on the Miller Modigliani formulation where the firm value and cost of capital are unaffected by financial leverage.

<sup>4</sup> There is an alternate version of DCF models, where cashflows are adjusted for risk, generating what are called certainty equivalent cashflows, and are discounted at a riskfree rate. It is inconsistent to do both in the same valuation, since you end up double counting risk.

benefits from debt and netted out against expected bankruptcy costs<sup>5</sup>, this may be technically true. In the half-baked version that is used in practice where the tax benefits of debt are added to unlevered firm value, risk is an after thought.

### ***The Payoff to Risk Management in a DCF World***

If the only input in a discounted cash flow model that is sensitive to risk is the discount rate and the only risk that matters when it comes to estimating discount rates is market risk (or risk that cannot be diversified away), the payoff to hedging risk in terms of higher value is likely to be very limited and the payoff to risk management will be difficult to trace. In this section, we will consider the value effects of both hedging and managing firm specific and market risk.

### ***Risk Hedging and Value***

Firms are exposed to a myriad of firm-specific risk factors. In fact, about 75 to 80% of the risk in a publicly traded firm comes from firm specific factors and there are some managers who do try to hedge or reduce their exposure to this risk.<sup>6</sup> Consider the consequences of such actions on expected cash flows and discount rates in a DCF model.

- Since hedging risk, using either insurance products or derivatives, is not costless, the expected cash flows will be lower for a firm that hedges risk than for an otherwise similar firm that does not.
- The cost of equity of this firm will be unaffected by the risk reduction, since it reflects only market risk.
- The cost of debt may decrease, since default risk is affected by both firm-specific and market risk.
- The proportion of debt that the firm can use to fund operations may expand as a consequence of the lower exposure to firm specific risk.

With these changes in mind, we can state two propositions about the effects of hedging firm specific risk on value:

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<sup>5</sup> The effects of hedging risk should show up in the expected bankruptcy cost. If hedging risk reduces the probability of bankruptcy, the expected bankruptcy cost should be lower for a firm that hedges risk. The practical problem will lie in assessing the probability of bankruptcy with and without the hedging.

<sup>6</sup> The R-squared of the regression of stock returns against market indices is a measure of the proportion of the risk that is market risk. The average R-squared across all US companies is between 20 and 25%.

*Proposition 1: An all equity funded firm that expends resources to reduce its exposure to firm specific risk will see its value decrease as a consequence.*

This follows directly from the fact that the expected cash flows will be lower for this firm and there is no change in the cost of equity as a consequence of the risk reduction. Since the firm has no debt, the positive effects of risk management on the cost of debt and debt capacity are nullified.

*Proposition 2: A fund that uses debt to fund operations can see a payoff from hedging its exposure to firm specific risk in the form of a lower cost of debt, a higher debt capacity and a lower cost of capital. The benefits will be greatest for firms that are both highly levered and are perceived as having high default risk.*

This proposition follows from the earlier assertions made about cash flows and discount rates. For firm value to increase as a consequence of prudent risk hedging, the cost of capital has to decrease by enough to overcome the costs of risk hedging (which reduce the cash flows). Since the savings take the form of a lower cost of debt and a higher debt ratio, a firm that is AAA rated and gets only 10% of its funding from debt will see little or no savings in the cost of capital as a result of the risk reduction. In contrast, a firm with a BB rating that raises 60% of its capital from debt will benefit more from risk hedging.

Firms can also hedge their exposure to market risk. In particular, the expansion of the derivatives markets gives a firm that is so inclined the capacity to hedge against interest rate, inflation, foreign currency and commodity price risks. As with the reduction of firm specific risk, a firm that reduces its exposure to market risk will see its cash flows decrease (as a result of the cost of hedging market risk) and its cost of debt decline (because of lower default risk). In addition, though, the beta in the CAPM (or betas in a multi factor model) and the cost of equity will also decrease. As a result, the effects of hedging market risk on firm value are more ambiguous.

*Proposition 3: If risk-hedging products are priced fairly, reducing exposure to market risk will have no effect on value.*

The cost of buying protection against market risk reduces cash flows but hedging against market risk reduces the discount rate used on the cash flows. If risk-hedging products are



fairly priced in the market place, the benefits will exactly offset the cost leading to no effect on value.

*Proposition 4: For the hedging of market risk to pay off, equity markets have to price risk much more highly than other markets for risk – derivatives markets and insurance companies in particular.*

While we talk about markets as a monolith, there are four markets at play here. The first is the equity market which assesses the value of a stock based upon the exposure of a company to market risk. The second is the bond market that assesses the value of bonds issued by the same company based upon its evaluation of default risk. The third is the derivatives market where we can buy options and futures on market risk components like exchange rate risk, interest rate risk and commodity price risk. The fourth is the insurance market, where insurance companies offer protection for a price against some of the same market risks. If all four markets price risk equivalently, there would be no payoff to risk hedging. However, if one can buy risk protection cheaper in the insurance market than in the traded equities market, publicly traded firms will gain by buying insurance against risk. Alternatively, if we can hedge against interest rate risk at a lower price in the derivatives market than in the equity market, firms will gain by using options and futures to hedge against risk.

Considering how the reduction of firm-specific risk and market risk affect value, it is quite clear that if the view of the world embodied by the discounted cash flow model is right, i.e., that investors in companies are diversified, have long time horizons and care only about market risk, managers over-manage risk. The only firms that should be hedging risk should be ones that have substantial default risk and high cost debt or firms that have found a way to hedge market risk at a below market price.

#### *Risk Management and Value*

If risk reduction generally is considered too narrowly in conventional valuation, risk management is either not considered at all or it enters implicitly through the other inputs into a valuation model. A firm that takes advantage of risk to get a leg up on its competition may be able to generate higher growth for a longer period and thus have a

higher value. In the second part of the paper, we will consider ways in which we can explicitly consider the effects of risk on valuation inputs.

### **Relative Valuation Models**

For better or worse, most valuations are relative valuations, where a stock is valued based upon how similar companies are priced by the market. In practice, relative valuations take the form of a multiple and comparable firms; a firm is viewed as cheap if it trades at 10 times earnings when comparable companies trade at 15 times earnings. While the logic of this approach seems unassailable, the problem lies in the definition of comparable firms and how analysts deal with the inevitable differences across these comparable firms.

#### ***Structure of Relative Valuation***

There are three basic steps in relative valuation. The first step is picking a multiple to use for comparison. While there are dozens of multiples that are used by analysts, they can be categorized into four groups:

- *Multiples of earnings:* The most widely used of the earnings multiples remains the price earnings ratio, but enterprise value, where the market value of debt and equity are aggregated and cash netted out to get a market estimate of the value of operating assets (enterprise value), has acquired a significant following among analysts. Enterprise value is usually divided by operating income or earnings before interest, taxes, depreciation and amortization (EBITDA) to arrive at a multiple of operating income or cash flow.
- *Multiples of book value:* Here again, the market value of equity can be divided by a book value of equity to estimate a price to book ratio or the enterprise value can be divided by the book value of capital to arrive at a value to book ratio.
- *Multiples of revenues:* In recent years, as the number of firms in the market with negative earnings (and even negative book value) have proliferated, analysts have switched to multiples of revenues, stated either in equity terms (price to sales) or enterprise value (enterprise value to sales)
- *Multiples of sector specific variables:* Some multiples are sector specific. For instance, dividing the market value of a cable company by the number of

subscribers that it has will yield a value to subscriber ratio and dividing the market value of a power company by the kilowatt-hours of power produced will generate a value per kwh.

