The pricing of sovereign risk in emerging markets: fundamentals and risk aversion

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Abstract

The literature on sovereign spreads has tended to confound risk with the pricing of risk. To clear up the confusion, we propose a dynamic market based measure of sovereign risk and use it to decompose sovereign credit default swap (CDS) spreads into first, expected losses from default and second, the risk premia required by investors as compensation for default risk. In doing so, we reveal that country-specific fundamentals primarily drive sovereign risk whilst global risk aversion drives time-variations in risk premia. Consistent with this, we find the sovereign risk premia is more highly correlated than sovereign risk itself in emerging markets. These results help us to explain the phenomenal convergence in emerging market spreads.

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Keywords: sovereign risk; default risk premia; risk aversion; credit default swaps; credit ratings; emerging markets

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1. Introduction

Emerging market debt valuations now appear stretched relative to their historical relationship with fundamentals and liquidity (IMF, 2004).

Between October 2002 and April 2006, spreads on sovereign bonds and credit default swaps (CDS) fell to levels that had historically never been seen – even beyond levels reached prior to the Asian Financial Crisis. For example, the CDS spread on the Philippines -- regarded as the benchmark for emerging markets in Asia -- declined from over 500 basis points near the start of that period to about 170 basis points towards the end of the period. Indeed by 2005, sovereign spreads had narrowed to the point where serious concerns were expressed within policy circles that market participants may be failing to adequately appreciate the risks of emerging market debt. But how narrow was too narrow? Are there global or regional forces driving this development? The problem is that there seemed to be little basis for deciding other than the fact that the spreads seemed to be rather tight relative to past regularities in fundamentals and liquidity levels. This paper directly addresses this problem by identifying the differential effects of fundamentals and risk aversion in the pricing mechanics within sovereign debt markets.

A common difficulty in analysing sovereign spreads is the question of how to distinguish between risk and the pricing of risk as compensation demanded by investors for bearing sovereign default risk. In general, asset prices are driven by fundamentals or investors' appetite for risk. Hence, we may think of sovereign risk as being driven by the country's economic fundamentals and the pricing of that risk as depending on investors' risk aversion which may vary over time. Duffie et al. (2003) point out that sovereign default is largely a political decision with sovereign issuers preferring to restructure or renegotiate their debt over defaulting outright. It is well-accepted that this decision is influenced mainly by a country's economic fundamentals and there is also evidence provided by Mauro et al. (2002) that fundamentals comove more strongly today than they did historically. In fact, the sovereign debt literature is concentrated in the determinants of sovereign risk (see for example, Reinhart et al (2003) and Borio and Packer (2004)) but is surprisingly, silent on the pricing mechanics despite frequent anecdotal conjectures being made within the finance industry[2]. This study addresses this void and contributes new empirical evidence on the distinctive pricing of fundamentals and risk aversion in sovereign debt markets. It differentiates itself from existing empirical studies which have misleadingly attributed either risk or risk premia entirely to sovereign or Brady Bond spreads.

In the recent literature on the pricing of credit risk in corporate bonds, Driessen (2003), Amato and Remolona (2005) and Berndt et al (2005) measure default risk in terms of the loss from default expected by investors and then decompose corporate bond spreads into that measure of risk and the price of that risk, namely the default risk premium. We apply this framework to investigate whether expected losses really depend on the fundamentals of issuers' creditworthiness and the default risk premia on factors that affect investors' risk aversion. Specifically, we build upon and extend the concepts of ratings implied expected loss and default risk premia introduced in Remolona, Scatigna and Wu (2007) to further contribute to the empirical analysis of sovereign credit default swap (CDS) spreads, using a comprehensive and unique database.

We present an innovative dynamic market based model for sovereign risk pricing to capture market participants' updating of their expectations on sovereign risk with their ex ante fundamental economic forecasts. Hence, we construct improved measures of expected loss by relying on sovereign credit ratings and adjusting for short-term rating announcements and hence, the default probabilities for the issuer. Furthermore, we derive higher-frequency estimates of sovereign default risk by assuming that market participants quickly adjust their assessments of risk to reflect their economic outlook as captured by anticipated credit ratings guidance. In this

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[2] See Remolona, Scatigna and Wu (2007) for an exposition on recent developments in the sovereign debt literature.

way, we derive unique time-varying estimates of sovereign default risk and risk premia as perceived by market participants.

In the empirical asset pricing literature, there are market-implied risk aversion variables developed that exploit information from the prices of equity index options. The concept of risk aversion has been previously linked with emerging market debt spreads by McGuire and Schrijvers (2003), Baek et al (2005), Garcia-Herrero and Ortiz (2006) and references therein. McGuire and Schrijvers correlate a principal component of emerging market spreads to the volatility implied by options on the stock market (VIX) whilst the latter studies compute ad hoc risk appetite indicators which are significant for Brady bond yield spreads and/or Emerging Market Bond indices. This motivates our attempt to better specify the role of risk aversion in sovereign risk pricing.

We stage a horse race to differentiate between the determinants of sovereign risk and risk premia with a set of risk aversion and country-specific fundamental explanatory variables. We find statistically significant effects of global risk aversion on the sovereign risk premium but not on sovereign risk itself, which is determined primarily by country-specific fundamentals. This is further supported by aggregate correlation analyses revealing that sovereign risk premia are consistently more highly correlated than sovereign risk levels across regions. In particular, we find that the Asian region is the most disparate suggesting that market participants disregard sovereign risk levels to a greater extent in their pricing of sovereign debt in Asia.

