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Derivatives: The Risks and Rewards

By John Vahey and Lauren Oppenheimer

In 350 B.C., Aristotle wrote of Thales the Milesian and "his financial device."[1] Thales, anticipating a strong olive harvest, paid olive press owners a fee to secure the rights to their services during the upcoming harvest.

When the olive harvest was huge, demand for olive presses soared, and Thales sold the rights to the presses to the highest bidders and made a fortune. The "financial device" that Aristotle's story described was, in fact, a derivative—possibly the first recorded derivative trade.

This paper explains what derivatives are, why they matter, how derivatives are used to manage commercial and investment risks, some of the dangers of derivatives, and reviews two important reforms put in place by the Dodd-Frank Act to reduce the riskiness of the derivatives market.

WHAT IS A DERIVATIVE?

Derivatives are contracts that allow businesses, investors, and municipalities to transfer risks and rewards associated with commercial or financial outcomes to other parties. Holding a derivative contract can reduce the risk of bad harvests, adverse market fluctuations, or negative events, like a bond default.

In each derivatives transaction, just like in any stock or bond trade, there is one party that wants to increase their exposure to a specific risk and one party that is looking to take the opposite risk.

Derivatives derive their values based on the price, volatility, and riskiness of an underlying stock, bond, commodity, interest rate, or currency-exchange rate.

Prices of derivatives fluctuate as the price of a reference security, commodity, bond, interest rate, or currency rises or falls in the market.

The value of some derivatives, like stock equity options and credit default swaps, are dependent on an event taking place in the future. If the event occurs—a stock trading above (or below) a certain price or a corporate bond default—the owner of the derivatives contract holds the right to a payment.

Other derivatives, like crude oil, cocoa, natural gas futures contracts, and interest-rate swaps, are explicit contractual agreements to exchange a specified number of barrels of crude oil, cocoa, natural gas, or interest-based payments on a specified date in the future, for a certain price.

WHO TRADES DERIVATIVES?

There are 3 types of traders in the derivatives markets: hedgers, arbitrageurs, and speculators.[2]

1. **Hedgers**—a hedging trade offsets a business or market risk. The risk could be exposure to a commodity, an interest rate, or a currency.
2. **Arbitrageurs**—an arbitrage trade is intended to take advantage of a mis-priced relationship that exists between a derivative and the commodity, currency, interest rate, or security it references.
3. **Speculators**—a speculative trade is intended to profit from market price fluctuations. Speculators will take the opposite side of a hedging or arbitrage trade.

All three of these groups meet to transact in the derivatives markets. They all have divergent interests, commercial risks, market views, and financial risk tolerances.

WHY DO DERIVATIVES MATTER?

Derivatives matter because they can reduce uncertainty for those for whom uncertainty is undesirable—like a farmer whose crops and profits depend on the cooperation of weather. Derivatives can't change the weather, but they can change the financial implications of a drought.

Beyond the weather, businesses are exposed to volatility in the prices of commodities, currencies, and interest rates. The market prices for key inputs in the production process, like the price of crude oil or copper, fluctuate daily. Therefore, future costs and profits are uncertain.

Businesses can use derivatives to reduce exposure to unexpected tremors in the markets for key goods and key costs. For example, Hershey's can use

derivatives to protect their business from volatile cocoa prices; Southwest Airlines can ensure that rising jet fuel prices won't ground their profits by entering into a derivative contract.

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The benefits of derivatives also apply to investment risks. A pension fund manager with a large portfolio of corporate bonds can protect the value of their portfolio by entering into a derivative contract. Executing a derivative trade that increases in value as prices in the bond market fall will allow a manager to steady investment returns, and reduce losses in periods of short-term volatility.

HOW DERIVATIVES MANAGE DIFFERENT TYPES OF RISK

Businesses and investors use derivatives to increase or decrease exposure to four common types of risk: commodity risk, stock market risk, interest rate risk, and credit risk (or default risk).

Risk 1: Commodity Risk

A business that must buy a commodity in the future is exposed to the risk of a rapid increase in the price of that commodity. A "futures" contract—a common derivative—can be used to reduce risk exposure to volatile commodity prices.

When you buy a commodity futures contract you agree (today) to the price that you will pay to take delivery of a commodity in the future. The seller of the contract is obligated to deliver the commodity on a specified date in the future for that price. The future could mean a few months or a few years.

Commodity futures contracts are traded on regulated exchanges. Trading commodity futures on organized exchanges dates back to Japanese rice exchanges in the 17th century.[3] Then and now, the exchange specifies the quantity and quality of the physical commodity that the futures contract is based on.

