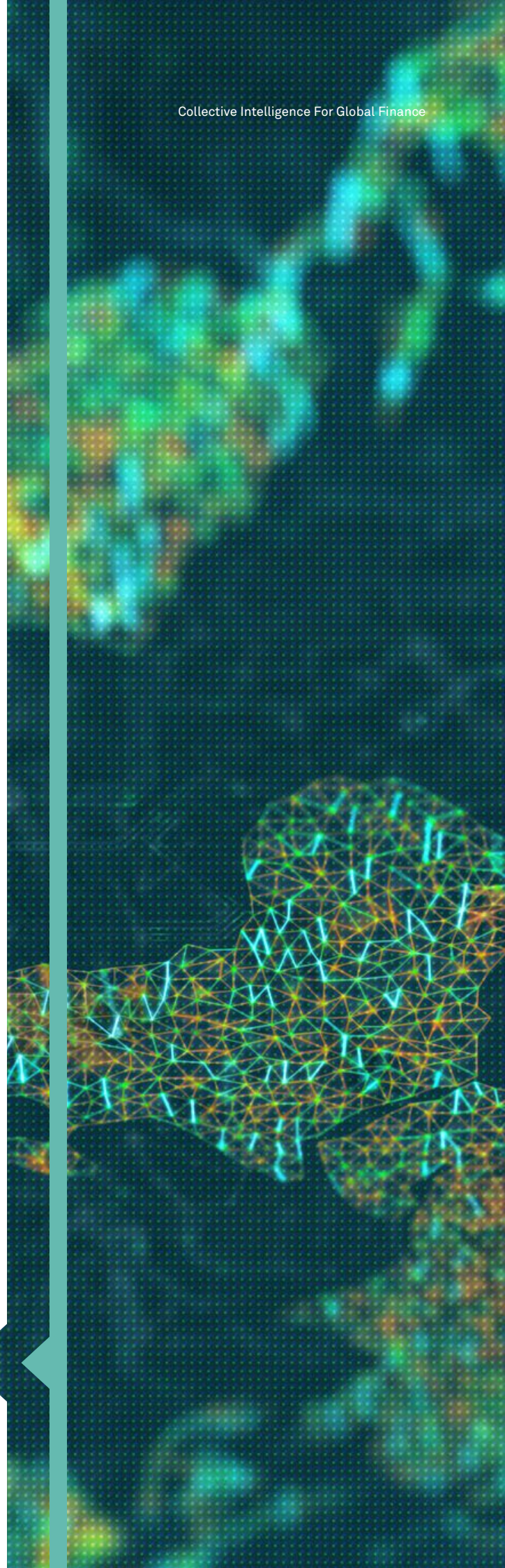


Whitepaper // No.3
**Sovereign Default Risk in
Developing Economies**

October 2015



Introduction



This paper examines the use cases for Credit Benchmark's Consensus Probabilities of Default (Consensus PDs), in the context of more established indicators of Sovereign Default Risk. We suggest that Consensus PDs, as an additional dataset that is both robust and broad, can play a valuable role in compensating for low signal-to-noise in other metrics. It can also provide a basis on which to fill coverage gaps in indicators such as CDS and bond yields, and offer an alternative form of beta metric at the portfolio level.

“The International Monetary Fund has warned that emerging economies and bond markets need to prepare for an increase in corporate failures if and when the US Federal Reserve and other central banks in advanced economies begin raising rates.”

Financial Times, 29th September 2015

The Case for Consensus Credit Risk Estimates

August's bout of market volatility brought renewed concerns about Sovereign default risks, especially in the developing economies¹. It also highlighted one of the key challenges for risk managers and macro analysts - the absence of a complete, consistent set of data to corroborate their internal analysis. In this paper, we compare available indicators with the newest credit risk metric: Consensus Probabilities of Default.

Since the 2008 financial crisis, **Credit Default Swaps** have provided a valuable indicator of default risks across a range of economies. But recently - with fewer names trading, and distortions caused by liquidity and implied CVAs - their value has been eroded. Market participants and economists still rely on **Government bond yields** which prove useful provided they are free of the distortions caused by quantitative easing (QE), but trading in local currency bonds can be patchy. Ideally, bond yields need to be adjusted by local expected inflation in order to be comparable, and there is no complete consensus on how to measure inflation expectations.