This study contributes new cross-country evidence on the mechanics of sovereign risk pricing in emerging markets. It reconciles existing conflicts in the sovereign debt literature arising from the inability to differentiate the market pricing of sovereign risk from the risk itself. Our framework is consistent with the class of doubly stochastic models of default as it implicitly captures the degree of default correlation for the group of emerging market sovereigns (see Duffie and Singleton (2003)). Hence, our findings are of direct interest to emerging market participants, major financial institutions and monetary policy makers as there are clear implications for bond pricing and portfolio credit risk management. We contribute a much better understanding on the recent developments in emerging debt markets.

The remainder of this paper is structured as follows: Section 2 explains our model for deriving a time-varying measure of sovereign default risk premia from CDS spreads followed by a discussion of data used in Section 3. Section 4 compares our market based measure of sovereign default risk with the rating agency implied views. Section 5 examines in detail, the role of investors' risk aversion in the pricing of sovereign debt and then moves onto its relationship with spreads in Section 6. Finally, Section 7 concludes and suggests further work to be done in this area.

2. The dynamic market based model

To analyse the time variation of sovereign risk at the monthly frequency, we derive a market-based measure that extends the work of Remolona, Scatigna and Wu (2007) on ratings implied expected losses (RIEL) for sovereign issuers. In their seminal work, expected losses from sovereign defaults are modelled as a non-linear mapping of sovereign credit ratings. Specifically, a translation of default intensity across rating categories is calibrated using the average five-year ahead default rates of both sovereign and corporate issuers (as an estimate of the unconditional 5 year default probability).

In this study, we extend the RSW-RIEL measure for sovereign default risk because the relevant information for assessing an issuer's creditworthiness arrives at a higher frequency than that based solely on sovereign ratings guidance, which by rating agencies' own admission are slow to adjust to the arrival of new information in the market. Altman and Rijken (2004) suggest that rating agencies focus on a long-term horizon (in using a "through-the-cycle" rating methodology) and thus aim to respond only to the perceived permanent component of credit-quality changes in their ratings guidance. However, market participants on the other hand adjust their risk assessments quickly as information arrives and prices financial assets accordingly. The problem with such market assessments is that they are not directly observable.

Here we derive market-based expected losses from sovereign default (MBEL) in two stages – first by accounting for short-term rating announcements and second by means of a market adjustment equation that is estimated with observable instrumental variables. This allows us to mimic the formation of investors' expectations on sovereign default risk at the monthly frequency based on changing economic conditions.

2.1 Modeling rating announcements

Rating agencies provide credit ratings to signal an issuer's long-term fundamental creditworthiness but also more short-term signals via reviews and outlooks to forewarn investors of the likely change of an issuer's credit quality in the near term. These are made by rating agencies when a significant event or deviation from an expected trend has either occurred or is expected to affect an issuer's capacity to repay its debt.

Micu, Remolona and Wooldridge (2006) examine the price impact of more timely rating announcements in the form of reviews and outlooks on corporate issuers. They find that investors value both the timely signals (rating reviews and outlooks) as well as the stable signals (ratings) of issuer creditworthiness. This is consistent with rating agencies' view that ratings, watchlists and outlooks together give a complete rating guidance on the issuer's capacity to meet its financial obligations. However, as the rating reviews for sovereign ratings are called "Creditwatch" (by S&P) and "Watchlists" (by Moody's) we will use the terms "review" and "sovereign watch" interchangeably in this paper.[3]

Thus, in order to capture the additional information implied by sovereign rating outlooks and watches, we adjust and extend the ratings implied expected loss (RIEL)

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[3] Fitch Ratings uses the term "Rating watch" but due to their limited coverage of sovereign issuers, we omit them in this study.

measure of Remolona, Scatigna and Wu (2007) – RSW-RIEL. We assume that rating announcements have symmetric impacts on sovereign debt markets and that credit watches are more likely to lead to a subsequent ratings change than outlooks. Guided by discussions with rating agencies, we assign a probability (p) of 0.3 for outlooks and 0.6 for credit watches and we compute the weighted RIEL average when there is a non-stable rating announcement. Specifically, we adjust a positive outlook or sovereign watch up by one notch in the rating scale and a negative outlook or sovereign watch down by one notch to infer the probabilities of default based on historical sovereign default experiences. We assume that the sovereign watches last for 3 months and outlooks for 2 years or until the next actual rating change, whichever is sooner. Following the RSW-RIEL methodology and the findings of Sturzenegger and Zettlemeyer (2005) we use a constant loss given default rate of 45%. The ratings implied expected loss (RIEL) adjusted for rating announcements can be represented as weighted averages:

$$RIEL_{adjusted\ i,t} = \begin{cases} 0.7 \times PD_{0\,i,t} \times \overline{LGD} + 0.3 \times PD_{1i,t} \times \overline{LGD} & \textit{For Outlooks} \\ 0.4 \times PD_{0\,i,t} \times \overline{LGD} + 0.6 \times PD_{1i,t} \times \overline{LGD} & \textit{For Watches} \end{cases} \qquad (1)$$

where $PD_{0i,t}$ is the original annualized ratings implied probability of default and $PD_{1i,t}$ is the new rating outlook/watch implied probability of default for country *i* at time *t* and $\overline{LGD}$ is the constant loss given default.

