Financial instruments to hedge commodity price risk for developing countries

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Abstract
Many developing economies are heavily exposed to commodity markets, leaving them vulnerable to the vagaries of international commodity prices. This paper examines the use of commodity options, including plain vanilla, risk reversal, and barrier options, to hedge such risks. It then proposes the use of a new structured product, a sovereign Eurobond with an embedded option on a specific commodity price. By extracting commodity price risk out of the bond, such an instrument insulates the bond default risk from commodity price movements, allowing it to be marketed at a lower credit spread. The product is also designed to help developing countries establish a credit derivatives market, which would in turn enhance the marketability and liquidity of sovereign bonds.

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Developing countries produce and export a large amount of raw material commodities, such as crude oil (Venezuela, Nigeria, and the Republic of Congo), copper (Chile and Zambia), and agricultural commodities, such as tobacco (Malawi) and cocoa (São Tomé and Principe). In particular, some developing countries' exports are highly concentrated in one or two leading commodities [Cashin et al. (1999)]. This heavy reliance on commodities exposes these economies to commodity price volatility, raising two related concerns. The first is the large fluctuations in revenue collections and the other is that it complicates public debt management. Either concern, if realized, will have an adverse impact on the economy [Becker et al. (2007)].

The first concern is obvious, price volatility is likely to affect the fiscal balances of economies whose revenues rely heavily on commodity-related taxes, royalties, and dividend income (in heavily state-owned commodity sectors). When commodity prices drop, revenues will fall, forcing countries to cut spending or incur debt. By contrast, a rise in commodity prices may create a revenue windfall, raising questions about an economy's absorptive capacity and how it spends the excess revenue. Some countries (Chile and Russia, etc.) have established resource funds to save commodity-related revenues when prices are high and to draw money for budget support when prices are low. Resource funds tend to minimize budget disturbances that result from price volatility and are a useful way of saving resources for future generations, especially if the resources are nonrenewable[2].

The second concern arises because governments cannot accurately predict future revenues and financing needs, which makes it difficult to project external borrowing needs. In the worst-case scenario, countries dependent of commodity revenues may not be able to make debt payments[3] or may have to pay higher interest rates for new external debt when price shocks cause fiscal balances to deteriorate, at the time when that they most need resources for financing. Some debt instruments could address this concern by linking debt payments to commodity prices or the GDP growth rate, such as commodity-linked or GDP-linked bonds[4]. Coupons and the principal payment of commodity-linked bonds are linked to a stated amount of a reference commodity. Because the volume is fixed, a country's debt payment is positively related to its export commodity prices, which means that its debt burden declines in line with falls in commodity prices. However, the pools of investors willing to have exposure to commodity risk are smaller than those that invest in traditional bonds. The GDP-linked debt instrument allows countries to adjust debt payment to their growth rates. If a drop in commodity prices causes growth to slow, countries can pay less.

In this paper, with regards to the first concern, which refers to large fluctuations in revenue collections, we explore three types of option transactions that can be used to smooth revenues[5]. The first hedging measure we consider is very straightforward but costly, using plain vanilla put or call options on the relevant commodities. The second is to buy structured option products, which lower the high cost of plain vanilla options by selling other options simultaneously. We use risk reversal as an example. Such structures are cost-effective but may introduce other risks. The third approach is to use barrier options to manage commodity price risk.

Next, to smooth the volatility of borrowing costs, the second concern, we introduce a new structured product, a sovereign Eurobond with an embedded option on commodity prices. This product is constructed in a way that keeps adverse price movements from affecting the country's ability to get external funds. Therefore, by enabling the country to smooth the cost of debt and maintain its cash flow at a reasonable cost, it is able to finance deficits. Moreover, the embedded option uses credit derivatives as the underlying instruments[6], for which market development may help create some liquidity conducive to sovereign bond market development[7].

