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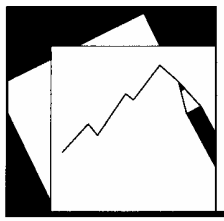

IMF Working Paper

Are Credit Default Swap Spreads High in Emerging Markets? An Alternative Methodology for Proxying Recovery Value

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International Capital Markets Department

Are Credit Default Swap Spreads High in Emerging Markets? An Alternative Methodology for Proxying Recovery Value

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Abstract

In times of distress when a country loses access to markets, there is evidence that credit default swap (CDS) spreads are a leading indicator for sovereign risk than the EMBI+ sub-index for the country. However, it is not easy to discern the variables that determine the level of CDS spreads in Emerging Markets (EM); traders only quote the CDS spreads and not the inputs that are required to calculate such spreads. This note provides some evidence from Argentina and Brazil that reveals inconsistency between theory and practice in pricing CDS spreads in EM. This note suggests an alternate methodology that links CTD (cheapest-to-deliver) bonds to recovery values assumed in CDS contracts. Furthermore, special features that pertain to CDS contracts (repo specialness, short squeezes by central banks) may also magnify the financial distress of a sovereign.

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[1] This paper has benefited from comments by Jane Brauer, Ben Miller, Hung Tran, Donald Mathieson, and participants in the seminars held by ICM, WHD, and RES. Any errors or omissions remain my own.

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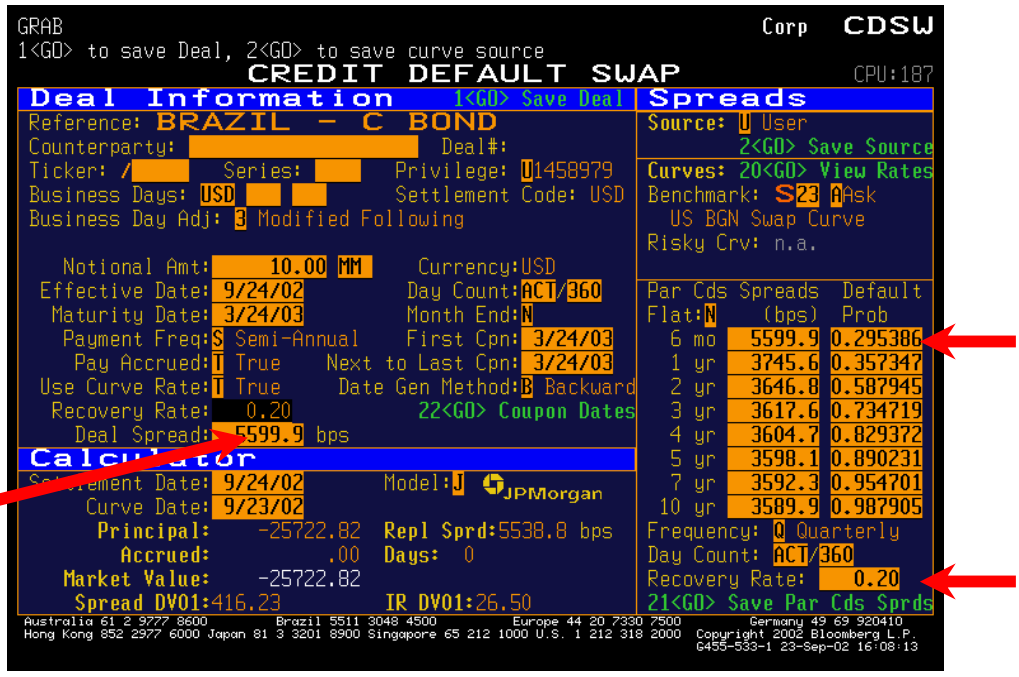
An Alternative Methodology for Proxying Recovery Value in Credit Default Swap Contracts

In times of distress when a country loses access to markets, there is evidence that credit default swap (CDS) spreads are a leading indicator for sovereign risk than the EMBI+ sub-index for the country. However, it is not easy to discern the variables that determine the level of CDS spreads in Emerging Markets (EM); traders only quote the CDS spreads and not the inputs that are required to calculate such spreads. This note provides some evidence from Argentina and Brazil that reveals inconsistency between theory and practice in pricing CDS spreads in EM. This note suggests an alternate methodology that links CTD (cheapest to deliver) bonds to recovery values assumed in CDS contracts.