We improve upon the arbitrary adjustments made to linearly transformed sovereign rating scales in Gande and Parsley (2005) and Kim and Wu (2006). The advantage of our approach is that we use realistic probabilistic assumptions to adjust our expected loss measure. We combine the adjusted RIEL series using both S&P and Moody's announcements in between actual rating changes. There is added informational value in this approach as Cantor et al. (1997) have shown split ratings to be priced in the mid point. There is no reason to believe that split short-term credit announcements by rating agencies will have widely different effects.

2.2 Estimating a market-based measure of sovereign risk

Next, we assume that the aggregate market's expected loss (market based expected loss, MBEL) adjusts toward expected ratings. We model this adjustment process using the following equation:

$$\lambda_t^M = (1-\phi)\hat{\lambda}_{t+1}^R + \phi\lambda_{t-1}^M + v_t \,, \qquad (2)$$

where λ_t^M is the MBEL, $\hat{\lambda}_t^R$ is the expected RIEL (adjusted for outlooks and reviews) and ϕ is the adjustment coefficient (assumed to be between 0 and 1) and where we suppress the country subscript *i.*

In order to obtain estimates of the MBEL we rewrite (2) in terms of differences:

$$\lambda_t^M - \lambda_{t-1}^M = (1-\phi)\left[\hat{\lambda}_{t+1}^R - \lambda_{t-1}^M\right] + v_t \qquad (3)$$

We apply two stage least squares to (3), using the sovereign CDS spread S_t as a proxy for the MBEL, with the predicted values being our estimate for the MBEL. The estimated equation is thus:

$$S_t^* - S_{t-1}^* = (1-\phi)\left[\hat{\lambda}_{t+1}^R - S_{t-1}^*\right] + u_t \qquad (4)$$

where S_t^* is the spread adjusted by a factor k_j which measures the relative level of the adjusted RIEL with respect to the sovereign spread for each country *j*

$$k_j = \frac{average(RIEL_J)}{average(S_J)} \quad j = 1,\ldots\ldots,24$$

And

$$\lambda_{t+1}^{R} = f(F_t) + \varepsilon_t \qquad (5)$$

In estimating (4) we assume that the (forecasted) adjusted RIEL is a function of a set of observable economic fundamentals F_t (as shown in equation (5)) which we use as instruments in the two stage least squares estimation. Otherwise, the use of a regressor estimated with error in predicting MBEL will introduce unnecessary bias. The variables we used are country-specific economic data which are available at a monthly frequency. These include inflation, industrial production, GDP growth consensus forecasts, export growth and foreign exchange reserves.

2.3 Deriving the sovereign risk premia

Based on the analytical framework established in the corporate credit risk pricing literature, we make use of physical (actual observed probabilities of default) and risk-neutral measures (credit spreads incorporating risk aversion) (see Duffie and Singleton (2003) and references therein). Hence, we define the sovereign default risk premium as the difference between the spread and expected loss:

$$\pi_t \equiv S_t - \hat{\lambda}_t^{M} \qquad (6)$$

where π_t is the risk premium, and as before, S_t is the spread and λ_t^M is the expected loss from default in the form of MBEL, again suppressing the country subscript i. In fact, a logarithmic expression of this relationship lends nicely to our interpretation of the risk premia as the price of sovereign default risk (price per unit of expected loss) as shown below:

$$\ln(\pi_t) = \ln(\frac{S_t}{\hat{\lambda}_t^{M}}) \qquad (7)$$

Our hypothesis is that this risk premium will depend on global factors as well as the risk itself but not separately on the fundamentals that determine the risk. Hence, we consider the equation

$$\ln(\pi_t) = \delta_0 + \delta_1 \ln(\lambda_t^M) + \delta_2 G_t + \delta_3 F_t \qquad (8)$$

where the new variable G_t is investors' risk aversion or appetite indicator and F_t the country-risk fundamentals. The specific hypothesis is that the fundamentals F_t, which enter λ_t^M in equation (4), do not enter separately in equation (7). The logarithmic forms follow Berndt et al (2005), who find such a relationship between default risk premia and default intensity.

Note that the risk λ_t^M plays two important roles: First it serves as a component of the spread, as defined in (5); and second it is our measure of risk and is therefore a determinant of the risk premium, as in equation (7). It has the advantage of incorporating not only all information material to assessing a sovereign issuer's credit worthiness from rating agencies but also from the market as a whole.

3. Data

Our sample comprises 24 small and/or emerging markets from Latin America, Central and Eastern European, Asian and Middle Eastern and African (MEA) regions (see Appendix A for the list of sample countries studied). Our sample period is from January 2002 to May 2006 for which sovereign CDS market data are available for all sample countries.

We rely on sovereign foreign currency credit ratings history for each country and five-year issuer-weighted cumulative average default rates by ratings for sovereign and corporate issuers from *Moody's Investor Services* and *Standard and Poors* (S&P).