Smoothing fluctuations in commodity revenue collections — option transactions

Commodity derivatives are widely regarded as a way to hedge commodity price volatility. Firms can take a position on commodity derivates to protect against an undesirable outcome. Stulz (2002) shows that derivatives are also widely used by companies for risk management. Suppose an airline company wants to hedge against the rising cost of jet fuel, it could lock in an agreed price with fuel suppliers for its purchase price through derivatives. Countries could also use derivatives to smooth commodity-related revenues. Daniel (2001) explains why hedging in oil price risk markets could be a solution to transfer the oil price risk from oil producing countries to others that are better able to bear it. Some countries have used commodity derivatives to smooth future revenues. As documented by Larson et al. (1998), many developing countries have begun using commodity derivatives markets to hedge commodity price risks. For example, Chile's state-owned company, Codelco (the world's largest copper producer), is already active in copper risk management. Moreover, cotton futures and options could serve as risk management instruments for Africa's cotton-producing countries [Satyanarayan et al. (1993)]. Claessens and Duncan (1984) provide many case studies to demonstrate that developing countries can benefit significantly from using financial instruments to manage their risk. Moreover, commodity importing countries could also use derivatives to smooth out their expenditures on commodities.

2 For an overview of nonrenewable resource funds and a review of their shortcomings see Davis et al. (2001). Fasano (2000) summarizes six economies' experiences with resource funds and examines their contributions to public financial management.

3 It is noted that default is an option that a country may resort to under certain conditions. In this paper, we assume that costs of default are too huge for the country to cash the option of default.

4 For descriptions of commodity-liked bonds, see O'Hara (1984), Atta-Mensah (2004), and Privolos and Duncan (1991). For description and benefits of GDP-linked bonds, see Borensztein and Mauro (2004).

5 There are valid reasons for hedging imports, as they are disruptive, too.

6 According to British Bankers' Association estimates, starting from 2005, the notional global amount of credit derivatives has been larger than the global amount of debt outstanding.

7 For example, Kazakhstan has a CDS market even though it does not have outstanding sovereign bonds.

Despite these benefits, three factors inhibit the wider use of commodity derivatives by countries. The first factor is that the markets for commodity options are rather limited in size and depth, and are therefore unlikely to be able to accommodate the needs of all the commodity-exporting countries. The second factor is the political constraints: the political costs of hedging may outweigh the benefits. As pointed by Daniel (2001), in a situation of falling commodity prices any gains from derivatives transactions may be seen as speculative returns. Alternatively, when prices rise hedging instrument may result in foregoing higher revenues. Finally, there is the issue of cost. Purchasing futures requires the deposit of margins and investing in options requires a premium payment.

In this section we describe how plain vanilla options could be used to hedge commodity risk and suggest that the high costs associated with them could inhibit their usage. We will subsequently describe two additional approaches that could reduce the cost of hedging significantly.

Plain vanilla options

In a typical vanilla option, a put option provides insurance against drops in commodity prices, while a call option insures against unfavorable price hikes. For commodity exporting countries, hedging against falls in price could be achieved by purchasing a put option.

Figure 1 lists the prices of at-the-money (ATM) options[8] on some selected commodities. The volatilities were obtained from Bloomberg for the month of November 2006. The risk-free interest rate r was 5.2 percent. In addition, we assume that the convenience yield[9] is the same as the storage cost per unit. Here, numbers under "strike" mean percentage of the underlying price[10]. The option prices, which can be interpreted as the percentage of the underlying nominal amount, are derived using the Black-Scholes formula [Black and Scholes (1973)].

Figure 2 shows the payoff of a plain vanilla put option. By buying a put option, the country locks in a floor for the price, K. As suggested by the prices in Figure 1, ATM commodity put options are expensive. By contrast, options that are 20 percent out-of-the-money (OTM) are less expensive than ATM commodity put options (Figure 3). According to Figures 1 and 3, buying a three-year, 20 percent out-of-the-money option for insuring an underlying portfolio of U.S.$500 million will cost about U.S.$11 million for gold, close to U.S.$5 million for oil, and U.S.$47 million for copper. Even though they are almost half as expensive as ATM options, the costs are still high. If a country's copper sector contributes 50 percent of GDP, and the country uses OTM options to hedge all of its output, an OTM hedging strategy would cost the country 5 percent of GDP, a burdensome amount for any developing economy. As a result, the government may be quite reluctant to hedge the commodity price risk. If the price movements turn out to be favorable, the costs and

Commodity	Strike	Volatility	Price of 1-year maturity	Price of 3-year maturity
Copper	100	38.2%	12.4	17.5
Oil	100	16.3%	4.1	4.8
Gold	100	21.1%	5.9	7.5