When deciding which multiple to use in a specific sector, analysts usually stick with conventional practice. For example, revenue multiples are widely used for retail firms, enterprise value to EBITDA multiples for heavy infrastructure companies and price to book ratios for financial service firms.

The second step in relative valuation is the selection of comparable firms. A comparable firm is one with cash flows, growth potential, and risk similar to the firm being valued. It would be ideal if we could value a firm by looking at how an exactly identical firm - in terms of risk, growth and cash flows - is priced in the market. Since two firms are almost never identical in the real world, however, analysts define comparable firms to be other firms in the firm's business or businesses. If there are enough firms in the industry to allow for it, this list is pruned further using other criteria; for instance, only firms of similar size may be considered.

The last step in the process is the comparison of the multiple across comparable firms. Since it is impossible to find firms identical to the one being valued, we have to find ways of controlling for differences across firms on these variables. In most valuations, this part of the process is qualitative. The analyst, having compared the multiples, will tell a story about why a particular company is undervalued, relative to comparables, and why the fact that it has less risk or higher growth augments this recommendation. In some cases, analysts may modify the multiple to take into account differences on a key variable. For example, many analysts divide the PE ratio by the expected growth rate in earnings to come up with a PEG ratio. Arguing that this ratio controls for differences in growth across firms, they will use it to compare companies with very different growth rates.

### ***Risk Adjustment in Relative Valuation Models***

If risk adjustment in discounted cash flow models is too narrow and focuses too much on the discount rate, risk adjustment in relative valuation can range from being non-existent at worst to being haphazard and arbitrary at best.

- In its non-existent form, analysts compare the pricing of firms in the same sector without adjusting for risk, making the implicit assumption that the risk exposure is the same for all firms in a business. Thus, the PE ratios of software firms may be compared with each other with no real thought given to risk because of the assumption that all software firms are equally risky.
- Relative valuations that claim to adjust for risk do so in arbitrary ways. Analysts will propose a risk measure, with little or no backing for its relationship to value, and then compare companies on this measure. They will then follow up by adjusting the values of company that look risky on this measure. If that sounds harsh, consider an analyst who computes PE ratios for software companies and then proceeds to argue that firms that have less volatile earnings or consistently meet analyst estimates should trade at a premium on the sector because they are little risky. Unless this is backed up by evidence that this is indeed true, it is an adjustment with no basis in fact.

### ***The Payoff to Risk Hedging in Relative Valuation Models***

If the assessment of risk in relative valuations is non-existent or arbitrary, it should come as no surprise that firms that try to improve their relative value will adopt risk management practices that correspond to analyst measures of risk. If analysts consider all firms in a sector to be equally risky and the market prices stocks accordingly, there will be no payoff to reducing risk and firms will not hedge against risk. In contrast, if earnings stability becomes the proxy measure for risk used by analysts and markets, firms will expend their resources smoothing out earnings streams by hedging against all kinds of risk. If meeting analyst estimates of earnings becomes the proxy for risk, firms will be eager for risk management products that increase the odds that they will beat earnings estimates in the next quarter.

The nature of risk adjustment in relative valuation therefore makes it particularly susceptible to gaming by firms. We would argue that one of the reasons for the accounting scandals at U.S. firms in 1999 and 2000 was that managers at risky firms created facades of stability for short-sighted analysts using both derivatives and accounting sleight of hand.

## Expanding the Analysis of Risk

The sanguine view that firm specific risk is diversifiable and is therefore does not affect value is not shared by many managers. Top executives at firms continue to believe that conventional valuation models take too narrow a view of risk and that they hence don't fully factor in the consequences of significant risk exposure. In this section, we will consider ways in which we can expand the discussion of risk in valuation.

### Simulation

In both discounted cash flow and relative valuation models, we tend to use expected values for the inputs – earnings, cash flows, growth and discount rates – and arrive at a base case valuation. Even if our expectations are unbiased and reflect all available information, we are ignoring the reality that each of the expected values comes from a distribution that may reflect a great deal of uncertainty. There are some analysts who believe that valuations are enriched when we use all of the available information in the distribution to arrive at a range of values rather than one base case number and argue that simulations are an effective tool for risk analysis.

### *Structuring a Simulation*

To do a simulation, we have to begin with distributions for each of the inputs into the valuations. In addition to expected values, we have to generate the following information:

- *Type of distribution that characterizes the variable:* Very few inputs follow the classic normal distribution but there are other distributions that may fit better such as the uniform, lognormal, exponential, Poisson and Gamma distributions. There are statistical tools that allow us to find the distribution that best fit the data.
- *Parameters of the distribution:* The parameters of the distribution have to be specified. While the normal distribution has only two relevant parameters – the mean and the standard deviation – other distributions require more inputs.

Once the distributional parameters are specified for each input, one outcome is drawn from each distribution and the firm is valued with those values for the inputs. This process is repeated over and over, with the values varying with each simulation. A typical analysis with multiple and complex distributions feeding into it can have thousands of

simulations, with the results presented in the form of a distribution of values (and statistical parameters).

While simulations yield impressive looking results, they are only as good as the inputs that go into them. The most critical inputs – the distribution type and parameters – require not only an understanding of statistics but also background information about the variables in question. There are two ways in which this information can be collected:

- *Historical data:* To estimate the revenue distribution and parameters of a company that has been in existence for decades, we can look at its history. For instance, the distribution of annual revenue growth rates – positive as well as negative- over the last 20 or 30 years will yield information on what the possible outcomes for future revenues are. Similar information can be obtained for margins and market share.
- *Cross Sectional Data:* For firms that have been in existence only a few years but are in sectors where there are dozens of firms at different stages in the life cycle – specialty retailing and software come to mind – we can look at the differences across companies to generate distributions. Thus, the distribution of revenue growth rates across companies may provide the foundation for making assumptions about future revenue growth for the company being analyzed.

All too often, simulations are hastily put together and little thought is given to the key inputs. The old adage – garbage in, garbage out – applies.

### ***Why Simulations do not represent risk adjustment***

Assume for the moment that we are able to use either historical or cross sectional data to make reasonable assumptions about the distributions of the input variables into a valuation. Since these distributions reflect both good and bad outcomes – revenues falling and rising, positive and negative margins – there is a misconception among some analysts that simulations represent risk adjustment. They do not. The final distribution of values that we get from the simulations will have an expected value and dispersion around that value. The expected value across thousands of simulations itself is not risk adjusted in any sense and will often be higher than the expected value from a conventional base case valuation, where expected values for each input are used for the estimation.

It is also worth noting that the payoff to hedging risk is presented in simulations as a reduction in the dispersion of values around an expected value but this is misleading. It is true that reducing a firm's exposure to any risk can reduce the standard deviation in the value of that firm as a stand-alone investment, but the real question is whether this translates into an increase in firm value. Using the terminology of risk and return models, the reduction of firm specific risk may reduce dispersion in firm value in a simulation but will not increase the value of the firm.

This is not to suggest that simulations are not useful to us in understanding risk. Looking at the variance of the simulated values around the expected value provides a visual reminder that we are estimating value in an uncertain environment. It is also conceivable that we can use it as a decision tool in portfolio management in choosing between two stocks that are equally undervalued but have different value distributions. The stock with the less volatile value distribution may be considered a better investment than another stock with a more volatile value distribution.