In addition, we use 5 year sovereign credit default swap (CDS) spreads sourced from the comprehensive *Markit* database. This unique database contains monthly quotes on CDS market spreads for 70 developed and emerging market sovereign obligors worldwide. As the sovereign CDS market enables the exchange of sovereign risk between participating financial institutions, *Markit* compiles quotes from a large sample of financial institutions and aggregates them into a composite spread that is reasonably continuous. Another advantage is that these contracts do not suffer from declining maturities like conventional debt instruments. Moreover, we use only the five-year spreads because these contracts are the most liquid and account for a large proportion of the sovereign CDS market. Zhu (2004) finds CDS spreads react particularly faster to bad news than spreads in the underlying cash market. CDS spreads have also been analysed by Pan and Singleton (2005) and Longstaff et al (2005) for sovereign and corporate obligors respectively.

The set of country-specific fundamental explanatory variables used include inflation, industrial production, GDP growth consensus forecasts, export growth and foreign exchange reserves. These variables are all available at the monthly frequency from 2002 to 2005. They are sourced separately from the IMF, Consensus Economics, Datastream, Moody's, Markit, JPMorgan Chase and Standard & Poor's.

4. Dynamics of Sovereign Risk - Comparing Alternative Measures

As our market based sovereign risk measure is an extension from the RSW-RIEL measure, we compare our augmented risk measure with the latter. The incremental improvement with our innovative market based approach rests upon the incorporation of information updates based on real-time economic data and rating agencies' shorter-term watchlists and outlooks. We find that accounting for these information releases substantially improves the information content of our sovereign risk measure over the pure ratings based alternative introduced by Remolona, Scatigna and Wu (2007).

To illustrate the behaviour over time of the estimates of expected loss using ratings alone (RSW-RIEL) and additional rating outlooks and watches (adjusted RIEL), Figure 2 shows them for four countries: China, Korea, Thailand and the Philippines. As we would expect, the RSW-RIEL estimates tend to remain stable for extended periods of time and then adjust abruptly and sharply, ultimately converging to the MBEL estimates which share a similar but smoother pattern to both RSW-RIEL and adjusted RIEL in between. The MBEL consistently moves ahead of the ratings based measures of expected loss. In the cases of China, Korea and Thailand, the RSW-RIEL, adjusted RIEL and hence MBEL estimates all reflect progressive rating upgrades over the sample period. Conversely, there has been a progressive rating downgrade for the Philippines with the market disagreeing with this view.

<Insert Figure 1 >

5. The role of global risk aversion

In this study, our main hypothesis is that the sovereign default risk premium should depend on factors that affect investors' risk aversion as well as on the risk itself. In this section, we derive default risk premia and test whether they are significantly affected by other factors, in particular the country risk fundamentals and liquidity effects that enter into our measure of country risk.

5.1 Identifying global risk aversion

We first turn to the empirical asset pricing literature to identify global factors that affect investors' risk aversion. While there is a large literature that purports to analyse risk aversion (or sometimes risk appetite), much of it is based on ad-hoc measures that have little theoretical basis and often confuse risk aversion with liquidity. However, there actually exists a rigorous strand of research in this line of literature. In the literature on empirical pricing kernels, Ait-Sahalia and Lo (1998) and Jackwerth (2000) show how to derive a theoretically sound measure of investors' risk aversion by comparing the return distributions implied by options prices to return distributions estimated from the realised movements of the underlying asset prices. Tarashev et al

(2003) apply this approach to index options in stock markets and derive monthly estimates of investors' effective risk appetite. They find that these indicators of risk attitude transcend national boundaries in their effects on financial markets.

Separately, McGuire and Schrijvers (2003) look at emerging market debt spreads and find an important common factor in the movements of these spreads over time. They proceed to identify observable variables that are correlated with this common factor. Importantly, their results reveal a significant relationship with the implied volatility in equity index options on the S&P 500 index (VIX).

We shall proceed to use the Tarashev et al (2003) effective risk appetite indicator and the commonly used VIX to proxy investor's degree of risk aversion in our analyses.

5.2 Is sovereign risk really so different from risk premia? A horse race

We essentially stage a horse race to find which variables best explain sovereign risk and which ones best explain risk premia? We subject both our market based sovereign risk and risk premium dependent variables to be regressed against the set of country-specific fundamental variables and risk aversion proxies (risk appetite indicator derived by Tarashev et al (2003) from options prices and the VIX).

<Insert Table 1 >

The fixed effects panel regression results for the two dependent variables are reported in Table 1. As hypothesised, In the case of the sovereign risk equations we find that effective risk appetite indicator does not add significant explanatory power for sovereign risk itself. However, risk appetite is significantly related to the risk premia in a negative manner. This is an intuitive result suggesting that as investors' risk appetites increase, the risk premium demanded as compensation for sovereign default risk falls. The VIX interestingly has a positively significant effect on both risk and risk premia. As global volatility is heightened, risk increases and this also becomes priced into emerging debt markets. This result suggests that the VIX is not a clean measure of risk aversion as it captures the volatility of financial markets more generally. The Tarashev et al (2003) indicator is the superior proxy for capturing investors' effective attitude towards risk.