I. Correlation between Recovery Value and Probability Of Default

The assumptions underlying the correlation between recovery value r, and the probability of default p is key to understanding CDS spreads. At a *theoretical* level, it is clear that CDS spreads are a joint function of the r and the p where both r and p are determined jointly; in other words, the correlation between r and p is not zero.[2] Discussions with traders in EM reveal that *in practice* r is usually fixed at roughly 20 cents of the face (or par) value. Mathematically, using r as a constant will result in the correlation of r and p to be zero. Also, empirically evidence from the corporate literature has shown (not surprising) that r is inversely correlated to p. The correlation between r and p cannot be zero in EM when theory and corporate literature suggest that r and p are negatively correlated.

Figure 1. Credit Default Swap in Practice



Source: Bloomberg, L.P.

Figure 1 shows CDS spreads (s) =f (r, p) and explains how CDS works in 3 components:
r is the recovery value at default, **p** is the probability of default; and **s** is

[2] Mathematically, the correlation between two variables, where one is a constant, is zero.

the premium per dollar of notational protection from time zero to T that solves the following equation:

$$\int_0^T sp(t)\left[u(t)+e(t)\right]dt+s\left(1-\int_0^T p(t)dt\right)u(T)=$$
$$\int_0^T \left[1-r\left(1+A(t)\right)\right]p(t)v(t)dt$$

Where

p(t) = risk-neutral default probability;
r = expected recovery rate on the reference obligation in a risk-neutral world;
s = premium per dollar of notational protection from time zero to T;
u(t) = the present value (PV) of payments at the rate of $1 per year on payment dates between zero and t
e(t) = PV on an accrual payment at time t, with payment equal to $t-t_l$, (where t_l is last payment date)
v(t) = PV of $1 received in time t
A (t) = accrued interest on the reference obligation at time t

II. An Alternate Methodology: The Cheapest-to-Deliver Bonds For Argentina and Brazil

A CDS contract usually refers to a few bonds in a "basket" of bonds at the time of the contract, allowing the protection seller a valuable option to deliver the cheapest bond upon a default (or, a credit event). These cheapest-to-deliver (CTD) bonds—or reference bonds—are generally priced at a discount to other similar bonds due to their illiquidity, denomination, legal jurisdiction, and other special features (interest-capitalization). Figure 2, illustrates the case of **Argentina** where, at default, bond prices varied considerably between 24 cents and 38 cents, with the euro denominated issues priced higher owing to large retail ownership in Europe.

