
Investing in emerging market local currency debt

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Abstract Emerging market government debt in local currency is a fast growing asset class. The asset class is new and it therefore offers attractive opportunities for active management. Good data and relatively stable economies make quantitative models for local currency debt reasonable. We suggest a valuation model for local currency debt. The model relates long-term interest rates to economic fundamentals. Our model explains emerging market interest rates reasonably well. An investment strategy based on the model seems promising. Our results suggest that models are useful for investing in emerging market local currency debt.

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Introduction

Emerging market government debt in local currency is a new, promising asset class. Emerging markets used to have no choice but to borrow in hard currency. Currency crises hit emerging markets regularly, and foreign investors shunned local currency bonds. The situation has changed. Emerging markets enjoy strong external conditions (low global interest rates, high commodity prices), and many countries have improved their economic fundamentals. As a consequence, many emerging markets have successfully borrowed in their own currency. The gain for an emerging market government is clear: eliminating currency risk. The gain for an international investor is also clear: an opportunity for investing in a new asset class. The asset class has grown rapidly. Local currency debt accessible to foreign investors

reached 424bn dollars in October 2007, up from 83bn in 2002 (Figure 1).¹

Emerging market local currency debt is a large but under-studied asset class. Local currency debt has outstripped hard currency debt as the main market for emerging market bonds (Figure 1). Yet, most emerging market research focuses on hard currency debt. For example, Kozhemiakin (2005) and Chiang *et al.* (2007) discuss the investment appeal of hard currency debt. Ferrucci (2003), Dailami *et al.* (2005), Buchanan and Ahmed (2006), and Jostova (2006) present models for hard currency debt. JP Morgan introduced indices for local currency debt in 2006 only. The growing dominance of local currency debt calls for more research and for specific investment strategies.

We develop a model for local currency debt. The model lays the foundation for quantitative investment strategies. It is, to our

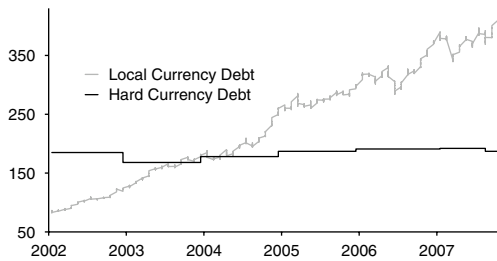


Figure 1 Market value of emerging market government debt, 2002–2007

knowledge, the first model of emerging market local currency debt. The approach relates long-term interest rates to economic fundamentals. More precisely, the model translates economic fundamentals into an estimated ‘fair value’ for long-term interest rates. Deviations from fair value are opportunities for active investment. We simulate such an active investment strategy for 15 emerging markets. Our results suggest that models are useful for investing in emerging market local currency debt.

Promising results for quantitative strategies are not surprising. Successful quantitative investing requires good data and relatively stable economies. Luckily, only the more advanced emerging markets can issue debt in local currency. More advanced nations tend to publish better data and to be more stable. Focusing on local currency debt therefore focuses on emerging markets that quantitative investing suits best. Moreover, the asset class is relatively new. It is therefore more likely that markets are still imperfectly efficient — offering opportunities for active management.

The paper is organised with sections outlining the model, summarising estimation results, discussing investment simulations, and concluding the study.

Modelling local currency debt

Interest rates determinants

What determines long-term interest rates? Asset pricing theory suggests that long-term rates equal average expected future short-

term rates plus a risk premium. Our model accordingly includes variables that help predict future short-term rates, as well as risk indicators.

Variables influencing monetary policy help predict future short-term rates. Such variables include the following:

- *Short-term interest rates*²: Interest rates are auto-correlated, as central banks change monetary policy only gradually. In other words, today’s interest rate is a useful indicator of tomorrow’s.
- *Inflation*: High inflation suggests that the central bank may need to hike interest rates to bring inflation down. For example, the South African Reserve Bank has a 3–6 per cent inflation target. Inflation breached the upper band in April 2007, reaching 6.3 per cent. The Reserve Bank hiked interest rates at the following three monetary policy meetings to cool inflation. High inflation can also reflect poor economic management, which would command a risk premium on government borrowing.
- *Economic activity*: Fast economic growth may reflect an overheating economy. If so, the central bank may soon raise interest rates to fight inflationary pressures. We use industrial production growth as a proxy for economic activity. GDP would be a more comprehensive proxy. We use industrial production, however, because data are typically of better quality and are available at higher frequencies.