¹ We use the terms 'Developing Economies' and 'Emerging Markets' interchangeably in this report but we recognize that there are a number of competing classifications including 'Emerged' and 'Frontier'.

Credit Benchmark: Collective Intelligence for Global Finance

Credit Benchmark (CB) has brought together a group of globally important banks that anonymously and securely pool their internal credit risk estimates to create qualified Consensus Probabilities of Default and senior unsecured Loss Given Default metrics.

Our Consensus Risk Estimates service, launched earlier this year, offers monthly updated Consensus PDs on thousands of obligors at the individual legal entity level, extending from Sovereigns and banks to public and private corporates and funds. Credit Benchmark also offers data on tens of thousands of obligors for use at portfolio level. We will shortly launch our Consensus LGDs service.

Quorate Consensus PDs are simple, unweighted averages of at least three independent PD contributions for an identical legal entity over an equivalent estimation period.

Participation in the service is open to all banks which use the IRB method for calculating regulatory capital and Credit Benchmark warmly invites interested institutions to become contributors.

Recent market volatility has left few financial instruments unscathed but **currencies** have been center stage. As indicators of Sovereign risk, they offer the advantage of coverage. When every country has to have some type of numeraire, freely floating currencies can provide an immediate barometer of the health of an economy. However many exchange rates are now distorted by Government intervention or fixed pegs. In volatile markets, liquidity is key, and **equity markets** are frequently the primary source of liquidity and undistorted pricing. As a result, they are also an indirect but useful indicator of Sovereign risk. But equity markets' value as a source of liquidity means that they can also be volatile - they are not universal to all countries, and they may be highly distorted by the mix of companies and industries represented in the local exchange.

Credit Rating Agencies provide well researched, durable opinions on the creditworthiness of individual Sovereigns, but their lack of frequent updates can restrict their value during times of rapid market change. For many developing countries, traditional ratings are simply not available.

Consensus Probabilities of Default are sourced from contributing IRB banks. See the highlighted box on page 2 for further description of Credit Benchmark (CB)'s data gathered.

Exhibit 1 (below) shows the relative coverage of some of these metrics:

Exhibit 1: Credit Data and Price Metric Coverage

	CDS	Bond Markets	Rating Agencies	Credit Benchmark
Number of Sovereigns	55	c. 150 issued, of which 40 are liquid	225*	210**
Source	DTCC cleared	OECD EIU	S&P, Fitch, Moody's	Credit Benchmark

*Of these, 93 are common to the top three rating agencies.

**Of these, 88 are fully quorate (at least three contributing banks).

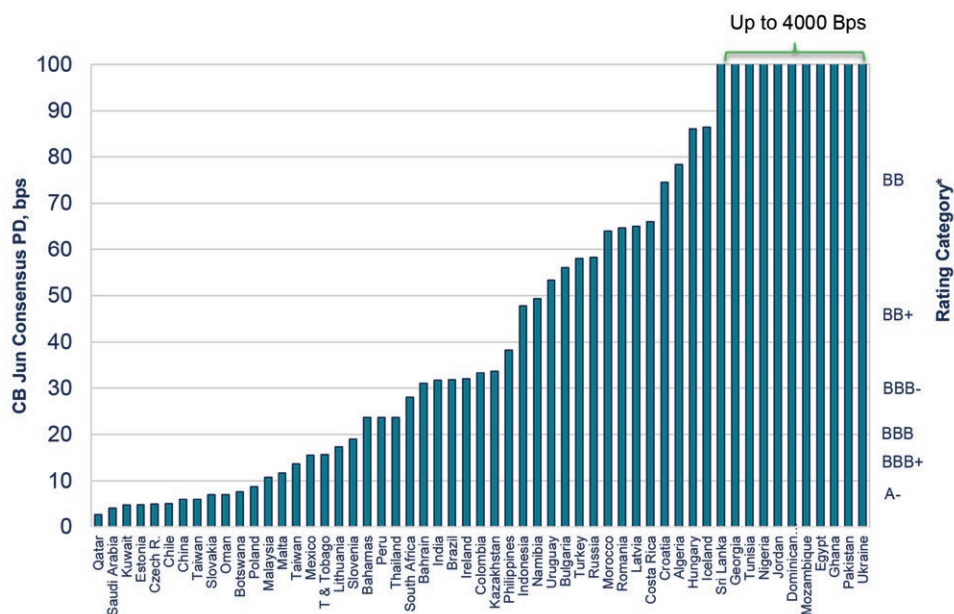
Consensus Probabilities of Default (Consensus PDs) and Losses Given Default (LGDs), sourced from multiple banks, provide extensive coverage and are regularly updated². This report explores the value of Consensus PDs as a key data source in tracking Sovereign default risk across the developing country universe.