Figure 1 – Prices of ATM options

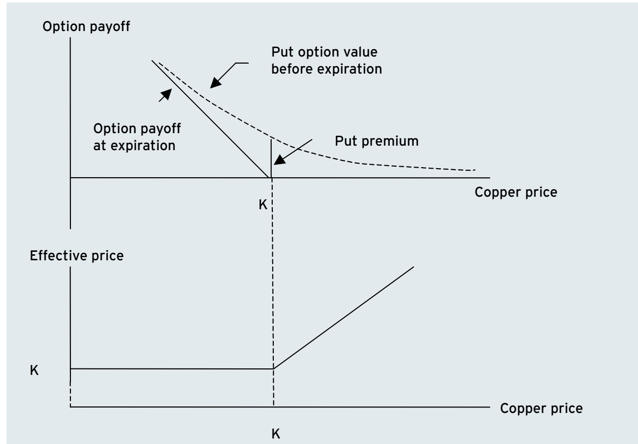

Figure 2 - A put option structure

losses involved in options could exert great political pressure on the government. Daniel (2001) describes the political pressure faced by the Ecuadorian authorities in early 1993 as a result of the losses incurred due to the option and swap deals conducted by the central bank and the monetary board.

Risk reversals

A traditional method for reducing option costs is to sell other options, so that the earnings from the short position will lower the insurance cost of the long option position. Risk reversal (RR) is one example of a zero-cost structure. As an example, we consider one country whose economy is heavily dependent on copper. Given that a plunge in world copper prices would severely affect the country's fiscal balance and current account the country enters into option transactions to hedge the copper price risk. Let the current copper price index be 100, and the country decides to buy a long-dated 20 percent OTM put with a strike price of 80 on copper for U.S.$500 million. The cost of such a three-year option position would be U.S.$47 million. To reduce these costs, the government could sell

Commodity	Strike	Volatility	Price of 1-year maturity	Price of 3-year maturity
Copper	80	38.2%	4.6	9.4
Oil	80	16.3%	0.3	1.0
Gold	80	21.1%	0.8	2.3

Figure 3 – Prices of 20 percent OTM options

8 These are options with strike price equaling the spot price.
9 The convenience yield is an imputed yield on the underlying instrument because warehousing commodities is apparently a convenient facility for the commodity user.
10 The underlying price is the futures price instead of spot price. Traders write options on futures because the commodity futures market is more liquid than the spot market.
11 A 20 percent out-of-the-money put will start providing insurance after the commodity prices fall more than 20 percent.