Risk indicators include both local and global variables:

- Local variables.
 - *Budget balance* (as a per cent of GDP). A large budget deficit increases the probability of default and hence the risk premium. For example, Russia ran budget deficits over 7 per cent of GDP in the mid-1990s. Such deficits are not sustainable, and the Russian government defaulted in 1998.

- *Current account* (as a per cent of GDP). Current account deficits bring higher risk. Deficits leave countries vulnerable to sharp capital outflows, as the 1990s crises illustrate. For example, Thailand ran an 8 per cent of GDP current account deficit in 1996. Capital flows financing the current account deficit abruptly reversed in 1997, triggering the Asian financial crisis. Current account deficits may also reflect an overheating economy with excessive consumption and/or investment.
- *External debt* (as a per cent of GDP). High external debt also leaves a country vulnerable to sharp capital outflows. Higher external debt therefore entails a higher risk premium.
- Global variables.
 - *Commodity prices*. Higher commodity prices reduce the risk premium of commodity exporters. Higher commodity prices boost growth and fiscal revenue, lowering the probability that a government defaults. Several emerging markets export commodities. For example, Russia exports oil and gas; South Africa exports minerals. We compute for each exporter a commodity price index that reflects its exports.
 - *Developed economies' long-term interest rates*. Low long-term rates in developed economies reflect abundant global liquidity and/or low risk aversion. Both benefit emerging markets, reducing their risk premium. We use German rates for new EU members, and US rates for other countries.

Figure 2 illustrates the relation between fundamentals and long-term interest rates in the Philippines.

We estimate a model relating long-term interest rates to the above fundamentals. We use an error correction framework. In such a framework, economic fundamentals

determine a fair value for interest rates. Interest rates sometimes deviate from fair value, but they revert to it eventually. We estimate coefficients that translate economic fundamentals into fair value. We also estimate the speed at which interest rates revert to fair value. More precisely, we estimate the following equation for a country i :

$$\Delta LR_t^i = \alpha^i + \gamma^i \Delta X_t + (\rho^i - 1) \times (LR_{t-1}^i - \beta^i X_{t-1}) + \varepsilon_t^i \quad (1)$$

where LR are long-term interest rates; β characterise the fair value coefficients; γ captures the short-run dynamics of interest rates; ρ is the mean reversion parameter; and ε is an error term.

We estimate the above equation in panel, imposing equal coefficients across countries. The restriction reflects our intuition that economic fundamentals are priced similarly in all emerging markets. Using this intuition improves the quality of our estimates.³ Two coefficients are nonetheless country-specific: the coefficient for commodity prices and the constant term. Commodities account for vastly different shares of economic activity in different countries. One therefore expects different pricing of commodity prices across countries. The constant term reflects a country-specific premium that our variables do not capture.

Data

We cover 15 emerging markets. We include countries that issue ten-year bonds foreign investors can invest in. Our panel estimation assumes that bonds are similar. As a consequence, we only include countries that issue local currency bonds at maturity close to ten years. We also restrict our study to bonds that foreign investors can invest in. J.P. Morgan's Global Bond Index for Emerging Markets covers such bonds. We exclude Brazil and Turkey, however, because they do not issue bonds at long enough maturities.