² Credit Benchmark currently provide Monthly Consensus PD and LGD updates.

The Consensus PD dataset in Emerging Markets

Consensus PD data can provide a rich insight into banks' assessments of developing economy Sovereign risk, with coverage ranging from some of the lowest risk countries, to those which are at significant risk of default³. The chart at Exhibit 2 shows June 2015 Consensus PD data for 56 Emerging Sovereigns:

Exhibit 2: CB Consensus PDs for Selected Developing Countries



*(right hand scale shows typical credit categories derived from IRB Bank Pillar 3 reports)

Outside of the credit risk departments of banks, a typical assessment of Sovereign risk will take into account numerous factors such as credit ratings, the general business environment, the extent of external debt and foreign currency liabilities, the financing of trade and current account deficits, and the level of inflation. Market indicators such as bond yields absorb this information and provide a benchmark to price the risk of lending to different Emerging Market countries.

In recent months, the perceived risk in Emerging Markets has risen significantly - with a particular focus on commodity-dependent Emerging Market Sovereigns carrying large US Dollar external debt. More generally, Emerging Market Sovereign interest rates are particularly sensitive to changes in inflation, which have become increasingly volatile due to large swings in commodity prices and currency movements.⁴

Real long term interest rates – the rate at which countries can borrow - can be estimated by adjusting nominal rates for expected inflation⁵. This is a useful proxy measure of the real yield risk premium required by the market to maintain the value of the currency. So the current market view of Sovereign risk can be inferred from the balance between long term bond yields, inflation expectations and currency movements.

³ As this dataset grows, it is likely to extend to most of the recognised 200+ Sovereign states
⁴ See figure 3 The Myth of Normal: The Bumpy Story of Inflation and Monetary Policy, Faust & Leeper (2015)
⁵ In this report we use the Economist Intelligence Unit measure of inflation expectations rather than relying on current inflation as a proxy.

Consensus PDs and Fixed Income Indicators

The following pages show the relationship between these indicators of Sovereign risk and current Consensus PD estimates. All market data is as of the last week of August 2015 (source: Economist Intelligence Unit -EIU).

In the next three scatterplots we investigate Consensus PDs plotted against three widely followed market metrics: 10 Year government bond yields, inflation expectations, and derived real yields⁶:

The chart at Exhibit 3 (right) shows that there is, as might be expected, currently a moderately positive relationship between Consensus PD and 10 year nominal Government bond yield.

This analysis highlights a number of bond markets with yields above (Brazil, Mexico, South Africa) or below (Taiwan, Thailand, Philippines) the fitted line. This implies that in the absence of reliable or recently traded bond yields for a given country, a Consensus PD estimate can be modified by the fitted equation to give an approximate current nominal bond yield estimate. For example:

Mexico model yield = 15.5 Bps x 0.148 + 2.47 = 4.76% vs actual yield of 6.09%.

Plotting Consensus PDs against inflation expectations⁷ also shows a moderately positive relationship between the two factors – see Exhibit 4 (right). However, again we observe a number of interesting outliers: Russia, Brazil and Chile all show inflation expectations which are above the fitted line while Turkey, Indonesia, Philippines and Thailand all lie below. In this example:

Mexico model expected inflation = 15.5 Bps x 0.1641 – 0.0617 = 2.48% vs current expectation of 3%.

With inflation rates in many countries becoming increasingly volatile⁸, the fitted line can be viewed as the central tendency for inflation rates which at any one time may be distorted up or down. In future research we will analyze the extent to which all of these factors migrate or revert over time.