### *Simulations with Constraints*

To use simulations as a tool in risk hedging, we have to introduce a constraint, which, if violated, creates very large costs for the firm and perhaps even causes its demise. We can then evaluate the effectiveness of risk hedging tools by examining the likelihood that the constraint will be violated with each one and weighing that off against the cost of the tool.

### *Book Value Constraints*

The book value of equity is an accounting construct and, by itself, means little. Firms like Microsoft and Intel trade at market values that are several times their book values. At the other extreme, there are firms that trade at half their book value or less. In fact, there are several hundred firms in the United States, some with significant market values that have negative book values for equity. There are two types of restrictions on book value of equity that may call for risk hedging.

- a. Regulatory Capital Restrictions: Financial service firms such as banks and insurance companies are required to maintain book equity as a fraction of loans or other assets at or above a floor ratio specified by the authorities. Firms that violate

these capital constraints can be taken over by the regulatory authorities with the equity investors losing everything if that occurs. Not surprisingly, financial service firms not only keep a close eye on their book value equity (and the related ratios) but they are also conscious of the possibility that the risk in their investments or positions can manifest itself as a drop in book equity. In fact, value at risk or VAR represents the efforts by financial service firms to understand the potential risks in their investments and to be ready for the possibility of a catastrophic outcome, though the probability of it occurring might be very small. By simulating the values of their investments under a variety of scenarios, they can identify not only the possibility of falling below the regulatory ratios but also look for ways of hedging against this occurring. The payoff to risk hedging then manifests itself as a decline in or even an elimination of the probability that the firm will violate a regulatory constraint.

- b. Negative Book Value for Equity: As noted, there are hundreds of firms in the United States with negative book values of equity that survive its occurrence and have high market values for equity. There are some countries where a negative book value of equity can create substantial costs for the firm and its investors. For instance, companies with negative book values of equity in parts of Europe are required to raise fresh equity capital to bring their book values above zero. In some countries in Asia, companies that have negative book values of equity are barred from paying dividends. Even in the United States, lenders to firms can have loan covenants that allow them to gain at least partial control of a firm if its book value of equity turns negative. As with regulatory capital restrictions, we can use simulations to assess the probability of a negative book value for equity and to protect against it.

### *Earnings and Cash flow Constraints*

Earnings and cash flow constraints can be either internally or externally imposed. In some firms managers of firms may decide that the consequences of reporting a loss or not meeting analysis estimates of earnings are so dire, including perhaps the loss of their jobs, that they are willing to expend the resources on risk hedging products to prevent this



form happening. The payoff from hedging risk then has nothing to do with firm value maximization and much to do with managerial compensation and incentives.

In other firms, the constraints on earnings and cashflows can be externally imposed. For instance, loan covenants can be related to earnings outcomes. Not only can the interest rate on the loan be tied to whether a company makes money or not, but the control of the firm can itself shift to lenders in some cases if the firm loses money. In either case, we can use simulations to both assess the likelihood that these constraints will be violated and to examine the effect of risk hedging products on this likelihood.

### **Discounted Cash flow Valuation**

In the first part of this paper, we noted that the adjustment for risk in conventional discounted cash flow valuation is narrowly focused on the discount rate. In this section, we consider the potential effects of risk (and its management) on other inputs in the model.

#### ***The Drivers of DCF Value***

The value of a firm can generally be considered a function of four key inputs. The first is the cash flow from assets in place or investments already made, the second is the expected growth rate in the cash flows during what we can term a period of both high growth and excess returns (where the firm earns more than its cost of capital on its investments), the third is the length of time before the firm becomes a stable growth firm earning no excess returns and the final input is the discount rate reflecting both the risk of the investment.

a. *Cash Flow to the Firm:* Most firms have assets or investments that they have already made, generating cash flows. To the extent that these assets are managed more efficiently, they can generate more earnings and cash flows to the firm. Isolating the cash flows from these assets is often difficult in practice because of the intermingling of expenses designed to generate income from current assets and to build up future growth. We would define cash flows from existing investments as follows:

$$\begin{aligned} \text{Cash flow from existing assets} = & \text{After-tax Operating income generated by assets} \\ & + \text{Depreciation of existing assets} - \text{Capital maintenance expenditures} - \text{Change in} \\ & \text{non-cash working capital} \end{aligned}$$

Note that capital maintenance expenditures refer to the portion of capital expenditures designed to maintain the earning power of existing assets.<sup>7</sup>

*b. Expected Growth from new investments:* Firms can generate growth in the short term by managing existing assets more efficiently. To generate growth in the long term, though, firms have to invest in new assets that add to the earnings stream of the company. The expected growth in operating income is a product of a firm's reinvestment rate, i.e., the proportion of the after-tax operating income that is invested in net capital expenditures and changes in non-cash working capital, and the quality of these reinvestments, measured as the return on the capital invested.

$$\text{Expected Growth}_{\text{EBIT}} = \text{Reinvestment Rate} * \text{Return on Capital}$$

where,

$$\text{Reinvestment Rate} = \frac{\text{Capital Expenditure} - \text{Depreciation} + \Delta \text{ Non - cash WC}}{\text{EBIT} (1 - \text{tax rate})}$$

$$\text{Return on Capital} = \text{EBIT} (1-t) / \text{Capital Invested}$$

The capital expenditures referenced here are total capital expenditures and thus include both maintenance and new capital investments. A firm can grow its earnings faster by increasing its reinvestment rate or its return on capital or by doing both. Higher growth, though, by itself does not guarantee a higher value since these cash flows are in the future and will be discounted back at the cost of capital. For growth to create value, a firm has to earn a return on capital that exceeds its cost of capital. As long as these excess returns last, growth will continue to create value.

*c. Length of the Excess Return/ High Growth Period:* It is clearly desirable for firms to earn more than their cost of capital but it remains a reality in competitive product markets that excess returns fade over time for two reasons. The first is that these excess returns attract competitors and the resulting price pressure pushes returns down. The second is that as firms grow, their larger size becomes an impediment to continued growth with excess returns. In other words, it gets more and more difficult for firms to find investments that earn high returns. As a general rule, the stronger the barriers to entry, the longer a firm can stretch its excess return period.

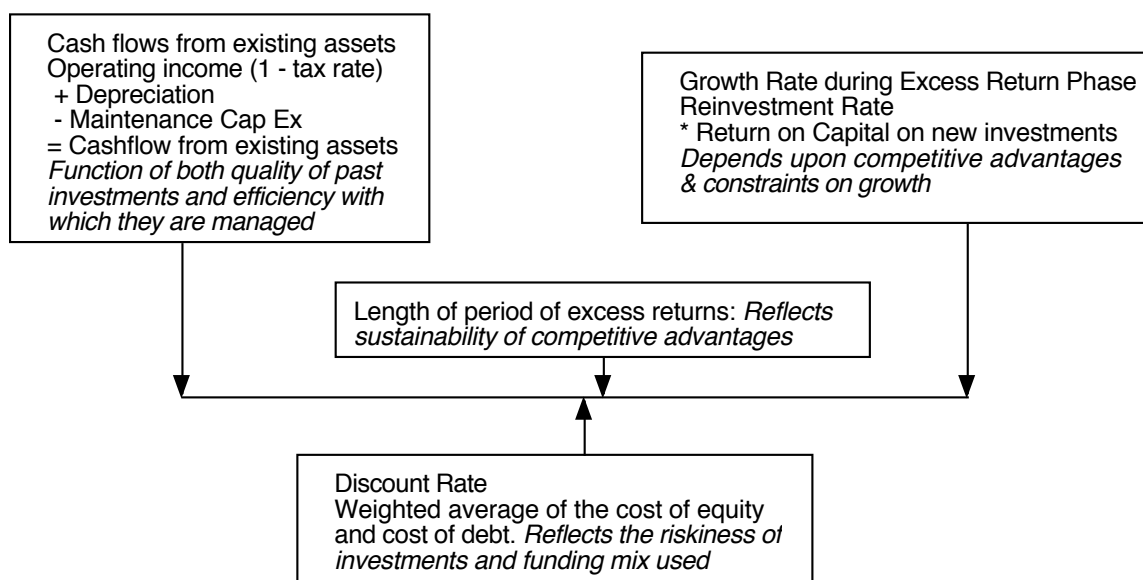
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<sup>7</sup> Many analysts assume that capital maintenance = depreciation. If we do that, the cashflow equation simplifies to just after-tax operating income and non-cash working capital.