"Forwards" are very similar to futures, but they are not traded on exchanges. They are traded over-the-counter (OTC) between two parties who may customize the forward contract to meet their specific risks.

Dunkin' Donuts' Dilemma

For Dunkin' Donuts, the volatile price of coffee could pose an enormous risk. It is not unusual for market coffee prices to double over a short period of time.

In the past year, the price of coffee futures fluctuated wildly. To protect against future fluctuations in coffee prices that could hurt profits, Dunkin' Donuts and a coffee grower can exchange coffee futures.

Currently, the July 2015 coffee future is trading for $1.80 per pound. Dunkin' Donuts can lock in this July 2015 price or gamble that prices will go down. If it's wrong, and prices shoot up to over $2.00, its profits may be squeezed or it may have to raise the price it charges for coffee.

By buying the futures contract, Dunkin' Donuts is shedding risk so it can focus on serving coffee and making donuts instead of worrying as much about the price of coffee.

By selling the future, the coffee grower also locks in the price of their crop for the next year. If coffee prices fall they are protected because the profits from the future contract will offset the losses from lower market prices for their coffee.

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Risk 2: Stock Market Risk

Stock equity options—another common derivative—can be used to increase or decrease exposure to the risk of rapidly fluctuating stock market prices.

There are two types of option contracts: "calls" and "puts". The owner of a call option owns the right, but not the obligation, to buy an asset at a specified price (known as the option's strike price) by a specific date in the future.

For example, the $400 Amazon.com April 2014 call option would give the option owner the right, but not the obligation, to buy Amazon.com stock for $400 between now and April. Call options rise in value when the underlying stock, in this case Amazon.com, rises.

The owner of a put option owns the right, but not the obligation to sell an asset at a specified strike price by a specified date in the future. The April 2014 $330 Amazon.com put option would give the holder the right, but not the obligation, to sell Amazon stock for $330 between now and April. Puts rise in value when the underlying stock falls.

Options trade on regulated exchanges, like the Chicago Board of Options Exchange, the Chicago Mercantile Exchange, and the International Securities Exchange. Options also trade over-the-counter, away from regulated exchanges.

The Amazon Option—Buy Now

Consider an investment manager who purchased Amazon.com stock in January 2013 for $250 per share. Today, the stock is trading for about $350 per share.

To protect the "long" position—being long a stock means you own it—in Amazon.com stock from an unexpected market sell-off, the manager could buy put options. The April 2014 Amazon.com $325 put would give the manager the ability to sell Amazon.com stock for $325 between now and April. Each put or call option contract grants the manager the right to buy or sell 100 shares of stock.

If Amazon announces negative financial news and the stock falls to $300, the manager can exercise the put options and sell the stock for $325—a profit of $25 per share of stock minus the cost of buying the option. The option profits can offset the losses the manager suffered from the falling stock price.

Alternatively, an investor can invest in options seeking pure investment gains and not to protect an existing stock position. If an investor thinks Amazon.com stock is going to rise they can buy the April 2014 $400 call option instead of buying the stock.

If Amazon rises from its current price of $350 to $420 by April, the investor can exercise the call option and buy the stock for $400—a profit of $20 per share minus option costs.

The flip-side of an option owner (or holder) is the option seller (or the "writer" of the option). The investor who sells the $400 call option is obligated to sell stock to the option owner for $400 per share if the option owner exercises their right. This will be more and more painful for the option seller as the stock trades sharply higher.

Risk 3: Interest Rate Risk

Companies issue bonds to investors that pay either fixed or floating rates of interest. If a company issues fixed-rate debt, the risk is that interest rates fall and the company is stuck paying an above-market-fixed-interest rate on their debt.

If a company issues debt that pays a floating rate of interest, the risk is that interest rates rise and their debt becomes more expensive. Typically, floating-

rate debt is tied to the three-month London Interbank Offered Rate (LIBOR)—LIBOR is the rate of interest that an AA-rated bank would pay another AA-rated bank on deposited funds.

The risk of having fixed or floating-rate debt can be offset with a derivative known as an interest-rate "swap". Swaps are agreements to exchange multiple payments over an extended period of time. But, unlike forwards, where only one exchange or payment is made at maturity, a swap contains a series of exchanges.

Interest-rate swaps are by far the most common type of swap. Companies use interest-rate swaps to manage their exposure to rising or falling interest rates. Interest expenses—or the cost of a company's debt—is a crucial cost for companies to monitor.