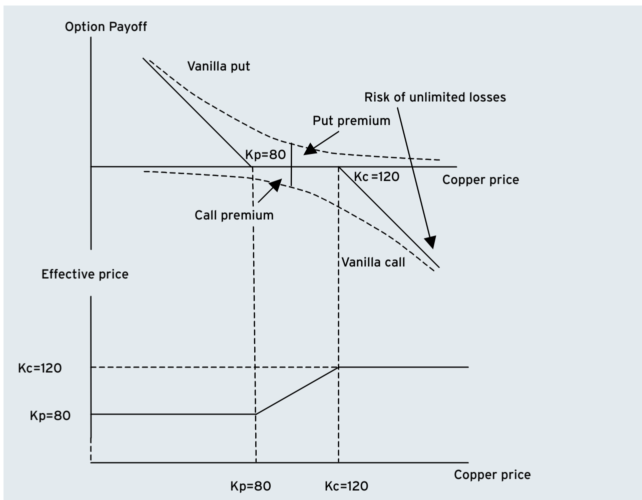

Figure 4 - A zero premium risk reversal structure

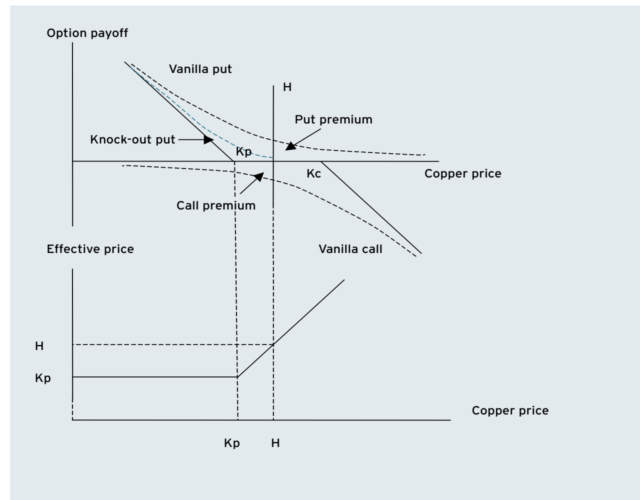

Figure 5 - A knock-out option

an OTM call with a strike price of 120. The sale of the 20 percent out-of-the-money call will raise U.S.$47 million if we ignore the volatility smile[12], yielding a net portfolio cost of zero. This structure is called a zero premium collar (Figure 4). In this case, the country is fully hedged for any price below 120. However, this structure carries some risk given that the effective price is capped at 120. Therefore, if copper prices climb steeply to more than 120, the instrument will begin to lose money, though the jump in copper prices would boost country's revenues, enabling it to finance the call option position. However, the risk of losing millions of dollars on hedging instruments during a favorable move in copper prices is likely to be both politically and financially unacceptable.

Barrier option structures

By introducing various barriers to plain vanilla contracts, creating instruments known as barrier options, we can fix some of the drawbacks of risk reversal approaches discussed above. We consider the following alternative to risk reversal: the country chooses to buy a put option with a strike Kp and a knock-out barrier H [($K_p < X_{T_0} < H$) as shown in Figure 5], where X_{T_0} is the spot price of underlying instrument at T_0. This option is an up-and-out put, which gets knocked out or ceases to exist if the underlying asset price X_t exceeds H during the life of the contract. Except for the knock-out property, the option is the same as a plain vanilla put option. Figure 5 shows the price of the up-and-out put together with a plain vanilla option. As $X_t \rightarrow H$, the up-and-out put price falls to zero. At time T_0, the cost of this barrier option falls below that of the plain vanilla option. The difference [Hull (2002)] is

$$\text{Difference} = -XT_0\ (H/X_{T_0})^{2\lambda}\ N(-y) + Ke^{-rt}\ (H/X_{T_0})$$

$$\lambda = (r + \sigma^2/2) \div \sigma^2,\ y = \ln[H^2/(X_{T_0}K)] \div \sigma\sqrt{T} + \lambda\sigma\sqrt{T}$$

Commodity	Strike	Volatility	Price of 1-year maturity	Price of 3-year maturity
Copper	80	38.2%	3.8	5.5
Oil	80	16.3%	0.3	0.9
Gold	80	21.1%	0.8	2.0

Figure 6 – Prices of the up-and-out put options: H=120

Figure 6 shows the prices of the up-and-out puts with H = 120, which are lower than those for plain vanilla put options. An up-and-out put option is similar to a dynamically managed risk reversal. The country could enter a risk reversal by buying a plain vanilla K_P – put and selling a plain vanilla K_c – call with the property that if X_t reaches H the two options will have the same value. Hence, if X_t hits H, the country could sell the put and close the call position. In other words, at t the country could liquidate the portfolio at zero cost. The loss from the dynamically managed risk reversal is zero when X_t exceeds H. This replication of risk reversal is exactly an up-and-out put option. In the worst case, the country will bear some liquidation losses (gap risk), though such risk would be minimal. Hence, knock-out or knock-in features make options affordable and eliminate the drawbacks of risk reversals, albeit at a higher cost. Public entities in developing economies could therefore use such instruments to hedge commodity risk, without the political backlash of risk reversals.

There are several other types of standard barrier options. A knock-in option comes into existence if a barrier is hit, and then the option becomes a plain vanilla one. Also the imbedded barrier positions may be different, and the barrier may be in the OTM region. Such options normally have benign hedge ratios and Greeks[13]. But the barrier may also be in the in-the-money (ITM) region. For example, a reverse knock-out option gets knocked out when it is in the money. The sensitivities of such options are discontinuous, which may lead

12 Volatility smile refers to a pattern in which an ATM option tends to have lower implied volatility than OTM or ITM options.
13 Greeks is a term that summarizes the sensitivity of the option price to changes in various parameters and variables. The smoother Greeks are, the easier it is to hedge the option.

to hedging difficulties. Up-and-out call options, in which the barrier H is greater than the strike K, are also difficult to hedge. This type of product combines a discontinuous pay-off at the barrier with a positive or negative gamma[14], depending on the current spot and time to maturity.

Barrier options can take various forms. For example, up-and-out and down-and-out barriers can be combined into one product, known as the double-no-touch knock-out, an option that expires if price touches any of the barriers. In partial barrier and forward-starting barrier options, barriers exist for only a portion of the option's life. The main advantage of such products is that they lower hedging costs.