Exhibit 3: 10 Year Government Bond Nominal Yield vs CB Consensus PDs

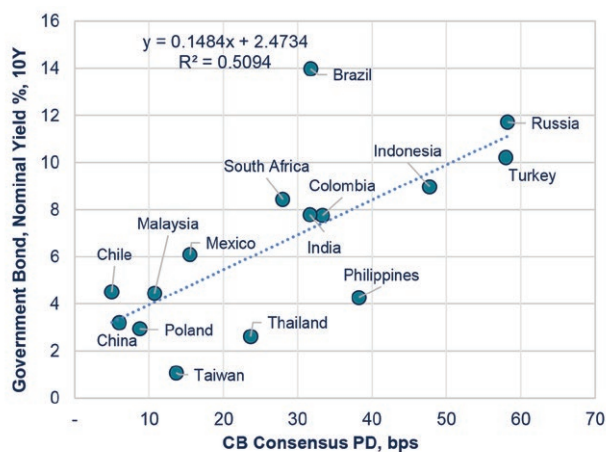
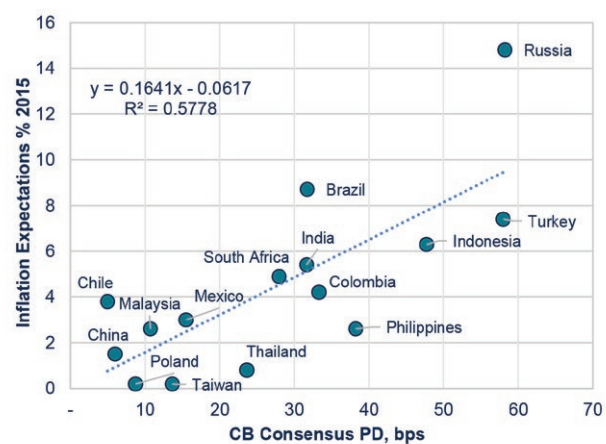


Exhibit 4: Inflation (CPI Expectation) vs CB Consensus PDs



⁶ Economist Intelligence Unit

⁷ Economist Intelligence Unit

⁸ Faust & Leeper (2015)

Exhibit 5, the third chart in this series, shows that compared with the previous Bond Yield and Inflation Expectation plots, the relationship between real yields and Consensus PDs appears far weaker than for the other two factors, even if Russia is excluded as a notable outlier. Interestingly, this appears to be the case only for Emerging Markets⁹. The relationship between Consensus PDs and real yields for developed markets is by contrast stronger than for both nominal yields and inflation against Consensus PDs.

The following table, Exhibit 6, shows the Cross Sectional Volatilities for the preceding metrics, for Emerging and Developed Markets.

Exhibit 5: 10 Year Government Bond Real Yield vs CB Consensus PDs

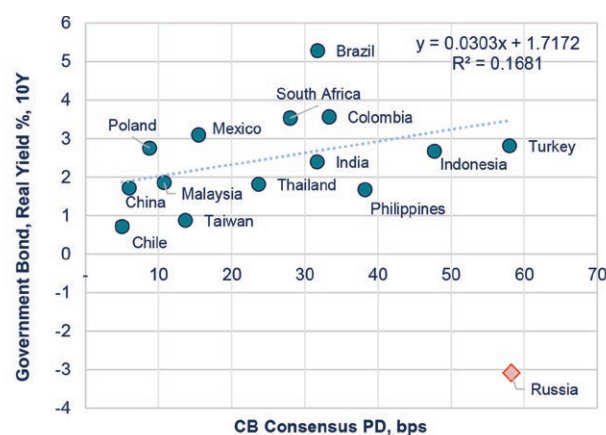


Exhibit 6: Cross Sectional Volatilities

Cross Sectional Volatility	Government Bond Yield	Inflation Expectations	Real Yield
Emerging Markets	3.70%	3.84%	2.11%
Developed Markets	0.66%	0.59%	0.75%

This shows a significantly higher level of uncertainty about these rates across the Emerging Economies. As such, Emerging Market real yields typically generate lower signal to noise ratios, implying that nominal yields and inflation expectations alone are unable to capture all available information. While it is well understood¹⁰ that local Emerging Market bond markets are relatively inefficient at capturing and synthesizing local economic information, this analysis highlights the scale of the resulting uncertainty.

Consensus PDs provide an additional set of data points which can compensate for the low signal to noise ratio in Nominal Yields and Inflation Expectations, and provide a robust reference point with which to fill gaps in other datasets.