Our results from panel regression analyses using monthly data from February 2002 to May 2006 for 24 sample countries remain largely consistent with extant sovereign risk studies. The significant fundamental variables in the short-term have the appropriate signs – positive for inflation and negative for foreign exchange reserves – in explaining sovereign risk and risk premia. There appears to be a high level of persistence in both expected losses and the compensation for that. The goodness of fit for regressions at the monthly frequency are high (adjusted R-squared of 99% and 97% for risk and risk premium respectively) and the fixed effects estimation is warranted based on the Hausman test.

Hence, we find our decomposition of sovereign spreads into expected losses and risk premia to be validated by the fact that the latter component is largely explained by variables related to investors' risk aversion while the other component is determined primarily by country-specific fundamentals. This makes sense of Baek et al's (2005) finding that a risk aversion index can significantly explain brady bond yield spreads. Our results suggest that investors' true risk aversion affects primarily the price of sovereign risk and not the actual risk level itself.

5.3 Controlling for liquidity

We also augment our fixed-effects panel regressions for sovereign risk and risk premia to account for the potential influences of illiquidity in emerging debt markets. As Longstaff et al. (2005) have shown that there are default and liquidity components in corporate CDS spreads, we attempt to control for any potential confounding effects from aggregate market liquidity.

The results of our control regressions are shown in Table 2. In addition to country-specific economic fundamentals, we find that market liquidity (as proxied by log net bond issuance) also explains market participants' perception of sovereign risk (MBEL). The positively significant coefficient suggests that the major side effect of liquidity is that as issuance increases, the average quality of issuers must decline as more and more lower rated issuers are able to access arms length financing. Nevertheless, our finding that global risk aversion determines primarily the pricing of risk remains robust to the effects of market liquidity.

<Insert Table 2>

5.4 Regional correlations of sovereign risk and risk premia

To shed further insights into sovereign risk pricing, we refine our analyses further to focus on the commonalities in the behaviour of sovereign risk and risk premia over time both within and across regions. We compare regional averages in the pair-wise correlations in estimated sovereign risk and risk premia. The most telling result shown in Table 3 is that correlations in risk premia systematically exceed correlations in sovereign risk. This provides further support for the common global risk aversion factor driving sovereign risk pricing. This also corroborates with Diaz-Weigel and Gemmill's (2006) finding of significant market comovements in Brady Bond spreads over standard fundamental regressors. Another interesting discovery we find is that whilst the actual sovereign risk levels are the most divergent within the Asian region, sovereign risk premia is surprisingly the most correlated in emerging markets – even more so than Latin American markets. This can perhaps be explained by market participants' common pricing for Asian sovereign debt post Asian Financial crisis (akin to lumping sovereigns into a single 'Asian basket'). The implication of this result is that market participants are clearly mispricing Asian sovereign debt the most – underpricing the risk in lower rated sovereigns that have remained fundamentally weak (demanding a relatively lower risk premium) at the expense of higher rated sovereigns which are potentially over-priced (with relatively higher risk premium than warranted by their restored sovereign risk levels).

<Insert Table 3 >

6. Explaining emerging market spreads

We pursue further analyses on the Asian region to better understand the narrowing of spreads across emerging debt markets. In Figure 2, we show the CDS spreads and market based sovereign risk measures over time for sample Asian countries. Of these, China and Korea are investment grade issuers whilst Thailand and the Philippines are speculative grade.

The differences in the two grades of issuers are illuminating. For the investment grade group, whilst spreads have been falling in recent years, this is largely due to an actual decline in sovereign risk as economic conditions have improved (risk premium gaps have remained fairly stable). In contrast, the narrowing spreads of speculative grade issuers have largely come about from a major narrowing of the risk premium gaps. The actual levels of sovereign risk have not changed but rather investors have become much more hungry for speculative grade debt. This reaffirms our previous finding that increasing global investor risk appetite is pushing down the risk premia demanded for taking on sovereign default risk. Furthermore, this is also consistent with our finding that aggregate correlations for sovereign risk premia are the highest of all emerging markets whilst the levels of sovereign risk are the most divergent. The speculative grade issuers are paying risk premia closer to the higher rated sovereigns whilst the higher rated sovereigns are actually becoming much less risky than the lower rated ones. Overall, the convergence in emerging market debt spreads have resulted from declining sovereign risk levels at the investment grade end and declining risk premia at the speculative grade end of the emerging market debt spectrum. To our best knowledge, this result has not been previously identified and should be of major interest to international policy makers and investors alike.

<Insert Figure 2 >

7. Conclusions

In this study, we demonstrated how we may decompose sovereign debt spreads into two components: the expected loss from default and the default risk premium. We computed expected loss as a translation of default intensity using forward-looking credit ratings and announcements and the default histories associated with each rating. Hence, expected loss measures sovereign risk and is a highly non-linear mapping of a straight ratings measure. We then derived a higher frequency measure of expected loss by means of a dynamic market based model. We then used this measure to decompose sovereign spreads at the monthly frequency into expected loss and risk premium. Hence, expected loss can be interpreted as both a component of the sovereign debt spread as well as a measure of country risk.

We find strong evidence that expected losses and risk premia as measured behave differently. One is driven largely by country-specific sovereign risk fundamentals and market liquidity while the other moves beyond national boundaries with investors' global risk aversion as well as with changes in the sovereign risk itself. Further research is warranted on the microstructural effects of liquidity on sovereign debt valuations in the CDS market. We have simply presented a much needed new approach to formalising the pricing of sovereign debt in emerging markets to account for the puzzling convergence of emerging market debt spreads observed in recent years.