*d. Discount Rate:* As noted in the first section, where we discussed the topic extensively, the discount rate reflects the riskiness of the investments made by a firm and the mix of funding used. Holding the other three determinants – cash flows from existing assets, growth during the excess return phase and the length of the excess return phase – constant, reducing the discount rate will raise firm value.

In summary, then, to value any firm, we begin by estimating cash flows from existing investments and then consider how long the firm will be able to earn excess returns and how high the growth rate and excess returns will be during that period. When the excess returns fade, we estimate a terminal value and discount all of the cash flows, including the terminal value, back to the present to estimate the value of the firm. Figure 1 summarizes the process and the inputs in a discounted cash flow model.

*Figure 1: Determinants of Value*



With these inputs, it is quite clear that for a firm to increase its value, it has to do one or more of the following: (a) generate more cash flows from existing assets, (b) grow faster or more efficiently during the high growth phase, (c) lengthen the high growth phase or (d) lower the cost of capital. To the extent that risk management can help in these endeavors, it can create value.

### ***Risk and DCF Value: A Fuller Picture***

To get a more complete sense of how risk affects value, we have to look at its impact not just on the discount rate but also on the other determinants of value. In this section, we will begin by revisiting our discussion of the relationship between discount rates and risk, and then move on to consider the effects of risk on cash flows from existing assets, growth during the excess return phase and the length of the excess return phase. In each section, we will draw a distinction between the effects of risk hedging and risk management on value, and argue that the latter has a much wider impact on value.

#### *Discount Rates*

In the first part of the paper, we consider two ways in which risk hedging can affect discount rates. While reducing exposure to firm specific risk has no effect on the cost of equity, reducing the exposure to market risk will reduce the cost of equity. Reducing exposure to any risk, firm-specific or market, can reduce default risk and thus the cost of debt. In this section, we will add one more potential effect of risk hedging.

Consider a firm that is a small, closely held public company or a private business. It is clear that the assumption that the marginal investor is well diversified and cares about only market risk falls apart in this case. The owner of the private business and the investors in the small, public company are likely to have significant portions of their wealth invested in the company and will therefore be exposed to both market and firm specific risk. Consequently, the cost of equity will reflect both types of risk. At the limit, if the owner of a business has 100% of her wealth invested in it, the cost of equity will reflect not the market risk in the investment (which is the beta in the CAPM or the betas in multi-factor models) but its total risk.<sup>8</sup> For such a firm, the reduction of firm specific risk will result in a lower cost of equity.

*Proposition 4: The payoff to risk management should be greater for private firms and for closely held publicly traded firms than it is for publicly traded firms with dispersed stock holdings.*

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<sup>8</sup> In fact, the beta for a private firm can be written as follows:

Total Beta = Market Beta/ Correlation between the firm and the market index

For example, if the market beta for chemical companies is 0.80 and the correlation between chemical companies and the market is 0.40, the total beta for a private chemical company would be 2.0.

This follows from the discussion above. The cost of equity for a private business will decrease when firm-specific risk is reduced whereas the cost of equity for a publicly traded firm with diversified investors will be unaffected. If we assume that the cost of reducing firm-specific risk is the same for both firms, the effects of reducing firm specific risk will be much more positive for private firms. Note, though, this does not imply that value will always increase for private firms when they reduce firm specific risk. That will still depend on whether the cost of reducing risk exceeds the benefits (lower cost of equity and cost of capital).

The relationship between risk management and discount rates is more complicated. Since risk management can sometimes lead to more exposure to at least some times of risk where the firm believes that it has a competitive edge, it is possible that the costs of equity and capital will rise as a consequence. While this, by itself, would reduce value, the key to effective risk management is that there is a more than compensating payoff elsewhere in the valuation in the form of higher cash flows or higher growth.

#### *Cash Flows from Existing Assets*

At the outset, it is difficult to see a payoff from risk hedging on cash flows from existing assets. After all, the investments have already been made and the efficiency with which they are managed has nothing to do with whether the risk is hedged or not. The only possible benefit from risk hedging is that the firm may be able to save on taxes paid. To see why, consider a tax schedule, where income beyond a particular level (say \$ 1 billion) is taxed at a higher rate – i.e., a windfall profit tax. Since risk management can be used to smooth out income over time, it is possible for a firm with volatile income to pay less in taxes over time as a result of risk hedging. Table 2 illustrates the tax paid by the firm, assuming at tax rate of 30% for income below \$ 1 billion and 50% above \$ 1 billion:

*Table 2: Taxes Paid: With and Without Risk Management*

<i>Year</i>	<i>Without risk management</i>		<i>With risk management</i>	
	<i>Taxable Income</i>	<i>Taxes Paid</i>	<i>Taxable Income</i>	<i>Taxes Paid</i>
<i>1</i>	600	180	800	240

2	1500	550	1200	400
3	400	120	900	270
4	1600	600	1200	400
<i>Total</i>	4100	1450	4100	1310

Risk hedging has reduced the taxed paid over 4 years by \$140 million. While it is true that we have not reflected the cost of risk hedging in the taxable income, the firm can afford to spend up to \$ 140 million and still come out with a value increase. The tax benefits in the example above were predicated on the existence of a windfall profit tax. Even in its absence, though, firms that go from making big losses in some years to big profits in other years can benefit from risk hedging to the extent that they get their tax benefits earlier.

If risk hedging can increase cash flows by reducing taxes paid, risk management may allow a firm to earn higher operating margins on its revenues. Reverting back to an example that we used earlier in the paper, a pharmaceutical firm that succeeds in keeping a more balanced pipeline of products is less likely to see its operating margin decline as a result of competition than a firm that depends on one or two products for its entire profits.

#### *Expected Growth during High Growth/Excess Return Phase*

The expected growth during the high growth/ excess returns phase comes from two inputs – the reinvestment rate and the return on capital. Both risk hedging and risk management can affect these inputs and through them the expected growth rate.

Consider risk hedging first. If managers accept every positive net present value investment that they are presented with, there would clearly be no benefit from hedging risk. In practice, though, it has been widely argued that managers in some firms under invest and there is empirical evidence to support this view. While there are many reasons given for under investment, ranging from the unwillingness of companies to issue new equity to the prevalence of capital constraints, the risk aversion of managers also plays a role. Managers have a substantial amount of human capital invested in the companies that they manage. Consequently, they may be much more concerned about firm specific risk than diversified stockholders in the firm. After all, if the firm goes bankrupt as a result of firm-specific risk, it is only one of several dozen investments for diversified investors but

it can be catastrophic for the managers in the firm. Building on this theme, managers may avoid taking good investments – investments with returns on capital that exceed the cost of capital and positive net present value– because of the presence of firm specific risk in those investments. An example will be a U.S. based company that avoids taking investments in Mexico, even though the expected returns look good, because the managers are concerned about exchange rate risk. This behavior will lower the reinvestment rate and the expected growth rate for this firm. If we can give these managers the tools for managing and reducing the exposure to firm specific risk, we could remove the disincentive that prevents them from reinvesting. The net result will be a higher reinvestment rate and a higher expected growth rate.