⁹ See Credit Benchmark White Paper #1 Sovereign Bond Risk Management: Added Value in Default Probability Data; June 2015

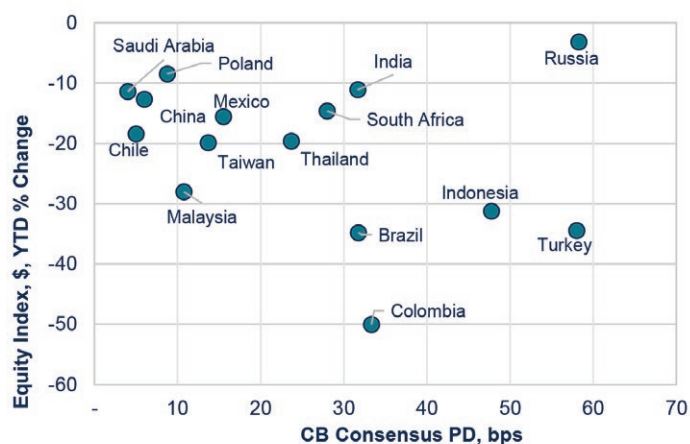
¹⁰ "Despite growing interest in these markets, a recent Moody's Analytics survey found that 75% and 46% of Emerging Markets participant view the lack of information and scattered information, respectively, as major challenges in assessing credit risk in this area"

- Liquidity and Credit Risk in the Emerging Financial Markets, Saadaoui & Boujelbene Public Finance Quarterly 2014/2

Consensus PDs and Equity Market Indicators

We now move on to an examination of the relationship between Consensus PDs and equity markets. First, we investigate at the index level the relationship between Sovereign PDs and Total Equity Index performance, measured in US Dollars for the period January-August 2015. See Exhibit 7 below.

Exhibit 7: USD Based Equity Index Changes, Jan-Aug 2015



This shows that the market movements this year have been very different for countries with similar PDs:

While the PD for Russia is double that of Colombia, a USD based investor has seen their Colombian assets halve in value this year, whereas the Russian stock market has risen so far that it has cancelled out the impact of the Ruble devaluation.

An even clearer picture emerges when we examine the relationship at index level between Sovereign PDs grouped by credit quality and 2015 Total Equity Index performance measured in Local currency and USD:

Exhibit 8: Equity Markets and Exchange Rates by CB Consensus PD

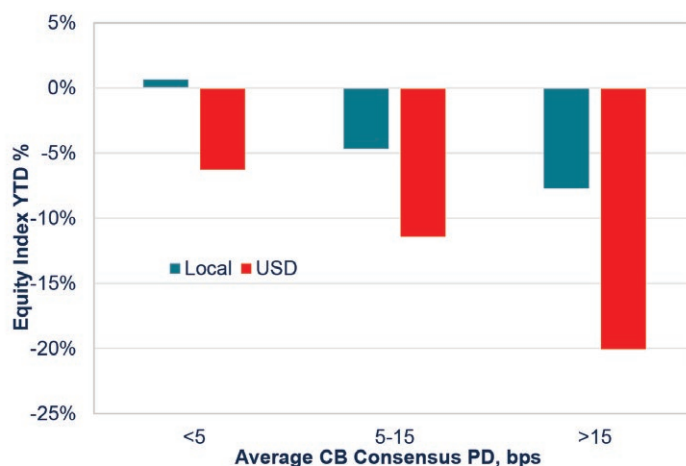


Exhibit 8 shows that currency and equity markets have broadly moved in tandem, so that the combined market and currency impact exceeds the local equity market changes.

Consistent with a general flight to quality, either measure shows that the declines in equity markets so far this year have been proportionately greater in the countries with higher Consensus PDs.

It is possible that Consensus PD changes may have a role in tracking regime shifts, such as the move from ‘risk on’ to ‘risk off’. For example, if the correlation between market movements and Consensus PDs breaks down, it may signify the emergence of a new or dormant factor which takes over from the usual risk on / risk off axis.

The next chart, Exhibit 9, shows the changes in USD based equity index levels, decomposed into local index and exchange rate components.

