

Should we fear derivatives?

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Derivatives are instruments whose payoffs are derived from an underlying asset. Plain vanilla derivatives include forwards, futures, options and swaps. Exotic derivatives have more complex payoffs.

Derivatives are typically priced, assuming there are no frictions in the financial markets. One constructs a portfolio that has the same pay off as the derivative. Then the derivative must be worth the same as this replicating portfolio. Otherwise, risk free arbitrage would be possible.

Derivatives have been traded for centuries but the market took off only recently. The volatility of interest and exchange rates increased sharply in the 1970s. Deregulation and the growth of international trade and finance increased the demand for risk management products. The development of the Black Scholes model in 1973 accelerated financial innovation by making it much easier to price derivatives.

The OTC market for derivatives is much bigger than the exchange traded one. In 2003, the notional amount outstanding of OTC derivatives was \$ 169.7 trillion while that of exchange traded derivatives was \$ 38.2 trillion. While the gross amount of outstanding derivatives positions was \$ 208 trillion, the net amount outstanding was only \$ 7.9 trillion.

On paper, it is possible to construct a replicating portfolio with the same properties as derivatives. But this is really possible only in case of firms with large trading operations who can trade fast and cheap to manage replicating portfolios well enough. These firms can also make markets in derivatives matching buyers and sellers. When they do so, there is no need to hedge their positions. But individuals and non-financial firms face much higher trading costs than the most efficient financial institutions. Creating a replicating portfolio for options in particular will be expensive. For the replicating portfolio to work well, trades must be made whenever the price of the underlying asset changes. And identifying the correct replicating strategy may be more difficult than it sounds. In short, many individuals and corporates will be willing to pay financial institutions to get the right derivative, instead of trying to develop it on their own.

Derivatives also make markets more efficient. For example, in many countries, the only reliable information about long term interest rates is obtained from swaps. This is because the swaps market is more liquid and active than the bond market. Derivatives also make it easier to act on information. Buying a put option is much easier than going short on a stock.

On paper, derivatives can disrupt markets, as it is easier to build speculative positions. But there is no compelling evidence to indicate that the introduction of derivatives trading permanently increases the volatility of the underlying.

Non-financial firms that have foreign currency transactions seem to benefit from using currency derivatives. Non-financial firms with high leverage seem to find it advantageous to use interest rate derivatives.

Some firms use derivatives to minimize accounting earnings volatility. Using derivatives can also be used to minimize the present value of tax liabilities. Firms for which options are a more important component of managerial compensation are less likely to hedge. This is because the upside of an option is more unlimited, compared to the downside.

Banks act as market makers in derivatives but also use derivatives to manage risk. Larger banks seem more likely to use derivatives to manage risk and thereby reduce the probability of financial distress.

Individuals tend to leave a lot of money on the table when faced with exercise decisions. They also tend to exercise options too early when compared to traders in large investment houses. Individuals also face many risks which are difficult to hedge with derivatives.

Derivatives that trade in liquid markets, can be bought and sold at the market price. But valuation becomes more complex when trading is illiquid and available prices do not reflect the correct value. The assumptions behind the Black Scholes model do not always hold good. The estimates of value for exotic derivatives tend to vary considerably across dealers.

Plain vanilla derivatives are liquid and it is easy to find a buyer. But long maturity and complex derivatives are less liquid. Complex derivatives appeal only to a small number of counterparties who want that particular set of risk characteristics and are confident about the product they are buying.

Concerns relating to disclosures about derivatives positions have increased in recent times. But the information disclosed typically focuses on the standalone risks of derivatives rather than on how derivatives are used. By using derivatives for hedging, the derivatives risks might increase but overall the firm may become less risky. Some firms do not report the impact of their hedging activities on various risks.

The sale of a derivative produces revenue. A wise derivative trading firm will typically proceed to hedge the derivative that it has sold. But when the market is not liquid, putting a value on the derivative and the corresponding hedge can be difficult. Often management does not side with risk managers who want to value derivatives conservatively and may support traders who prefer a more aggressive approach.

Derivatives trading does not need much cash investment and can look very profitable when revenue is compared with the cash investment. Derivatives may look profitable when traditional accounting is used but when the cost associated with the increase in risk is accounted for, this may not be the case. Arriving at the true profitability of derivatives requires taking into account the capital required to support the risks of derivatives.

Often a loss associated with a derivative is the flipside of a large gain on the hedged exposure. When a hedge is designed to eliminate the risk associated with an exposure, the hedge will make a loss when the hedged exposure is profitable.

Some derivative losses are not the random by-products of well-conceived hedges. They may be the outcomes of poorly conceived derivatives positions. But somebody's loss is usually somebody's gain. The deadweight costs of derivatives losses are small. As firms learn more about how to use derivatives, foolish use of derivatives will become less likely and less frequent.

Financial institutions make detailed risk disclosures. Their value at risk tends to be small. Banks might make a loss if the counterparty defaults. But many OTC swaps are collateralized. There are provisions in the contract for posting more collateral when the situation demands. But there are two problems to be considered here. Large losses at the level of one firm might impose huge costs on the financial system. Firms have little incentive to take into account these negative externalities. So, firms may pay less attention to firm risk than is socially optimal. Another problem is that models may not capture all the risks

well. For example, in 1998, liquidity risk proved to be the big factor and was not included in most models.

Bankruptcy law has an automatic stay provision. Creditors cannot demand immediate payment. Many derivatives are exempted from this automatic stay. The master agreement usually specifies how payments will be made if a contract is terminated. However, if a position is hedged, the bank has only the hedge on its books after the default, without having the contract it was trying to hedge. The bank's risk increases and during periods of economic turmoil, the market may become illiquid. This may make it difficult for the bank to make the payments it owes.

LTCM, the celebrated hedge fund had assets worth \$ 125 billion on a capital base of \$ 4.1 billion in July 1998. LTCM essentially took long positions in risky high yield bonds and short positions in treasuries or derivatives. When Russia defaulted on its bonds in 1998, there was a flight to safety. The yields on the bonds held by LTCM did not fall as much as the interest rates on treasuries. Essentially, the prices of treasuries rose relative to the prices of the risky bonds on which LTCM was long. The fund began to make losses. As it did so, it sold some assets. Traders, anticipating more liquidation, took actions that put more pressure on the asset prices. Counterparties also tried to maximize the collateral that they could obtain from LTCM. Also, some banks were making losses of their own. They also started selling assets similar to what LTCM held, thereby increasing the losses.

By mid-September 1998, LTCM could avoid default only by closing its positions or receiving an infusion of capital. But closing LTCM's positions was not easy. The bank had 50,000 derivatives contracts and securities positions where the liquidity was very low. The most efficient solution for creditors was to avoid a fire sale, takeover, inject some cash and liquidate the portfolio slowly or find a buyer for the portfolio. Ultimately, creditors injected \$ 3.6 billion in the fund and took control, with the LTCM partners retaining some ownership. There was no default or public bailout. The creditors eventually got more money than they put in.

Concluding notes

Derivatives allow firms and individuals to hedge and take risks more efficiently. But if a firm uses derivatives opportunistically or has lack of experience, it may create firm level risk. For the economy as a whole, the

collapse of a large derivatives dealer may increase systemic risk. But on balance, derivatives do help to make the economy more efficient.

We need not fear derivatives though we must have a healthy respect for them. We do not refuse to board a plane because it may crash. Instead, we try to make planes as safe as possible. The same argument applies to derivatives. Typically, the losses from derivatives are localized but the whole economy benefits from the existence of derivatives.