*Proposition 5: The payoff to risk hedging should be greater for firms with weak corporate governance structures and managers with long tenure.*

Managers with long tenure at firms are more likely to have substantial human capital invested in the firm and whether they are likely to get away with turning away good investments will largely be a function of how much power stockholders have to influence their decisions. A long-term CEO with a captive board can refuse to invest in emerging markets because he views them as too risky and get away with that decision. Without condoning his behavior, we would argue that providing protection against firm specific risks may help align the interests of stockholders and managers and lead to higher firm value.

The effect of risk management on growth is both broader and more difficult to trace through. A company that takes advantage of the opportunities generated by risk will be able to find more investments (higher reinvestment rate) and earn a higher return on capital on those investments. The problem, however, is in disentangling the effects of risk management on expected growth from those of other factors such as brand name value and patent protection.

*Length of the High Growth/ Excess Return Period*

A firm with high growth and excess returns will clearly be worth much more if it can extend the period for which it maintains these excess returns. Since the length of the high growth period is a function of the sustainability of competitive advantages, we have

to measure the impact of risk hedging and management on this dimension. One possible benefit to risk hedging and smoother earnings is that firms can use their stable (and positive) earnings in periods where other firms are reporting losses to full advantage. Thus, a gold mining stock that hedges against gold price risk may be able to use its positive earnings and higher market value in periods when gold prices are down to buy out their competitors, who don't hedge and thus report large losses at bargain basement prices.

The payoff from risk management, though, should show be much greater. Firms that are better at strategically managing their exposure to firm-specific risks may find that this by itself is a competitive advantage that increases both their excess returns and the period for which they can maintain them. Consider, for instance, a pharmaceutical firm. A significant portion of its value comes from new products in the pipeline (from basic research to FDA approval and commercial production) and a big part of its risk comes from the pipeline drying up. A company like Pfizer that manages its R&D more efficiently, generating more new products and getting them to the market quicker will have a decided advantage over another pharmaceutical firm that has allowed its research pipeline to run dry or become uneven with too many products in early research and too few close to commercial production.

*Proposition 6: The payoff to risk management should be greater for firms that are in volatile businesses with high returns on capital on investment.*

For risk management to pay off as excess returns over longer periods, firms have to be in businesses where investment opportunities can be lucrative but are not predictable. In fact, the reason the value added to managing the pipeline in the pharmaceutical business is so high is because the payoff to research is uncertain and the FDA approval process is fraught with pitfalls but the returns to a successful drug are immense. Table 3 summarizes the effects of risk hedging and risk management on the different components of value:

*Table 3: Risk Hedging, Risk Management and Value*

<i>Valuation Component</i>	<i>Effect of Risk Hedging</i>	<i>Effect of Risk Management</i>
Costs of equity and capital	Reduce cost of equity for private and closely held	May increase costs of equity and capital, if firms



	firms. Reduce cost of debt for heavily levered firms with significant distress risk	increases its exposure to risks where it feels it has a differential advantage.
Cash flow to the Firm	Cost of risk hedging will reduce earnings. Smoothing out earnings may reduce taxes paid over time.	More effective risk management may increase operating margins and increase cash flows.
Expected Growth rate during high growth period	Reducing risk exposure may make managers more comfortable taking risky (and good) investments. <u>Increase in reinvestment rate will increase growth.</u>	Exploiting opportunities created by risk will allow the firm to earn a <u>higher return on capital</u> on its new investments.
Length of high growth period	No effect	Strategic risk management can be a long-term competitive advantage and increase length of growth period.



dcfriskeffect.xls: This spreadsheet allows you to estimate the effect of risk hedging and risk management on the discounted cash flow value of a firm.

## **Relative Valuation**

While discounted cash flow models allow for a great deal of flexibility when it comes to risk management, they also require information on the specific effects of risk hedging and risk management on the inputs to the models. One way to bypass this requirement is to look at whether the market rewards companies that hedge or manage risk and, if it does, to estimate how much of a price it is willing to pay for either risk hedging and risk management.

### ***Payoff to Risk Hedging in Relative Valuation.***

A firm that hedges risk more effectively should have more stable earnings and stock prices. If the market values these characteristics, as proponents of risk hedging argue, the market should attach a much higher value to this firm than to a competitor that does not hedge risk. To examine whether this occurs, we could look at a group of comparable companies and either identify the companies that we know use risk hedging products or come up with quantifiable measures of the effects of risk hedging; two obvious choices would be earnings variability and stock price variability. We can then compare the market values of these companies to their book value, revenues or earnings and relate the level of these multiples to the risk hedging practices of these firms. If risk hedging pays off in higher value, firms that hedge risk and reduce earnings or price variability should trade at higher multiples than firms that do not.

Let us consider a simple example. In table 4, we have listed the price to book and enterprise value to sales ratios of gold and silver mining stocks in the United States in November 2003. We have also reported the return on equity for each stock, and about 80% of the stocks in sample reported negative earnings in 2002. The beta<sup>9</sup> and standard deviation in stock prices<sup>10</sup> are used as measures of the market risk and total risk respectively in these companies. In the final column, the compounded annual return investors would have earned on each of these stocks between November 1998 and November 2003 is reported.

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<sup>9</sup> The betas are estimated using 5 years of weekly returns against the S&P 500.

<sup>10</sup> The standard deviations are annualized estimates based upon 5 years of weekly returns on the stock.

Table 4: Gold Mining Companies Valuation Multiples and Risk

<i>Company Name</i>	<i>PBV</i>	<i>EVS</i>	<i>ROE</i>	<i>Beta</i>	<i>Standard Deviation in Stock prices</i>	<i>5-year return</i>
IAMGOLD Corp.	5.50	9.28	6.91%	-0.26	64.99%	14.51%
Ashanti Goldfields Company Lim	3.63	3.93	14.50%	0.11	63.22%	6.75%
Silver Standard Resources Inc.	5.93	6.55	0.00%	0.19	78.28%	35.94%
Barrick Gold	3.44	5.69	0.00%	0.31	38.19%	-0.58%
AngloGold Ltd. ADR	5.31	5.78	0.00%	0.33	51.23%	18.64%
Compania de Minas Buenaventura	8.98	23.15	0.00%	0.58	42.21%	33.63%
Crystallex Intl Corp	2.66	6.63	-39.55%	0.86	77.60%	40.73%
Campbell Resources	1.79	6.50	-45.54%	-1.78	144.37%	2.95%
Cambior Inc.	3.92	3.08	0.00%	-0.59	76.29%	-12.38%
Richmont Mines	2.81	1.37	12.91%	-0.14	59.68%	11.73%
Miramar Mining Corp.	2.08	5.63	0.00%	0.02	70.72%	15.12%
Golden Star Res	14.06	17.77	20.65%	-0.73	118.29%	39.24%
Royal Gold	5.50	23.99	8.93%	-0.26	65.70%	35.02%
Agnico-Eagle Mines	2.08	8.15	-1.00%	-0.25	50.92%	18.24%
Newmont Mining	3.32	7.30	0.00%	0.17	53.80%	16.35%
Stillwater Mining	1.16	3.06	0.00%	2.18	79.20%	-14.10%
Glamis Gold Ltd	5.07	22.23	3.63%	-0.71	53.67%	40.38%
Meridian Gold Inc	2.61	8.72	7.54%	0.30	51.99%	20.68%
Teck Cominco Ltd. 'B'	1.20	1.90	1.19%	0.49	40.44%	7.86%
DGSE Companies Inc	2.40	0.68	12.50%	1.17	86.20%	-9.86%
Bema Gold Corporation	4.61	21.45	-6.19%	-0.76	81.91%	24.27%
Hecla Mining	26.72	7.35	-19.49%	-0.16	78.72%	6.77%
Canyon Resources	2.25	3.48	-22.64%	-0.15	83.07%	5.15%
Placer Dome	3.18	6.01	6.60%	0.42	54.11%	0.82%
Aur Resources Inc.	1.94	2.83	2.25%	0.65	51.80%	10.92%
Coeur d'Alene Mines	17.40	10.45	-105.71%	0.64	79.53%	-8.63%
Apex Silver Mines	3.87	4.77	-6.56%	0.52	42.08%	8.47%
Black Hawk Mining Inc.	3.21	2.60	-30.47%	0.20	74.36%	1.73%