References

Ait-Sahalia, Y and A Lo (1998): "Nonparametric estimation of state-price densities implicit in financial asset prices," Journal of Finance, 53, 499-547.

Altman, E I and H A Rijken (2004): "How rating agencies achieve rating stability", Journal of Banking and Finance, 28, 2679-2714.

Amato, J D and E M Remolona (2003): "The credit spread puzzle", BIS Quarterly Review, December.

Amato, J D and E M Remolona (2005): "The pricing of unexpected credit losses", BIS Working Papers No 190, November.

Baek, I-M, A Bandopadhyaya and C Du (2005): "Determinants of market-asessed sovereign risk: Economic fundamentals or market risk appetite?" Journal of International Money and Finance 24, 533-548.

Berndt, A, R Douglas, D Duffie, M Ferguson and D Schranz (2005): "Measuring default risk premia from default swap rates and EDFs", BIS Working Paper No 173.

Borio, C and F Packer (2004): "Assessing new perspectives on country risk", BIS Quarterly Review, December.

Cantor, R, F Packer and K Cole (1997): "Split ratings and the pricing of credit risk", Journal of Fixed Income, 7(3).

Diaz-Weigel D D and G Gemmill (2006): "What drives credit risk in emerging markets? The roles of country fundamentals and market co-movements" Journal of International Money and Finance 25, 476-502.

Driessen, J (2005): "Is default event risk priced in corporate bonds?" Review of Financial Studies, 18, 165-195.

Duffie D, L H Pedersen and K J Singleton (2003): "Modeling sovereign yield spreads: A case study of Russian debt", Journal of Finance, 58(1), 119-159.

Duffie D and K J Singleton (2003): Credit risk: Pricing, measurement and management, Princeton University Press.

Garcia-Herrero, A and A Ortiz (2006): "The role of global risk aversion in explaining Latin American sovereign spreads", Economia 6(2).

International Monetary Fund (2004): "Global Financial Stability Report", World Economic and Financial surveys, April, Washington.

Jackwerth, J C (2000): "Recovering risk aversion from option prices and realized returns", Review of Financial Studies 13, 433-451.

Kim, S-J and E Wu (2006): "Sovereign credit ratings, capital flows and financial sector development in emerging markets", working paper, University of New South Wales.

Mauro, P, N Sussman and Y Yafeh (2002): "Emerging market spreads: then versus now", Quarterly Journal of Economics, May, 695-733.

McGuire, P and M A Schrijvers (2003): "Common factors in emerging market spreads", BIS Quarterly Review, December.

Micu, M, E Remolona and P Wooldridge (2006): "The price impact of rating announcements: which announcements matter?" BIS working papers no. 207, June.

Moody's Investor Service (2006): "Default and recovery rates of sovereign bond issuers, 1983-2005", Special Comment, April.

Gande, A and D C Parsley (2005): "News spillovers in the sovereign debt market". Journal of Financial Economics 75, 691-734.

Longstaff, F A, S Mithal and E Neis (2005): "Corporate Yield Spreads: Default Risk or Liquidity? New Evidence from the credit default swap market", Journal of Finance 60(5), 2213-2253.

Pan, J and K J Singleton (2005): "Default and recovery implicit in the term structure of sovereign CDS spreads", working paper, MIT.

Reinhart, C, K Rogoff and M Savastano (2003): "Debt intolerance", Brookings Papers on Economic Activity, 1, 1-74.

Remolona, E, M Scatigna, and E Wu (2007): "A ratings based approach to measuring sovereign risk", BIS Quarterly Review, March (forthcoming).