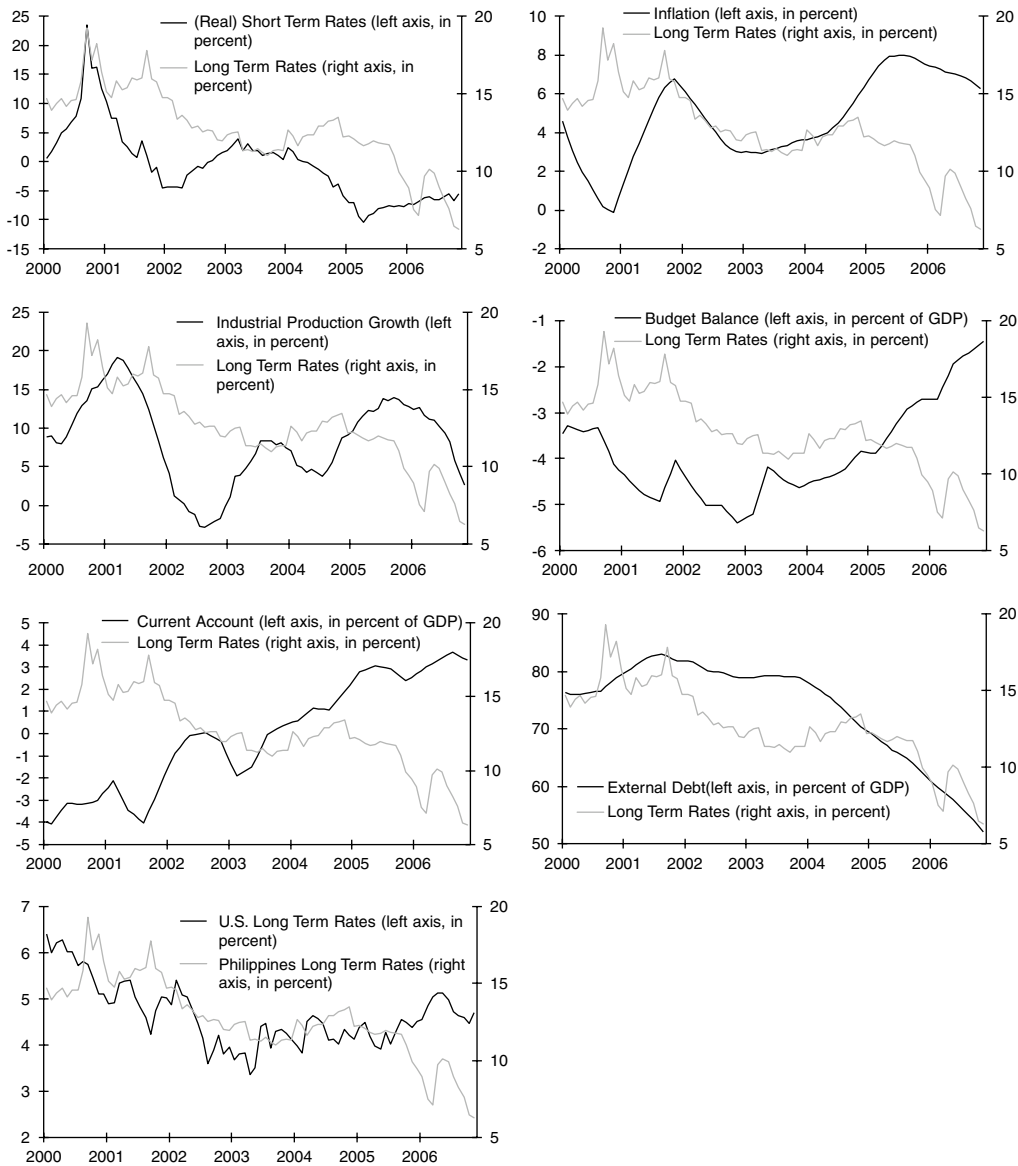


Figure 2 Long-term interest rates and fundamentals in the Philippines, 2000–2006

We add India and the Philippines, as their markets are reasonably liquid and increasingly accessible to foreign investors. Overall, we cover the following markets: Chile, Colombia, the Czech Republic, Hungary, India, Indonesia, Malaysia, Mexico, Peru, the Philippines, Poland, Russia, Slovakia, South Africa, and Thailand.

Our estimation period is 2000–2006. We have pre-2000 interest rate data for a few countries. Including data before 2000 would

be problematic, though. Financial crises hit several markets in the late 1990s. Markets tend to price fundamentals differently during financial crises. Moreover, several countries conducted far-reaching structural reforms after the crisis. Starting our estimation after the 1990s crises should therefore yield better estimates.

We use monthly data. Financial data come from Bloomberg. Economic data come from the IMF and the OECD. We use national

sources or consensus data for filling in gaps in historical data. Interest rates are Bloomberg's generic ten-year yields when available. Otherwise, we use the rate of the vanilla bond whose maturity is closest to ten years.

Model vs reality

How well do fundamentals explain interest rates?

Observed interest rates are close to their estimated 'fair value', as Figure 3 illustrates for the Philippines. Monetary policy and risk indicators seem to explain interest rates fluctuations well. Figure 3 also sheds light on emerging rates falling in recent years. Our model suggests that improved fundamentals account for most of the fall.

Fundamentals have an intuitive influence on interest rates. Table 1 presents the econometric estimates. Intuitive estimates further suggest that the model explains interest rates well.

Variables influencing monetary policy affect interest rates. (Real) short-term rates increasing 100 basis point (bp) raise long-term rates by 27 bp. Long-term rates gain 24 bp when inflation moves up 1 percentage point. Industrial production growth quickening 1 percentage point adds 7 bp to long-term rates.

Long-term rates reflect local risk indicators. Budget balance improving 1 percentage point of GDP takes 1 bp off long-term rates. Current account balance contracting 1 percentage point of GDP reduces long-term rates by 9 bp. External

debt falling 1 percentage point of GDP reduces long-term rates by 7 bp.