Figure 2. Argentine Bonds at Default

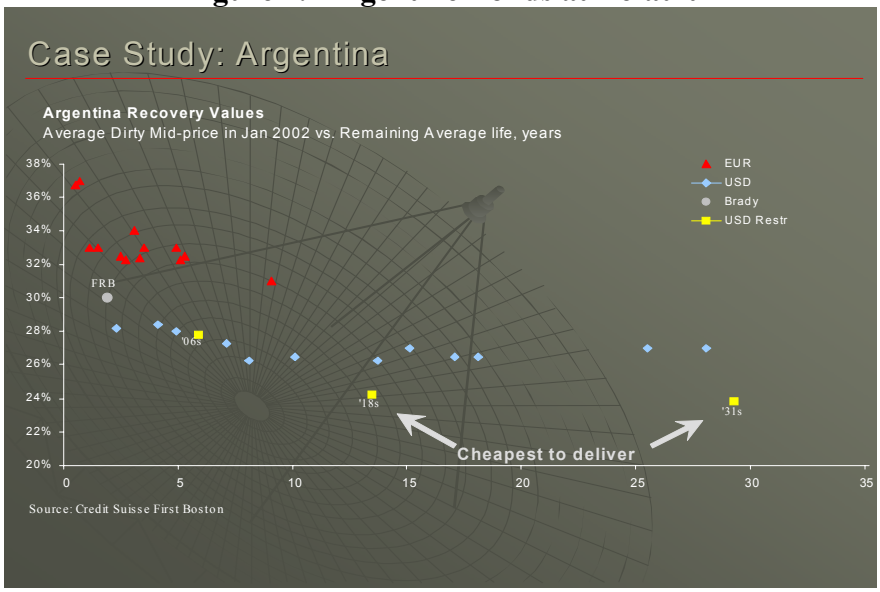
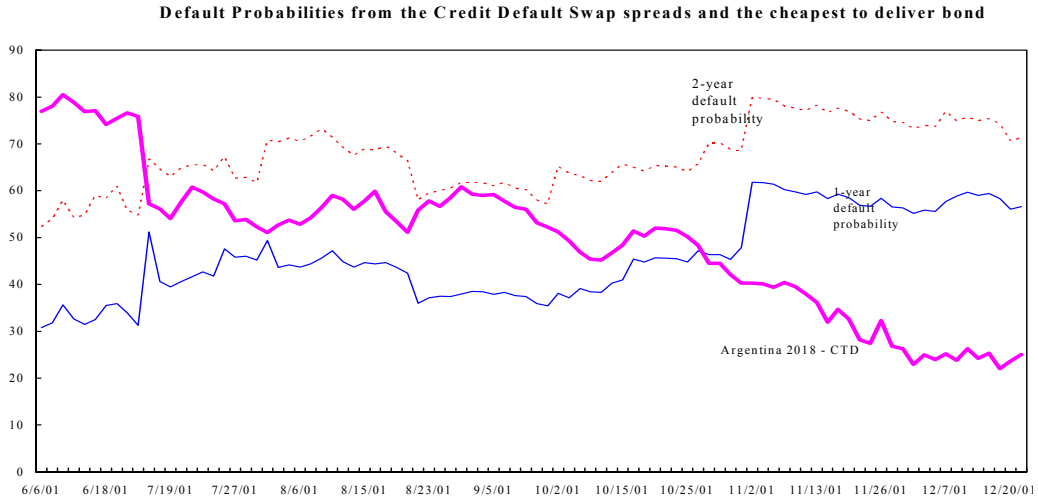


Figure 3 illustrates Argentine CDS spreads and decomposes them into their two components r and p. In this example, r is not assumed to be a constant and the CTD bond is a proxy for r; the Argentine 2018 was used in most contracts as the CTD bond along with the Argentine samurai/yen issues. **Note that bond prices do not necessarily collapse at default.** The prices of the Argentine CTD bond actually rose from about 24 cents to 28 cents owing to the cross default clauses when the Argentine default occurred.