The barrier options described above can also be combined to produce more complex products, such as multi-underlying barrier options or amortizing barrier options. Multi-underlying barrier options may be 'in' or 'out,' conditional on more than one underlying price. Such structures are especially useful for developing economies that are heavily dependent on two commodities. The amortizing barrier option may be useful to countries with exposure to sustained movements in commodity prices, as it is designed to earn or lose a fraction of its value, proportional to the time the underlying price is above the barrier. We can further modify barrier options by adding more complicated barriers. In a resettable barrier, for example, once one barrier is touched, another already known barrier gets activated. Such instruments give developing economies greater flexibility for hedging commodity risk.

Smooth borrowing cost — a structured product

Countries that are highly dependent on commodity exports find that their external borrowing costs, especially credit spreads, and commodity prices are high correlated with each other. When commodity prices are rising, the improvements in sovereign balance sheet resulting from budget surpluses and reserve accumulations could reduce default risk, and in turn credit spreads and borrowing costs. The reverse obviously also holds true.

If commodity prices could be delinked from the credit spread on a country's Eurobond, the default probability embedded in the Eurobond will not be affected by commodity price movements. As a result, the country could tap international markets at a reasonable cost even when the commodity price moves adversely, the time when financing is needed most. One natural approach is to attach a commodity derivatives contact to the Eurobond. An easy way is to attach a plain vanilla put option so that when the commodity price decreases, bondholders that mark-to-market losses from the bond due to increasing credit spread could be compensated by the gain from the option. However, the fact that the country is the underwriter of the option introduces counterparty risk for the investors, and therefore reduces the attractiveness of the instrument.

An alternative way is for the bond investors to receive a commodity price-linked option on a CDS, written on the sovereign issuer. This is supposed to protect bondholders against a default by the issuer without them having to pay for the CDS. In return, bondholders would accept a lower credit spread. In such a structure the country has to pay an upfront option premium to an intermediary. This structure could prevent the commodity price volatility from influencing the Eurobond's credit spread, and smooth out the country's external borrowing cost. An additional advantage is that it would help market-making of credit instruments on developing countries.

The instrument

The basic components of this instrument include a standard Eurobond, a digital option on commodity prices, and a credit default swap (CDS). To extract some of the commodity price risk, we embed an option in a standard Eurobond. Current time is T_0, the option expires at T_1, and the bond has maturity of T_2. First, we assume that the bond with maturity T_2 contains a European knock-in put option, in which the barrier gets activated once commodity prices reach the barrier. In particular, we assume that if the commodity price, X_t, falls below a predetermined barrier level, H, anytime during $t \in [T_0, T_1]$, the bondholder will receive a digital put option[15] with strike K ($H < K$). We then introduce a second component: at T_1, if the digital is in-the-money, $X_{T_1} < K$, the bondholder has the right to receive a CDS with a strike price of S_{T_0}, while the market price of this CDS has reached S_{T_1}. If S_{T_1} is higher than S_{T_0}, which is likely because the lower commodity price will have an adverse impact on the economy, the bondholder, at T_2, has a positive payoff of S_{T_1}-S_{T_0} multiplied by the notional amount. The structure is shown in Figure 7. Lines a, b, and c are three examples of price movements. The price movement following line a does not result in the knock in the digital as it does not fall below H. Though the price movements following line b and c knock in the digital, only that movement following line b ends up ITM and receives a CDS with the premium S_{T_0}. This is because at T_1, the digital for c is out of the money ($X_{T_1} > K$).

This instrument has several characteristics. First, an option to hedge the commodity price decrease is needed only if the commodity price falls sharply – $X_t < H$, or if this price drop is persistent – X_{T_1} is still below K at T_1. Mild fluctuations and temporary drops in commodity prices may not divert the economy from its own implied path. Thus, a knock-in feature is added to increase the option's relevance and also lower its price.

Second, the option is digital, and the payoff is a CDS — features that protect the bondholders against a potential default if the commodity price decrease is sharp and permanent. In fact, the whole structure can be regarded as a knock-in CDS, where the knock-in feature is linked to a commodity price. Therefore, the commodity risk in the bond is stripped out from the bond price by introducing a CDS, making the bond bear lower default risk.