Improved economic fundamentals can have a substantial impact on long-term rates. For example, our results suggest that the Philippines, turning a 2.5 per cent of GDP current account deficit in 2001 into a 3 per cent surplus in 2006, knocked nearly 50 bp off its long-term rates. The country's reducing its budget deficit from 5 per cent of GDP in 2002 to 1.5 per cent in 2006 took about 5 bp off long-term rates. Overall, improving fundamentals explain why the Philippines can tap international markets at a reduced rate. Difference in fundamentals also helps explain why interest rates differ between countries. For example, Slovakia runs a much smaller current account deficit than Hungary (2 per cent of GDP against 9 for Hungary). Slovakia's healthier current account balance contributes to its lower interest rate. At the end of 2006, its long-term rate was 4.2 per cent, against 6.7 per cent for Hungary. More precisely, Slovakia's healthier current account balance accounts for about 60 of the 250 bp difference in Slovakian and Hungarian rates.

Global variables influence long-term rates as well. EU emerging market rates rise 106 bp when German rates increase 100 bp; non-EU emerging market rates rise 100 bp when US rates increase 100 bp. Higher commodity prices reduce commodity exporters' rates. For example, precious metals' prices rising one standard deviation reduces South African rates by 74 bp.

We tested other potential variables affecting interest rates. The variables turned out not robust across sub-periods. We left these indicators out of the model. Such indicators include sovereign rating, GDP growth in developed economies, indicators of political risk, and implied volatility of US equity.⁴

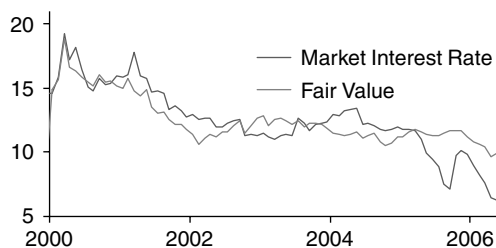


Figure 3 The Philippines: market interest rate vs fair value, 2000–2006 (in per cent)

Investment strategy

Simulating an investment strategy tests our quantitative approach further. We saw that

Table 1 Estimated coefficients

Variable	Estimate	Standard error	t-statistics
<i>Long-term coefficients</i>			
Real short-term rate	0.27	0.08	3.37
Inflation	0.24	0.08	2.96
Budget balance/GDP	-0.01	0.09	-0.13
US ten-year rate	1.00	0.28	3.60
German ten-year rate	1.06	0.27	3.94
Current account/GDP	-0.09	0.06	-1.57
Industrial production growth	0.07	0.03	2.57
External debt/GDP	0.07	0.02	3.25
Commodity prices (Chile)	-0.33	0.20	-1.59
Commodity prices (Colombia)	-0.42	0.20	-2.04
Commodity prices (Mexico)	-0.09	0.13	-0.75
Commodity prices (Peru)	-0.04	0.18	-0.20
Commodity prices (Russia)	-0.38	0.28	-1.35
Commodity prices (South Africa)	-0.61	0.32	-1.89
<i>Short-term coefficients</i>			
Mean reversion	0.88	0.02	50.88
Real short-term rate	0.29	0.02	11.91
Inflation	0.20	0.06	3.44
Budget balance/GDP	0.02	0.04	0.49
US ten-year rate	0.30	0.06	4.91
German ten-year rate	0.82	0.08	9.70
Current account/GDP	0.02	0.04	0.37
Industrial production growth	0.00	0.01	0.42
External debt/GDP	0.17	0.04	4.13
Commodity prices (Chile)	-0.13	0.09	-1.45
Commodity prices (Colombia)	-0.29	0.17	-1.68
Commodity prices (Mexico)	0.02	0.05	0.32
Commodity prices (Peru)	-0.07	0.09	-0.70
Commodity prices (Russia)	-0.02	0.04	-0.52
Commodity prices (South Africa)	-0.32	0.18	-1.72
Volatility of US equity	0.02	0.00	5.23
<i>Constants</i>			
Chile	3.08	3.28	0.94
Colombia	6.89	2.39	2.89
Czech republic	-1.49	1.09	-1.36
Hungary	-4.60	1.61	-2.86
India	-0.72	1.46	-0.50
Indonesia	1.89	1.86	1.01
Malaysia	-3.54	1.69	-2.09
Mexico	2.12	2.07	1.02
Peru	-1.07	3.84	-0.28
Philippines	-0.19	2.09	-0.09
Poland	-2.80	1.24	-2.25
Russia	6.21	4.45	1.40
Slovakia	-4.93	1.53	-3.21
South Africa	4.35	2.29	1.90
Thailand	3.08	3.28	0.94

the model estimates fair value for long-term interest rates. Deviations from fair value are opportunities for active investment. Our approach assumes that rates revert to fair value. We simulate an investment strategy based on this assumption. Results illustrate the potential benefits of quantitative

investing in emerging market local currency debt.