There are three interesting findings that emerge from this table. The first is that even a casual perusal indicates that there are a large number of companies with negative betas, not surprising since gold prices and the equity markets moved in opposite directions for much of the period (1998-2003). At the same time, there are companies with not just positive betas but fairly large positive betas, indicating that these companies hedged at

least some of the gold price risk over the period. Finally, there is no easily detectable link between betas and standard deviations in stock prices. There are companies with negative betas and high standard deviations as well as companies with positive betas and low standard deviations.

To examine whether the pricing of these companies is affected by their exposure to market and total risk, we estimated the correlations between the multiples (price to book and EV/sales) and the risk variables. The correlation matrix is reported in table 5:

*Table 5: Correlation Matrix: Value versus Risk: Gold Mining: November 2003*

	<i>PBV</i>	<i>EV/S</i>	<i>BETA</i>	<i>Standard Deviation</i>	<i>Earnings stability</i>	<i>5-year return</i>
<i>PBV</i>	1.000	.303	-.122	.196	.074	.078
<i>EV/S</i>		1.000	-.347	.011	-.094	.711**
<i>BETA</i>			1.000	-.424*	.013	-.296
<i>Standard Deviation</i>				1.000	.065	-.064
<i>Earnings stability</i>					1.000	-.313
<i>5-year return</i>						1.000

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

Only two of the correlations are statistically significant. First, companies with higher betas tended to have lower standard deviations; these are the companies that hedged away gold price risk, pushing their betas from negative to positive territory and became less risky on a total risk basis (standard deviation). Second, companies with high enterprise value to sales ratios had much higher returns over the last 5 years, which perhaps explains why they trade at lofty multiples. It is the absence of correlation that is more telling about the payoff or lack thereof to risk management in this sector. Both the price to book and enterprise value to sales ratios are negatively correlated with beta and positively correlated with standard deviation in stock prices, though the correlations are not statistically significant. In other words, the companies that hedged risk and lowered their stock price volatility did not trade at higher multiples. In fact, these firms may have been punished by the market for their risk hedging activities. There was also no correlation

between the stability of earnings<sup>11</sup> and the valuation multiples. There is also no evidence to indicate that the hedging away of gold price risk had any effect on overall stock returns.

Does this mean that risk hedging does not pay off? We are not willing to make that claim, based upon this sample. After all, gold mining stocks are a small and fairly unique subset of the market. It is possible that risk hedging pays off in some sectors but the question has to be answered by looking at how the market prices stocks in these sectors and what risk measure it responds to. The onus has to be on those who believe that risk hedging is value enhancing to show that the market sees it as such.

### ***Payoff to Risk Management in Relative Valuation***

If the market does not attach much value to risk hedging, does it value risk management? As with the risk hedging case, we can begin with a group of comparable firms and try to come up with a quantifiable measure of risk management. We can then relate how the market values stocks to this quantifiable measure.

We will face bigger challenges establishing a link (or lack thereof) between risk management and value than we do with risk hedging. Unlike risk hedging, where the variability in earnings and value can operate as a proxy for the amount of hedging, it is difficult to come up with good proxies for the quality of risk management. Furthermore, these proxies are likely to be industry specific. For instance, the proxy for risk management in the pharmaceutical firm may be the size and balance in the product pipeline. In the oil business, it may be a measure of the speed with which the firm can ramp up its production of oil if oil prices go up.

### **Option Pricing Models**

There is a third way of looking at the value of both risk hedging and risk management and that is to use option-pricing models. As we will argue in the next section, risk hedging is essentially the equivalent of buying a put option against specific eventualities whereas risk management gives the firm the equivalent of a call option.

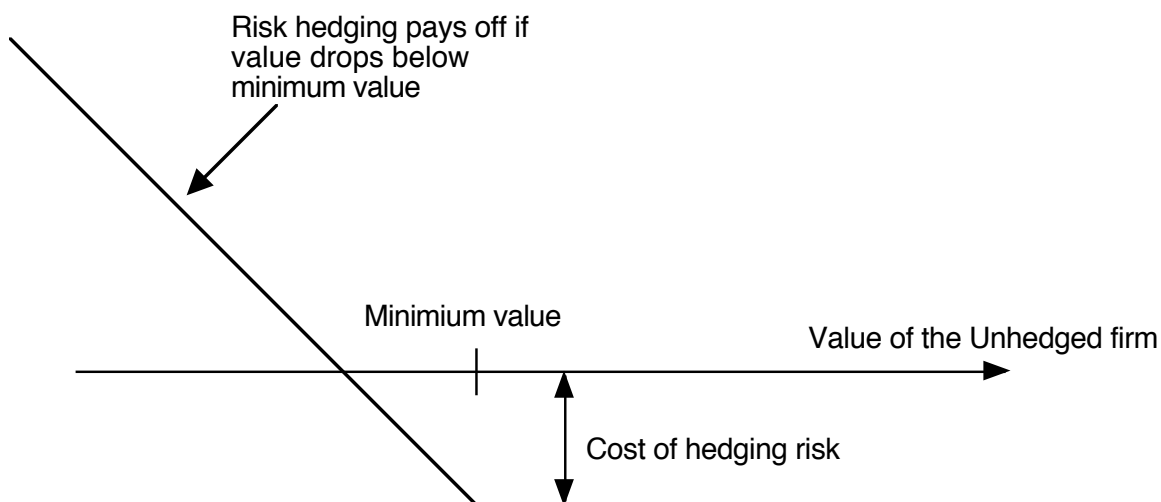
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<sup>11</sup> The variance in quarterly earnings over the previous 5 years was used to measure earnings stability.