Exhibit 9: Local Equity Index and Exchange Rate Changes Jan-Aug 2015

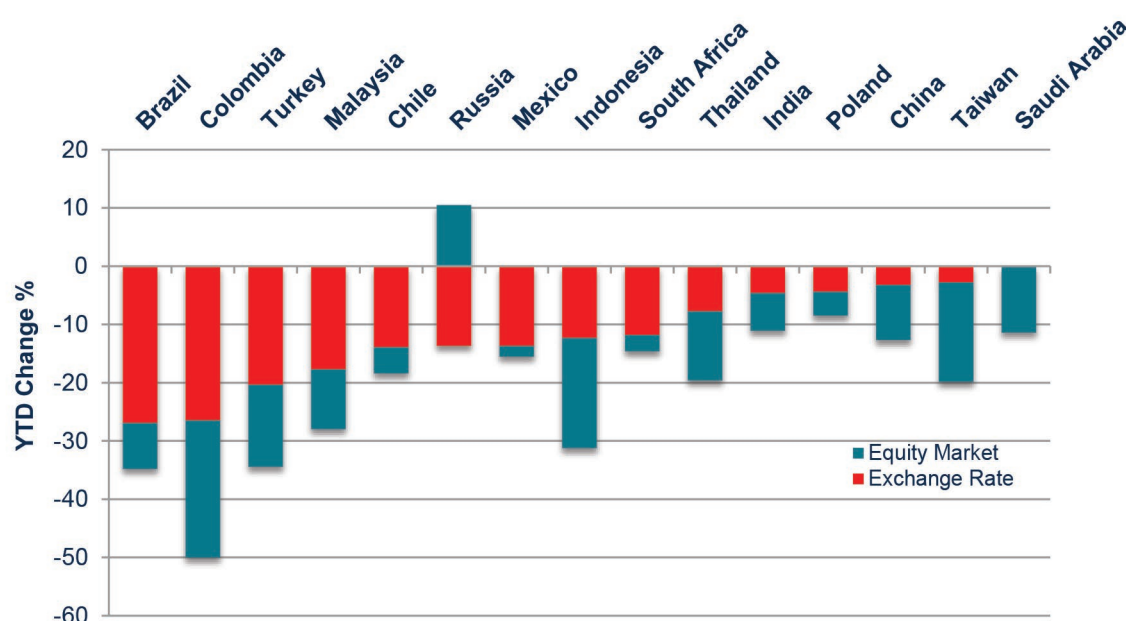


Exhibit 9 shows that the 2015 mix of currency and local equity components of USD changes are very different across individual equity markets¹¹. This again suggests that, at the portfolio level, Consensus PD estimates might provide advance warning of equity market or exchange rate over-valuation. This is similar to the analysis in our first whitepaper (June 2015) which implied that a predictive signal may exist for portfolios of Sovereign bonds.

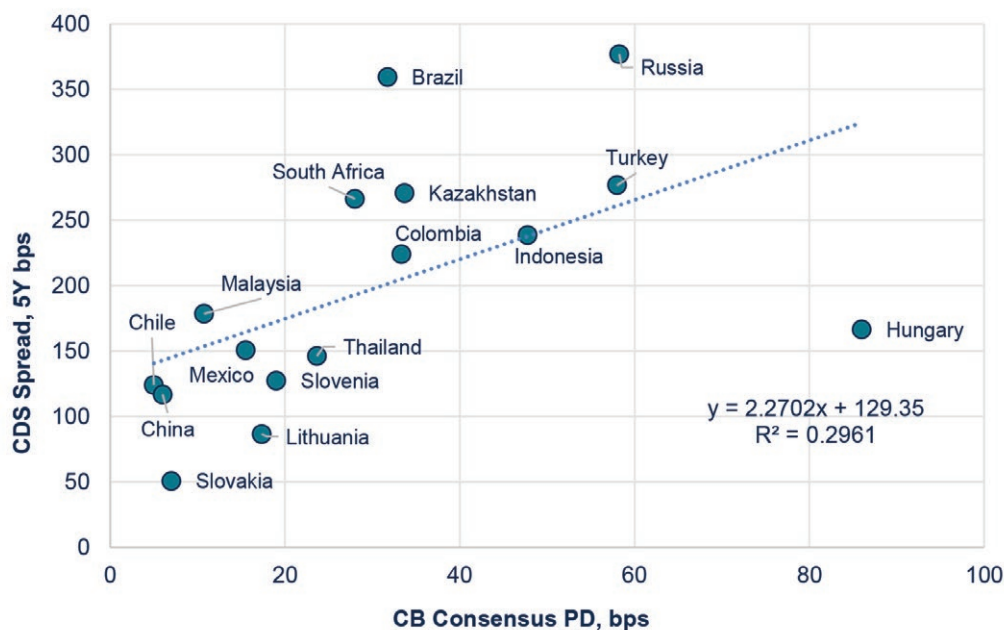
These studies imply that Consensus PDs may offer an alternative form of beta metric, and potentially provides a more flexible risk and regime tracking measure than equity market or exchange rate volatility viewed in isolation.