14 Gamma is the second derivative of the option price formula with respect to the underlying risk. It represents the curvature of the option. Delta is the first derivative of the option price with respect to the underlying risk.

15 A digital put option is an option in which the payoff is fixed after the price of the underlying instrument moves below the strike price.

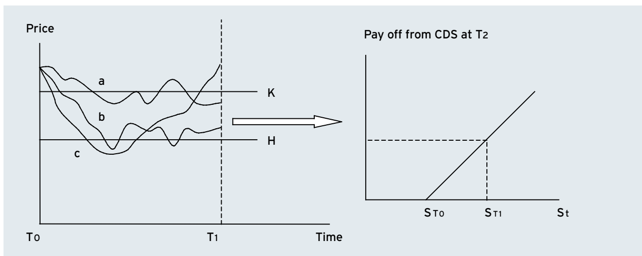

Figure 7 – The structure of the new instrument

Third, the introduction of CDS may have long-term benefits. To the best of our knowledge, CDS markets operating in developing economies are not very liquid. No matter how illiquid or 'artificial' at the outset, a CDS market could lead to a genuine market for sovereign Eurobonds. Having said that, it should be borne in mind that the introduction of CDS in hedging instruments for developing economies can also introduce some pricing difficulties, because in most developing economies market data, such as a CDS spread term structure, do not exist.

Intermediary

As the sovereign issuer is not in a position to buy or sell the CDS to investors, a large investment bank with a good credit rating can act as an intermediary. At T_0, a developing economy issues option-embedded bonds to investors. The investment bank promises to sell the CDS at S_{T_0}, specified at the inception of the bonds, to bondholders if the embedded option turns out to be in the money at T_1. In other words, the bondholders have secured the default protection from a credible counterparty at a low and fixed price. The investment bank has to buy the CDS at S_{T_1} from a CDS market maker. They should be compensated for their expected loss by the developing economy at time T_0. In an arbitrage-free environment, this payment to the investment bank should be equal to the price of the option embedded in the bond.

Pricing

To calculate the price that the developing economy has to pay to the investment bank we need to calculate the price of the embedded option in the bond. Given the lack of data on developing economies' CDS premia the data required to price the option must be decided a priori. To simplify the pricing process, we assume that the bond matures after $T_2 - T_0$ years and that the options expires after $T_1 - T_0$ years. Therefore, if the option is in the money at T_1, the investment bank has to deliver the CDS at T_1, and the first and only payment occurs at T_2. We set $T_2 - T_1$ as one year, and the CDS contract here is assumed to be a one year forward CDS[16]. Figure 7 shows the expected value of the payoff. The payoff at T_0 is given by payoff = $N \times B(T_0, T_2) \times \{Max[(S_{T_1} - S_{T_0}), 0] \times I_{X_u \leq H,\ X_{T_1} \leq K,\ u \in [T_0, T_1]}\}$, where N is the notional amount, $B(T_0, T_2)$ is the discount factor, and $I_{X_u \leq H,\ X_{T_1} \leq K,\ u \in [T_0, T_1]}$ is an indicator function (1 when commodity price hits H during $[T_0, T_1)$ and is below K at T_1).

The option is a path-dependent option, which means that knowledge of final spot values is not sufficient to determine the payoff. Monte Carlo simulation is the natural way to price the option. Before conducting the simulation, we must choose the CDS premium at T_0, the dynamic path for CDS premium; the commodity prices at T_0, the dynamic path for commodity prices; and the correlation between commodity prices and CDS premiums.

We assume that the dynamic paths for both the commodity prices and the CDS premia follow mean-reverting lognormal processes, a method that gives us two advantages. Firstly, the simulated prices are always positive in a lognormal process. Secondly, traders naturally think that volatilities arise from a lognormal distribution model rather than from a normal distribution model. Here we use the predetermined values for all parameters being considered. To show the impact of the parameters on the final payoff we derive prices using different parameter values. Owing to the developing economy's high dependence on commodity prices, we impose a significant correlation between the two processes.

Specifically, the dynamic processes for commodity price and CDS premium are $d\ln(X_t) = [\theta_X - a_X\ln(X_t)]dt + \sigma_X dW_X$, $X_{T_0} = X_{T_0}$; $d\ln(S_t) = [\theta_S - a_S\ln(S_t)]dt + \sigma_S dW_S$, $S_{T_0} = S_{T_0}$; $dW_X dW_S = \rho dt$.