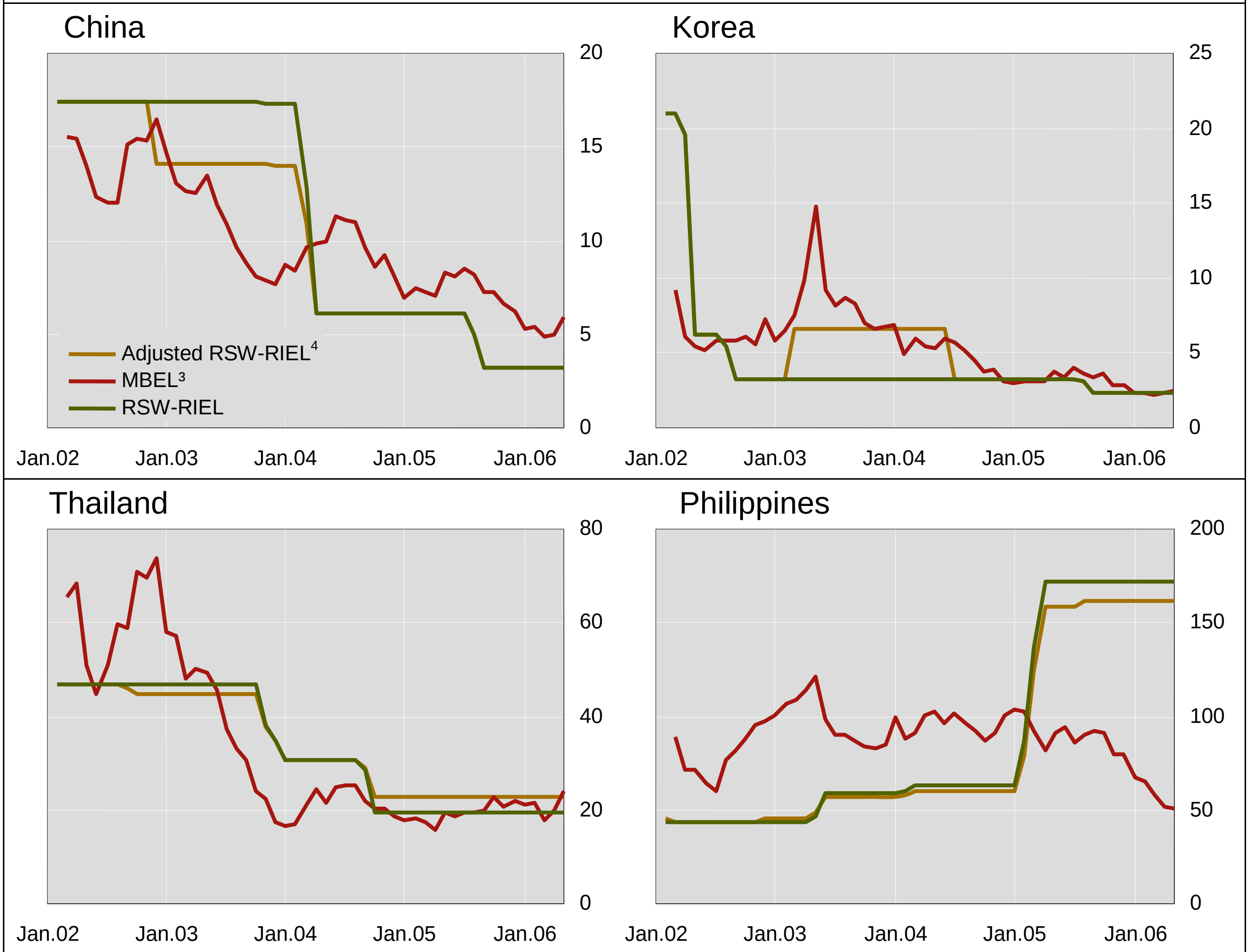
Standard and Poor's (2006): "2005 transition data for rated sovereigns", Commentary Report, February.

Sturzenegger, F and J Zettelmeyer (2005): "Haircuts: estimating investor losses in sovereign debt restructurings, 1998-2005", IMF Working Paper WP/05/137, July.

Tarashev, N, K Tsatsaronis and D Karampatos (2003): "Investors' attitudes towards risk: what can we learn from options?" BIS Quarterly Review, June.

Zhu, H (2004): "An empirical comparison of credit spreads between the bond market and the credit default swap market", BIS Working Papers No 160, August.

Figure 1: Comparing measures for expected losses: RSW-RIEL[1,2] and MBEL[1,3]



[1] In basis points. [2] Remolona-Scatigna-Wu (2006) rating-implied expected loss. [3] Market-based expected loss. [4] Adjusted for outlooks and reviews.

Figure 2: CDS spreads and MBEL (In basis points)