¹¹ Economist sample overlap with quorate CB PDs.

Consensus PDs and Credit Default Swaps

In our final set of analyses, we examine the relationship between 1 Year Consensus PD and current 5 year \$ CDS:

Exhibit 10: 5Y CDS Spreads vs CB Consensus PD



These 16 data points are based on the overlap between recently traded Sovereign CDS and Consensus PDs. Russia, Brazil, South Africa and Kazakhstan show significant liquidity or counterparty risk premia, or particularly low implied recovery rates. CDS for Hungary, Slovakia, and Lithuania appear to be priced on a very different basis – perhaps implying unusually high implied recovery rates, liquidity risk and/or counterparty risk. For example, the fitted line implies that fully liquid, counterparty-risk-free CDS on Lithuania with typical recovery rates would be priced as $17.3 \text{ Bps} \times 2.2702 + 129.35 = 168.7 \text{ Bps}$ vs the actual price of 86.7.

Recovery rate assumptions are crucial in CDS and bond pricing and these can be estimated from Consensus LGDs. Credit Benchmark is developing a parallel Senior Unsecured LGD dataset. With knowledge of Consensus PDs and LGDs, it will be possible to plot model CDS spreads for all quorate Sovereigns in the current live CB dataset. In a forthcoming paper we will look at this approach in more detail.

Complementarity of Consensus PDs and Credit Rating Agencies

Credit Rating Agencies provide durable long term credit opinions for Sovereigns and Corporates and these are typically used as a baseline for calibration by banks.

Agencies periodically publish ex-post transition matrices and ex-post default frequencies for each rating, but they typically avoid assigning ex-ante PDs to these.

Consensus PDs are complementary to these ratings for a number of reasons:

1. Sovereign Consensus PDs are available for a sizeable universe. Credit Benchmark's coverage is shown in the table on P.3. Credit Benchmark is now also beginning to receive PD estimates for Sovereigns and Government Agencies which are otherwise currently unrated.
2. Beyond Sovereigns, Consensus PDs provide broad coverage of private companies and organizations who may have no rating and who may not have issued any debt or public equity. Credit Benchmark has already mapped over 50,000 legal entities¹² and expects this number to grow significantly each month.
3. Consensus PDs (and LGDs) reflect the large and diverse pool of models validated by regulators, and used by bank risk teams. Crucially, these reflect the views of organizations with a considerable financial stake in the outcome.
4. The spread of PD estimates comprising a consensus figure highlights divergences between different models, and the trend in Consensus PD estimates may give early warning of impending potential changes in Agency ratings, equivalent to the 'Watch' alerts from Agencies.
5. Aggregation of Consensus PDs for large groups of obligors can provide benchmark portfolios to assess ratings for companies or organizations of a particular type (e.g. Airlines, Oil and Gas), or in a particular country (e.g. Hong Kong). These can be complementary to Sovereign ratings and Consensus PDs, by showing trends in particular industries or across entire economies.

¹² As of July 2015.

Conclusions

Consensus Probability of Default (Consensus PDs) estimates can provide valuable additional data when assessing developing country risk, especially when other data sources are incomplete or subject to distortion. In particular, Consensus PDs can be used to challenge, corroborate or augment a number of other common data points:

- › Nominal Bond Yields
- › Inflation Expectations
- › Real Yields
- › Currency/Equity portfolio groups
- › CDS prices
- › Credit Agency Ratings

As this dataset expands, topics for further research include:

1. Are these relationships stable over time?
2. Do these relationships change for other groups of Sovereigns? (E.g. Developed)
3. Do PDs indicate where currency pegs are disguising default risk?
4. Can PDs and LGDs be used to benchmark CDS prices?
5. Can PDs and LGDs be used to determine the liquidity premium in bonds and CDS?
6. Is it possible to create a scorecard which combines these metrics to support asset allocation decisions?

Collective Intelligence for Global Finance

Credit Benchmark is an entirely new source of data in credit risk. We pool PD and LGD estimates from IRB banks, allowing them to unlock the value of internal ratings efforts and view their own estimates in the context of a robust and incentive-aligned industry consensus. The resultant data supports banks' credit risk management activities at portfolio and individual entity level, as well as informing model validation and calibration. The Credit Benchmark model offers full coverage of the entities that matter to banks, extending beyond Sovereigns, banks and corporates into funds, Emerging markets and SMEs.

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