By Ito's lemma, we obtain: $dX_t = X_t[\theta_X + \sigma_X^2/2 - a_X\ln(X_t)]dt + \sigma_X X_t dW_X$, $X_{T_0} = X_{T_0}$; $dS_t = S_t[\theta_S + \sigma_S^2/2 - a_S\ln(S_t)]dt + \sigma_S S_t dW_S$, $S_{T_0} = S_{T_0}$; $dW_X dW_S = \rho dt$.

ρ is negative because the adverse movement of commodity prices may mean higher default probability, which must be compensated by a higher CDS premium. The simulations show the effects of σ_X, H, and ρ on the option premium. We assume that the option has a notional amount of U.S.$1 and that the values for the other parameters are the values in Figure 8.

Figure 9 shows how the option premium varies with σ_X and H when ρ is held constant at the specified level. For the same H the price of the option premium increases as σ_X moves up, because as volatility increases X is more likely to drop to H, and the bondholder will receive a digital option. For a fixed σ_X, the option premium increases as H increases, because the higher the barrier (the closer to the spot price) goes the more likely it is that the bondholder will receive the digital option. Figure 10 plots the option premium against σ_X and ρ for a given H. As before, the relationship with σ_X is positive. With respect to ρ, Figure 7 shows that the higher the negative correlation goes the higher is the option premium. In other words, a higher absolute value of ρ means that a decline in commodity prices has a larger impact on credit spreads and, ceteris paribus, pushes CDS premiums higher.

16 See Hull and White (2003) for the pricing for forward CDS.

Parameters	Values
$T_2 - T_0$	5
$T_1 - T_0$	4
X_{T_0}	100
θ_X	1
a_X	0.2
σ_X	0.1–0.3
H	60–80
K	90
S_{T_0}	10%
θ_S	-0.5
a_S	0.2
σ_S	0.2
ρ	−0.1–(−0.9)

Figure 8 – A-priori parameters

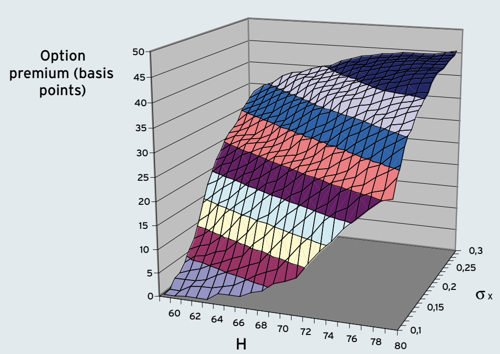

Figure 9 – Option premium: $\rho = -0.5$

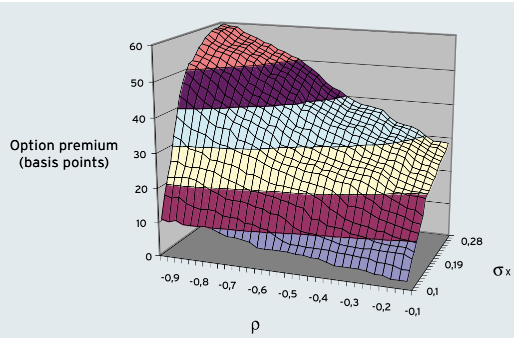

Figure 10 - Option premium: H = 70

Conclusion

This paper shows how developing economies can use options to hedge commodity price risk. As an alternative to vanilla options, which are expensive, we introduce low-cost alternatives, including barrier options, which are flexible and cost effective. We also explore a new structured product with a smooth credit spread, achieved by extracting the price volatility out of yield. With such volatility excluded, adverse commodity price movements are kept from disrupting a developing economy's liquidity and financing needs. More broadly, the use of this approach may help an economy establish rudimentary capital market and credit derivatives activities.

There are several issues worth discussing. The first issue is the role of credit derivatives in general. On the one hand, the increasing popularity of credit derivatives could enhance the liquidity of the underlying debt instrument just as equity options have increased the transaction volume of equities. On the other hand, volatility could be transmitted from credit derivatives markets to debt markets. This could deter sovereign countries from renewing Eurobonds. Therefore, how the risk is transmitted between them warrants further research. The second is the issue of governance and capacity constraints that have been mentioned quite often in relation to developing countries' debt management framework. Given the complexity of exotic options and structured products, it is noted that developing countries may hire independent investment agencies to conduct these transactions.

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