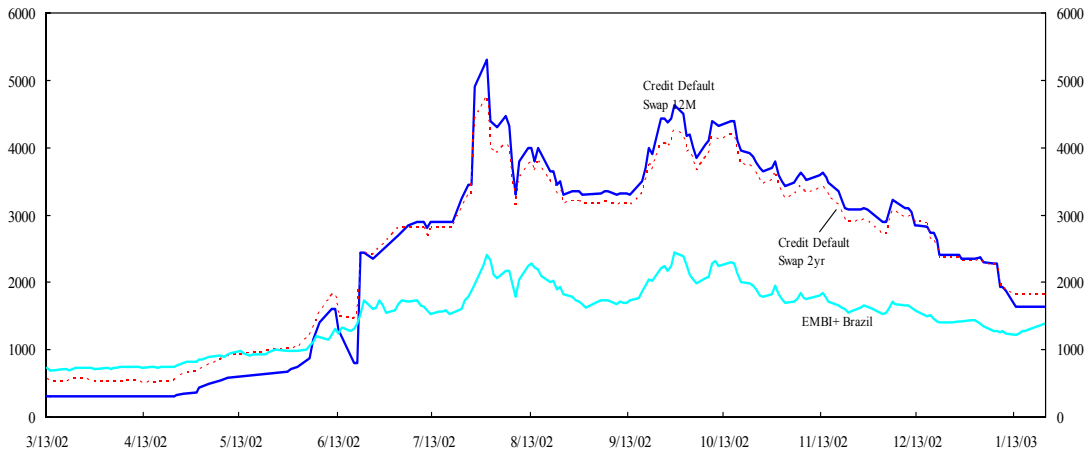
Figure 3. Argentine Default Probabilities Using Cheapest-to-Deliver Bonds



source: Merrill Lynch and staff estimates

Another example illustrates that **Brazil's CTD bonds** were a better proxy for r. The CTD bond increased about 30 percent from 37 cents to the dollar to 49 cents to the dollar in the month surrounding the election in October, 2002 (figure 4). This increase led to CDS spreads to tighten from more than 4,500 basis points to less than 3500 basis points during the period. Holding recovery value constant (at say 20) would force the CDS spreads to be driven *only* by the probability of default. However, consistent with the derivation of the CDS equation, the 1,000 bps tightening in CDS contract around the elections was also caused by the roughly 30 percent increase in the price of the CTD bond

Figure 4. Brazilian CDS Spreads (2002)



III. IMPLICATION OF CDS SPREADS FOR DISTRESSED EMERGING MARKETS

Mispricing of CDSs magnifies the financial distress of a sovereign. During July/August 2002, the EMBI+ sub-index for Brazil widened to just over 2,000 bps. During the same period, the CDS spreads for Brazil reached 4,500 bps, largely owing to squeeze on some short bonds (the 2004s and the EIs) and other factors such as repo specialness.[3] CDS spread widening were leading indicators to sell-offs in the underlying bonds i.e., CDS market were driving the EMBI+ sub index (the "tail wags the dog"). Recent experience with bonds traded on the mature markets (Weyerhauser, Ford etc) also indicate that CDS spreads provide valuable information (about insider trading, etc) and are a leading indicator of financial distress. CDS spreads are also more volatile than the spreads on the underlying asset— CDS contracts require the insurer to cover the loss to par (that is par minus recovery value), while at default the bondholder's loss is the value of the bond minus its recovery value (where, for distressed assets, the value of bond is well below par). In other words, the likelihood of loss is significantly larger for a CDS insurer than for an investor holding a particular bond.

This note concludes (i) that not linking recovery value to CTD bonds may lead to overpricing CDS spreads; and (ii) conjectures that there are special features that pertain to CDS contracts (repo specialness, short squeezes by central banks) that magnify the financial distress.

[3] Market sources indicate that the Central Bank also bought most of the Brazilian Yen bonds to further squeeze the market for CTD bonds that led to higher CDS prices.

References

Credit Suisse First Boston, 2002, Emerging Market Sovereign Strategy, various issues.

Hu, Yen-Ting, and Perraudin, William, 2002, "The Dependence of Recovery Rates and Defaults," Birbeck College and Bank of England, Working Paper.

Jarrow, R.A., Lando, D., and Turnbull, S.M., 1997, "A Markov Model for the Term Structure of Credit Spreads, "*Review of Financial Studies*, 10, pp. 481–523.

Kijima, M., and Komoribayashi, K., 1998, "A Markov chain model for valuing credit risk derivatives," *Journal of Derivatives,* 6 (1), pp. 97–98.

Merrick, John J. Jr., 2001, Crisis Dynamics of Implied Default Recovery Ratios: Evidence from Russia and Argentina. *Journal of Banking and Finance,* 25, 1921-1939.