### *An Option Pricing View of Risk Hedging*

Consider a firm with a value of \$100 million and assume that it buys risk-hedging products to ensure that its value does not drop below \$ 80 million. In effect, it is buying a put option, where the underlying asset is the unhedged value of the firm's assets and the strike price is the lower bound on the value. The payoff diagram for risk hedging as a put option is shown in figure 2:

*Figure 2: Payoff Diagram for Risk Hedging*



If we can estimate a standard deviation in firm value, we can value this put option and by doing so, attach a value to risk hedging. Since this protection will come with a cost, we can then consider the trade off. If the cost of adding the protection is less than the value created by the protection, risk hedging will increase the value of the firm:

$$\begin{aligned} \text{Value of firm after risk management} = & \quad \text{Value of firm without risk hedging} \\ & + \text{Value of put (risk hedging)} \\ & - \text{Cost of risk hedging} \end{aligned}$$

To provide a measure of the value of risk hedging, consider again the example of the firm with a value of \$ 100 million that wants to hedge against the possibility that it's value may drop below \$ 80 million. Assume that the standard deviation in firm value<sup>12</sup> is 30%

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<sup>12</sup> The standard deviation in firm value will generally be much lower than the standard deviation in stock prices (equity value) for any firm with substantial leverage. In fact, the standard deviation in firm value can be written as:

and that the one-year riskless rate is 4%. If we value a one-year put option with these characteristics, using a standard Black-Scholes model, we arrive at a value of \$2.75 or 2.75% of firm value. That would indicate that this firm can spend up to 2.75% of its value to hedge against the likelihood that value will drop below \$ 80 million. The value of risk hedging can be estimated as a function of both the degree of protection demanded (as a percent of existing firm value) and the standard deviation in firm value. Table 6 provides these estimates:

*Table 6: Value of Risk Hedging as a percent of Firm Value*  
*Standard Deviation in Firm Value*

<i>Protection boundary</i>	<i>10%</i>	<i>20%</i>	<i>30%</i>	<i>40%</i>	<i>50%</i>
80%	0.01%	0.78%	2.75%	5.34%	8.21%
85%	0.07%	1.48%	4.03%	7.03%	10.21%
90%	0.31%	2.55%	5.65%	9.00%	12.43%
95%	0.95%	4.06%	7.59%	11.22%	14.86%
100%	2.29%	6.04%	9.87%	13.70%	17.50%

The value of hedging risk increases as the volatility in firm value increases and with the degree of protection against downside risk. The cost of hedging risk can be compared to these values to assess whether it makes sense to hedge risk in the first place.

This process can be extended to cover risk hedging that is focused on earnings, but the problem that we run into is one that we referenced in the earlier section on discounted cash flow valuation. Without a model to link earnings to value, we cannot value risk hedging as put against value declining. Simplistic models such as assuming a constant PE ratio as earnings go up and down can lead to misleading conclusions about the value of hedging.

Looking at the trade off between the cost and value of risk hedging yields the following proposition about risk hedging:

*Proposition 7: Risk hedging is most likely to generate value when investors cannot find traded instruments in the market that protect against the risk.*

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$$\sigma^2_{\text{Firm value}} = (E/(D+E))^2 \sigma^2_{\text{Equity}} + (D/(D+E))^2 \sigma^2_{\text{Debt}} + 2((E/(D+E))(D/(D+E))) \sigma_{\text{Equity}} \sigma_{\text{Debt}}$$

This proposition emerges from our belief that if investors can find securities in the market that protect against risk, it is unlikely (though not impossible) that companies could buy risk protection for less. Since it is easier for investors to buy protection against certain types of risk such as currency, interest rate and commodity risk than against others such as political risk, this would indicate that risk hedging is likely to have a much larger payoff when employed to reduce exposure to the latter.


### ***An Option Pricing View of Risk Management***

If risk hedging creates the equivalent of a put option for the firm, risk management creates the equivalent of a call option. This is because risk management is centered on taking advantage of the upside created because of uncertainty. Consider a simple example. Assume that you operate an oil company and that you are considering whether to invest in new refineries and facilities designed to help you increase your oil production quickly to take advantage of higher oil prices. You are looking at a call option, whose value will be tied to both the variance in oil prices and the amount of additional production (and cash flows) you will generate if oil prices increase.

In fact, while much of the real option literature has been focused on valuation issues and applying option pricing models to valuing real options such as patents or oil reserves, real options also offer an effective framework for examining the costs and benefits of risk management. Using the option framework would lead us to the following proposition about risk management.

*Proposition 8: Risk management is likely to generate the most value for firms that operate in volatile businesses with substantial barriers to entry.*

The first part of the proposition – higher volatility – follows from viewing risk management as a call option, since options increase in value with volatility. Significant barriers to entry allow firms that take advantage of upside risk to earn substantial excess returns for longer periods.

 riskhedging.xls: This spreadsheet allows you to estimate how much risk hedging is worth as a percent of the value of the firm.



## A Final Assessment of Risk Management

There are two extreme views that dominate the risk management debate and they are both rooted in risk hedging. One perspective, adopted by portfolio theorist and believers in efficient markets, is that risk hedging on the part of firms is almost always useless and will generally decrease value. While proponents of this view will concede that there are potential tax benefits (though they are likely to be small) and possibly a savings in distress cost, they will argue that diversified investors can manage risk exposure in their portfolios much more effectively and with lower costs than managers in the individual firms. At the other extreme are those who sell risk hedging products and essentially argue that reducing risk will reduce earnings and price variability almost always yield a payoff to firms in the form of higher stock prices. Neither side seems to make a meaningful distinction between risk hedging and risk management.

### When does risk hedging pay off?

Based upon our discussion in this paper, we think that there is an intermediate view that makes more sense. Risk hedging is most likely to generate value for smaller, closely held firms or for firms with substantial debt and distress costs. It is also most likely to create value if it is focused on hedging risks where investors cannot buy risk protection through market-traded securities. The increase in value is most likely to come from a lower cost of capital though there may be a secondary benefit in managers being more willing to invest in high risk, high return projects (higher growth). Risk hedging is unlikely to create value for firms that are widely held by diversified investors and if it is focused on risk that where market protection is difficult to obtain. Table 7 summarizes our conclusions:

*Table 7: Payoff to Risk Hedging*

<i>Marginal investor is</i>	<i>Risk being reduced is</i>	<i>Market risk protection exists</i>	<i>Firm is highly leveraged</i>	<i>Effect on cash flows</i>	<i>Effect on growth</i>	<i>Effect on discount rate</i>	<i>Effect on value</i>
Diversified	Firm specific risk	Yes	No	Negative (Cost of risk)	None	None	Negative

				reduction)			
Diversified	Firm specific risk	No	Yes	Negative	None	May reduce (lower cost of debt and capital)	Neutral to negative
Diversified	Market risk	Yes	No	Negative	None	Reduce	Neutral to negative
Diversified	Market risk	No	Yes	Negative	None	Reduce	Neutral to positive
Not diversified	Firm specific risk	Yes	No	Negative		Reduce	Neutral
Not diversified	Firm specific risk	No	Yes	Negative	Positive	Reduce	Neutral to positive
Not diversified	Market risk	Yes	No	Negative	None	Reduce	Neutral to positive
Not diversified	Market risk	No	Yes	Negative	Positive	Reduce	Positive

Using this matrix, it is clear that risk hedging should be used sparingly by firms that are widely held by institutional investors, are not highly levered and are exposed to market risks where investors can buy risk protection easily.

#### **When does risk management pay off?**

All firms are exposed to risk and should therefore consider risk management as an integral part of doing business. Effective risk management is more about strategic than financial choices and will show up in value as higher and more sustainable excess returns. The benefits of risk management, though, are likely to be greatest in businesses with the following characteristics:

- a. *High volatility*: The greater the range of firm specific risks that a firm is exposed to, the greater the potential for risk management. After all, it is the uncertainty about the future that is being exploited to advantage.

- b. *Strong barriers to entry*: Since the payoff to risk management shows up as higher returns, it is likely to create more value when new entrants can be kept out of the business either because of infrastructure needs (aerospace, automobiles) and legal constraints such as patents or regulation (pharmaceuticals and financial service firms).