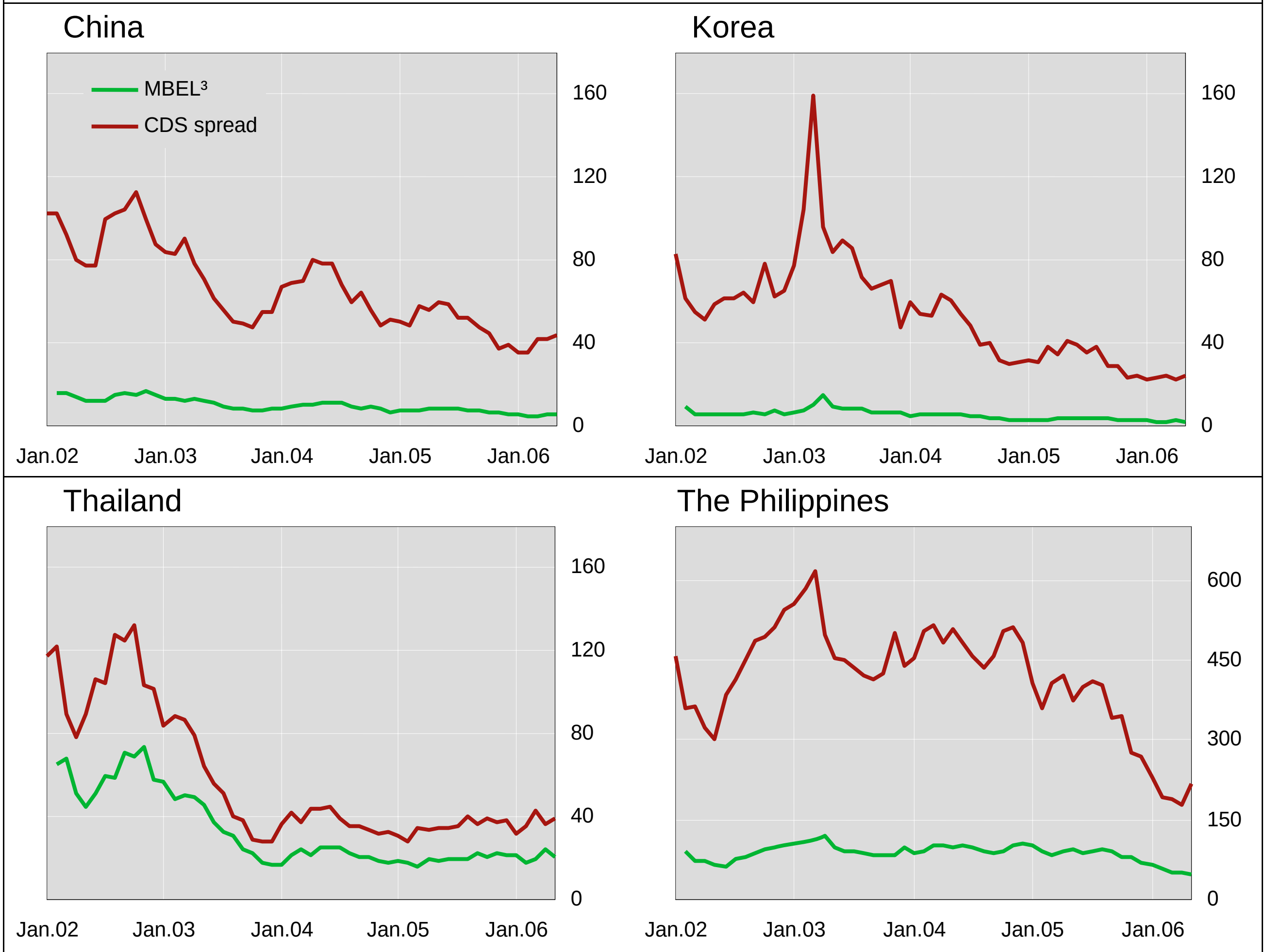


Table 1: What explains sovereign risk and what explains risk premia?

Explanatory variables	Dependent variables	
	Log MBEL	**Log risk premium**[1]
Fundamentals		
Lagged log dependent variable	0.855** {0.000}	0.708** {0.000}
Inflation rate	0.137* {0.097}	0.226 {0.154}
GDP growth consensus forecasts	-0.003 {0.149}	-0.007 {0.145}
Industrial production	0.000 {0.811}	-0.001 {0.463}
Foreign exchange reserves	-0.056** {0.010}	-0.175** {0.000}
Risk aversion		
VIX index	0.010** {0.002}	0.023** {0.000}
Risk appetite (Tarashev et al)	0.000 {0.980}	-0.043 {0.061}*
Hausman test	*120.81**** *{0.000}*	*166.422**** *{0.000}*
Adjusted R-squared	**0.99**	**0.97**

P-values are shown in parentheses, based on White cross-section standard errors. Sample period: Feb 2002- May 2006, monthly data frequency.

[1] Estimated using market based expected losses instead of rating implied losses.

Table 2: The influence of liquidity on sovereign risk and risk premia		
Explanatory variables	Dependent variables	
	Log MBEL	**Log risk premium[1]**
Fundamentals		
Lagged log dependent variable	0.849** {0.000}	0.644** {0.000}
Inflation rate	0.962* {0.058}	0.731 {0.630}
GDP growth consensus forecasts	0.007 {0.380}	-0.025 {0.215}
Industrial production	-0.000 {0.587}	-0.001 {0.405}
Foreign exchange reserves	-0.099** {0.000}	-0.238** {0.000}
Risk aversion		
VIX index	0.010** {0.005}	0.023** {0.000}
Risk appetite (Tarashev et al)	-0.003 {0.849}	-0.044 {0.118}
Liquidity		
Net bond issuance	0.041* {0.056}	0.047 {0.241}
Adjusted R-squared	**0.99**	**0.97**

Note: P-values are shown in parentheses, based on White cross-section standard errors. Sample period: Feb 2002- May 2006, monthly data frequency.

[1] Estimated using market based expected losses instead of rating implied losses.

Table 3: Average pair-wise correlation coefficients for Sovereign Risk and Risk Premia					
Panel A: Sovereign risk based on MBEL estimates					
	Correlation with:				
	Intra-region	**Rest of the world**	**Asia**	**Latin America**	**CEE**
Asia	0.28	0.35			
Latin America	0.54	0.50	0.34		
Central and Eastern Europe	0.62	0.52	0.37	0.56	
Middle East and Africa	0.52	0.53	0.37	0.58	0.58
World	*0.49*	*0.47*			
Panel B: Sovereign risk premia					
Asia	0.63	0.61			
Latin America	0.58	0.61	0.59		
Central and Eastern Europe	0.65	0.61	0.62	0.61	
Middle East and Africa	0.62	0.61	0.64	0.61	0.60
World	*0.62*	*0.61*			

Appendix A: List of sample countries

Asia	*Central and Eastern Europe*	*Latin America*	*Africa and the Middle East*
China	Bulgaria	Brazil	Egypt
Korea	Czech Republic	Chile	Lebanon
Thailand	Hungary	Colombia	Morocco
Philippines	Poland	El Salvador	South Africa
	Russia	Ecuador	
	Turkey	Mexico	
	Ukraine	Panama	
		Peru	
		Venezuela	