A preliminary step before simulating a portfolio is computing how accurately the model predicts whether interest rates will go up or down. Table 2 presents the results for three-month forecasts. The model predicts

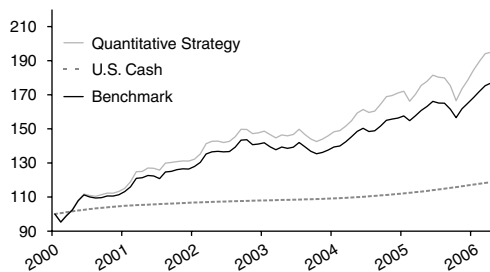
Table 2 Success rates based on mean-reversion, 2000–2006 (in per cent)

Total
77
57
53
66
52
64
58
53
71
64
54
50
52
58
47
58

Table 3 Simulation's summary statistics, 2000–06

	Benchmark	Quantitative strategy
Sharpe ratio	1.08	1.20
Average return (annual, in per cent)	9.3	11.0
Volatility (annual, in per cent)	5.9	6.8
Tracking error (annual, in per cent)		1.7
Information ratio		1.0

Our simulation results are specific to the sample period. One should therefore exercise caution before extrapolating them. The results nonetheless suggest that models for emerging market debt can make investment sense.

**Figure 4** Cumulated returns, 2000–2006 (2000 = 100)

directions of rate changes with nearly 60 per cent success.

We then simulate an active portfolio strategy. We overweight countries whose rates are higher than fair value (anticipating rates falling back to fair value); we underweight countries whose rates are lower than fair value (anticipating rates raising back to fair value). The benchmark is the equally weighted sum of all (hedged) interest rates. The Appendix presents the strategy in greater detail.

Our portfolio outperforms its benchmark. The portfolio yields better returns, as Figure 4 illustrates. Volatility is a bit higher (Table 3). Information and Sharpe ratios imply that extra returns compensate the modest increase in volatility (Table 3).

Conclusion

Emerging market local currency debt is a fast growing asset class. The asset class is new and it focuses on relatively stable economies. It is therefore a reasonable candidate for quantitative investing. We have modelled local currency debt. Results suggest that models are useful for investing in local currency debt. Given how quickly emerging markets develop, models for local currency debt will likely become widespread over the next few years.

Acknowledgments

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Notes

1. Figures are market values for JP Morgan's Government Bond Index — Emerging Markets (GBI-EM).
2. We use real rather than nominal interest rates. Nominal interest rates are highly correlated with inflation, which causes econometric issues.
3. Imposing the restriction yields much better econometric estimates. Estimating Equation (1) without restrictions would give very imprecise coefficients. Local currency debt is a new asset class, and we therefore have few observations to base our estimates on. For example, interest

rate data for Chile start in 2005, totalling fewer than 20 monthly observations. Estimating a model with fewer than 20 observations would yield very imprecise coefficients. Imposing equal coefficients across countries circumvents the problem. Each estimate uses all observations from all countries. The estimate is therefore more precise.

4. Implied volatility does not impact interest rates' fair value. We find that it impacts rates in the short run, however.

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Appendix Investment strategy

Our strategy assumes that interest rates revert steadily to fair value. Expected interest rate one period ahead is therefore the following: $E(LB_{t+1}) = LB_t + (\rho - 1)(LB_t - \overline{LB}_t)$, where \overline{LB}_t is the rate's fair value.

We construct a signal for each interest rate. The signal is three-month expected return hedged in US dollars divided by returns historical volatility. The strategy aims to beat a benchmark, which is the equally weighted sum of all (hedged) interest rates. We use the following decision rule:

- $\text{Signal} > 1.5 \Rightarrow$ over-weight country 10 per cent.
- $1.5 > \text{signal} > 0.5 \Rightarrow$ over-weight country 5 per cent.
- $0.5 > \text{signal} > -0.5 \Rightarrow$ stick to benchmark.
- $-0.5 > \text{signal} > -1.5 \Rightarrow$ under-weight country 5 per cent.
- $\text{Signal} < -1.5 \Rightarrow$ under-weight country 10 per cent.