An interest-rate swap is an agreement between two parties to exchange (or swap) interest payments for a certain period of time. One party agrees to pay a fixed rate of interest to a trading counterparty. In return, they receive a floating-rate payment—a payment that moves up or down depending on how market-interest rates fluctuate—from their counterparty.

How Can Dollar General Save a Dollar?

On November 1, 2013, retailer Dollar General had a $1 billion bond with a "floating" interest rate of LIBOR plus 1.275%. It floats because each quarter, the LIBOR rate on the bond resets to reflect the current LIBOR market rate.

The three-month LIBOR rate on January 1, 2014 was about .25%. So, the total rate of interest Dollar General is required to pay bond investors at the end of the quarter will be 1.525% (LIBOR .25% + 1.275% base rate = 1.525%).

On April 1st (the first day of the 2nd quarter) the interest rate will be reset again and it may be higher or lower. In order to offset the risk of rising rates, Dollar General can enter into a five-year interest-rate swap. The purpose of the swap is to turn Dollar General's floating-rate debt (which is unpredictable) into fixed-rate debt.

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Between its quarterly bond payment to investors and the swap, Dollar General will have three relevant interest payments.

1. *To its bondholders, Dollar General will pay three-month LIBOR plus 1.275%. Bondholders are not involved in the swap.*
2. *In the swap, Dollar General will receive a floating-rate payment of LIBOR from its swap counterparty.*
3. *In the swap, Dollar General will pay the current five-year fixed-swap rate of 1.61% to its swap counterparty.*

In steps 1 and 2 above Dollar General pays LIBOR plus 1.275% to debt holders and receives a LIBOR-based floating payment from its swap counterparty. Therefore, the two LIBOR-based floating payments offset. And the fixed 1.275% payment is left over.

In step 3, Dollar General makes a fixed-rate swap payment of 1.61%. So, between payments to debt holders and its swap counterparty it is required to make a total fixed-rate payment of 2.88% (1.275% + 1.61%).

The five-year swap has allowed Dollar General to transform its floating-rate debt into fixed-rate debt. By entering into this swap they are protected if market interest rates rise.

Risk 4: Credit Risk

Credit risk is essentially the market's perception of a company's probability of default. Investors are exposed to credit risk if they own a company's debt.

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"Credit default swaps" (CDS) offer protection against a corporate default by allowing investors to take a position on the default risk of a corporate bond issuer.

An investor can own a CDS that references a single bond or an index of multiple bonds. Consider an investment fund that owns a large portfolio of investment grade corporate bonds. The fund manager thinks that financial conditions are going to deteriorate and corporate-default risk will rise in the short-term.

The fund can buy protection from rising default risk by purchasing a credit default swap index that references 100 investment grade bond issuers. An index CDS is a lot like the S&P 500 of CDS—it combines exposure to a wide-range of bond issuers into a single index. The cost of the index rises when default risk rises.

In the event of a bond default, the seller of default protection is contractually obligated to pay the owner of default protection the difference between the bond's face value, 100 cents on the dollar, and the market price of the bond post-default.

After a default, if a bond is trading for 60 cents on the dollar, the seller of default protection is obligated to pay the protection owner $40 ($100 par value minus the market price of $60). If the default protection owner is also a bond holder, the $40 payment will equal the mark-to-market losses on their defaulted bonds.

THE DANGERS OF DERIVATIVES

In a 2002 letter to Berkshire Hathaway shareholders, Warren Buffett warned investors about the "latent" problems in the over-the-counter derivatives market. He expressed the view that, due to multiple shortcomings with how the market functioned, derivatives were "financial weapons of mass destruction."[4]

Two of the specific weaknesses Buffett's letter cited were: an abundance of bilateral credit risk—or the risk that a counterparty to a trade would be unable to meet its financial obligations—and a lack of margin collateral in place to cover potential losses.

During the financial crisis, these deficiencies became painfully evident, especially in relation to the derivatives trades of AIG.

A subsidiary of AIG, AIG Financial Products (AIGFP) had sold CDS on mortgage-related investments. AIG's risk was that the value of the underlying mortgages would decline. When the housing market collapsed, losses on AIG's derivatives caused AIG's financial health to deteriorate. Derivative counterparties began to question the ability of AIG to honor its derivative-related financial obligations.

AIG's credit rating was downgraded. As a result of AIG's failing economic health derivative counterparties demanded that AIG provide collateral to account for the declining values of their derivatives trades.