Given that risk management can have such high payoffs, how can we explain the lack of emphasis on it? There are several reasons. The first is that its emphasis on strategic rather than financial considerations pushes it into the realm of corporate strategy. The second is that it is far more difficult to trace the payoff from risk management than it is with risk hedging. Those who sell risk-hedging products can point to the benefits of less volatile earnings and even less downside risk in value, but those pushing for risk management have to talk in terms of excess returns in the future.

### **Risk hedging versus risk management**

We have made much of the difference between risk hedging and risk management in this paper and the consequences for value. In table 8 below, we summarize the discussion in this paper:

*Table 8: Risk Management versus Risk Hedging – A Summary*

	<i>Risk hedging</i>	<i>Risk management</i>
<i>View of risk</i>	Risk is a danger	Risk is a danger and an opportunity.
<i>Objective</i>	To protect against the downside of risk	To exploit the upside created by uncertainty.
<i>Functional emphasis</i>	Financial	Strategic, stretching across all functions.
<i>Process</i>	Product oriented. Primarily focused on the use of derivatives and insurance to hedge against risks.	Process oriented. Identify key risk dimensions and try to develop better ways of handling and taking advantage of these risks than the competition.
<i>Measure of</i>	Reduce volatility in earnings,	Higher value

<i>success</i>	cash flows or value.	
<i>Type of real option</i>	Put option (Insurance against bad outcomes)	Call option (Taking advantage of high volatility to create good outcomes)
<i>Primary Effect on value</i>	Lower discount rate	Higher and more sustainable excess returns.
<i>Likely to make sense for</i>	Closely held and private firms or publicly traded firms with high financial leverage and substantial distress costs.	Firms in volatile businesses with significant potential for excess returns (if successful).

### **Developing a Risk Management Strategy**

Given the discussion of risk hedging and risk management in this paper, we see five steps that every firm should take to deal with risk effectively.

*Step 1: Make an inventory of possible risks:* The process has to begin with an inventory of all of the potential risks that a firm is exposed to. This will include risk that are specific to the firm, risks that affect the entire sector and macroeconomic risks that have an influence on the value.

*Step 2: Decide whether to hedge or not to hedge:* We have argued through this paper that risk hedging is not always optimal and will reduce value in many cases. Having made an inventory of risks, the firm has to decide which risks it will attempt to hedge and which ones it will allow to flow through to its investors. The size of the firm, the type of stockholders that it has and its financial leverage (exposure to distress) will all play a role in making this decision. In addition, the firm has to consider whether investors can buy protection against the risks in the market on their own.

*Step 3: Choose risk hedging products:* If a firm decides to hedge risk, it has a number of choices. Some of these choices are market traded (currency and interest rate derivatives, for example), some are customized solutions (prepared by investment banks to hedge against risk that may be unique to the firm) and some are insurance products. The firm has to consider both the effectiveness of each of the choices and the costs.

*Step 4: Determine the risk or risks that you understand better or deal with better than your competitors:* This is the step where the firm moves from risk hedging to risk management and from viewing risk as a threat to risk as a potential opportunity. Why would one firm be better at dealing with certain kinds of risk than its competitors? It may have to do with past experience. A firm that has operated in emerging markets for decades clearly will have a much better sense of both what to expect in a market meltdown but also how to deal with it. It may also come from the control of a resource – physical or human – that provides the company an advantage when exposed to the risk. Having access to low cost oil reserves may give an oil company an advantage in the event of a drop in oil prices and having a top notch legal staff may give a tobacco company a competitive advantage when it comes to litigation risk.

*Step 5: Devise strategies to take advantage of your differential advantage in the long term.* In the final step in the process, firms build on their competitive edge and lay out what they will do to create the maximum benefit. The oil company with low cost reserves may decide that it will use its cost advantage the next time oil prices drop to acquire oil companies with higher cost reserves and high leverage.

Risk hedging and risk management are not mutually exclusive strategies. In fact, we consider risk hedging to be part of broader risk management strategy where protecting against certain types of risk and trying to exploit others go hand in hand. We would argue that most firms do not have comprehensive strategies when it comes to dealing with risk. Consider how each step in this process is handled currently and the entity it is handled by. The risk inventory, if it is done, is usually the responsibility of the managers of a company. These managers often bring in a narrow perspective of risk, based upon their own experiences, and tend to miss some important risks and over weight others. The advice on what type of risks to hedge (step 2) is usually offered by the same entities (investment banks and insurance companies) that then offer their own risk hedging products (step 3) as the ideal solutions. As a result of the conflict of interests, too much risk gets hedged at many large firms and too little at smaller firms, and the risk hedging products chosen are almost never the optimal ones. The last two steps are usually viewed as the domain of strategists in the firm and the consultants that work with them. The limitation with this set-up, though, is that strategic advice tends to gloss over risk and

focus on rewards. Consequently, strategies that focus on higher profitability and higher growth often dominate strategies built around taking advantage of risk. Table 9 summarizes the five steps, the state of play at the moment and potential opportunities for complete risk management advice.

## **Conclusion**

There is too much of a focus on risk hedging and not enough attention paid to risk management at firms. This is troubling since the payoff to risk hedging is likely to be small even for firms where it makes sense and is often negative at many large publicly traded firms with diversified investors. In contrast, the payoff to risk management can be substantial to a far larger subset of firms.

In this paper, we have laid out the fundamental differences between risk hedging and risk management and set up a template for the comprehensive management of risk. The real work, though, will have to occur at the level of each firm since the right path to adopt will depend upon the firm's competitive advantages and the sector it operates in. Unlike risk hedging, which is viewed as the job of the CFO, risk management should be on the agenda of everyone in the corporation. In today's world, the key to success lies not in avoiding risk but in taking advantage of the opportunities offered by risk. As businesses confront the reality of higher volatility, they have to get out of a defensive crouch when it comes to risk and think of ways in which they can exploit the risk to advantage in a global market place.

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*Table 9: Steps in Developing a Risk Strategy: Potential Problems and Possible Opportunities*

	<i>What is it?</i>	<i>Who does it now?</i>	<i>Limitations/ Problems</i>	<i>Possible Improvements</i>
Step 1	Make an inventory of all of the risks that the firm is faced with – firm specific, sector and market.	Internal. Managers of firms do this now, but often haphazardly and in reaction to events.	Managers may be good at identifying firm-specific problems but may not be very good at assessing sector or market risks. They may miss some risks and overinflate others.	A team with sector expertise and experience can do a much more comprehensive job.
Step 2	Decide what risks should be hedged and should not.	Investment banker or insurance company determines what risk should be hedged and what products should be used.	Conflict of interest. Not surprisingly, the investment banker or insurance company will over hedge risk and find that their products are the best ones.	Offer unbiased advice on both components; in effect, offer to evaluate the products of others to find cheapest and best alternative. To do this, you have to take your products off the table.
Step 3	For the risks to be hedged, pick the risk hedging products which can be derivatives or insurance products			
Step 4	Determine the risk dimensions where you have an advantage over your competitors either because you understand the risk better or you control a resource.	If it occurs, it is usually part of strategic consulting advice and is packaged with other strategic objectives.	Risk gets short shrift since the focus is on rewards. In other words, strategies that offer higher growth will win out over ones which emphasize risk advantages.	Develop a team that focuses only on strategic risk consulting. You can offer your services as an adjunct to existing consulting services.
Step 5	Take strategic steps to ensure that you can use this risk advantage to gain over your competition.			