Eventually, in 2008, derivatives losses and demands for additional collateral overwhelmed AIG. The Federal Reserve, fearing that the failure of AIG would have dire systemic consequences, stepped in and provided $85 billion in capital.

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disturbance. The Dodd-Frank Act sought to address Mr. Buffett's concerns, and the shortcomings in the derivatives market that AIG's derivatives failure painfully exposed.

REDUCTION OF BILATERAL CREDIT RISK

Bilateral credit risk, or counterparty risk, is the risk that a trading counterparty will default by failing to make a swap payment. As mentioned above, interest-rate swaps are agreements between two parties to exchange multiple periodic payments.

In the past, to execute a swap transaction, Dollar General would have most likely contacted a swaps market-making desk at a swap dealer. Market makers are continuously willing to buy or sell swaps, bonds, stocks, and other securities.

The dealer bank and Dollar General would agree on price and enter into a swap. The bank could play the role of facilitator—immediately matching Dollar General with another bank customer looking to take the opposite side of the trade. Or the bank could enter into the transaction with Dollar General and then seek to trade with another bank customer to offset the risk.

In either case, the bank would end up with two offsetting transactions. They would accept the fixed-rate payment in the Dollar General swap. They would pay the fixed-rate payment in the offsetting transaction.

When swaps are traded in this manner, a vast web of swap agreements is created with banks playing a central role. Banks face other banks or banks face corporations and each transaction contains credit risk. This was exposed as a major source of systemic risk as financial institutions began to weaken during the crisis.

Dodd-Frank fundamentally restructures the derivatives market. To address an overabundance of credit-risk relationships, Dodd-Frank requires certain standardized swaps to be submitted to and cleared through a central counterparty (CCP).

The CCP, instead of a bank, stands between the two trading counterparties and guarantees the performance of the trade. This reform centralizes the credit risk of the swaps market into centralized clearing entities. This centralization stands in contrast to the myriad tangled swap agreements prior to Dodd-Frank.

In a recent speech, Federal Reserve Board Governor Jerome Powell noted the potential benefits of centralized clearing for market participants. "Rather than trying to assess its exposure to all of its trading partners, a market participant would need to manage only its exposure to the central counterparty."[5]

Since 2008, a sizeable portion of interest-rate swaps trading has migrated to CCPs. As former Commodity Futures Trading Commission (CFTC) Chairman Gary Gensler stated in a December 2013 speech, "Reforms have taken us from only 21

percent of the interest rate swaps market being cleared five years ago to more than 70 percent of the market this fall."[6]

In a centrally cleared trade, if one of the counterparties to the trade becomes unable to make good on their financial obligations, the CCP steps in and makes the required payment.

This is the system that has long-existed in the exchange-traded futures and options market. In that market, trades between market participants are submitted to and guaranteed by a clearinghouse. The clearinghouse monitors the financial health of each clearing member to ensure that they are able to meet their financial obligations.

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— CFTC Chairman Gary Gensler, 2013.

MARGIN REQUIREMENTS

Margin is collateral, cash or securities, that is in place to cover potential trading losses. The Dodd-Frank Act requires CCPs to collect margin in relation to cleared swap trades.

As Buffett's 2002 letter states, "Unless derivatives contracts are collateralized or guaranteed, their ultimate value depends on the creditworthiness of the counterparties to them."[7]

For cleared swaps, CCPs will be responsible for collecting initial margin. And the CCP will then monitor the exposure of each cleared trade and mark each position to market daily.

If the swap value drops, the participant whose position value has decreased will be required to deposit additional margin—known as variation margin—to re-establish an adequate buffer of margin capital.

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— Warren Buffet, 2002.

Dodd-Frank now requires this practice, which has long been standard in the futures and options market, in the swaps market. This requirement ensures that the parties that enter into swaps trades have capital in place to absorb losses—if losses should occur.

The margin requirements contained in Dodd-Frank significantly reduce the risk that the derivatives market poses to the financial system. The existence of CCPs will ensure that mark-to-market losses on cleared swap exposures are reconciled swiftly.

CONCLUSION

The derivatives market is a market where investors come to exchange risks. In a global economy with divergent risk exposures, derivatives allow businesses and investors to protect themselves from rapid price fluctuations and negative events.

Prior to the crisis, the swaps market was not subject to an effective regulatory regime. There was an over abundance of bilateral credit risk and trades were under-collateralized. As the collapse of AIG demonstrated, this inferior market structure quickly became a source of risk.

As the regulatory process continues, policymakers must seek to ensure that the derivatives market is a venue to manage risk, rather than a source of risk itself.

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Endnotes

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