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Understanding Emerging Market Sovereign Bond Yield Spread: Role of Default and Non-Default Determinants

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This paper is motivated by the fact that emerging market assets size has been expanding and trying to use sovereign debt market as part of capital market as main research focus. It is highlighting the distinction between default and non-default determinants and examining their significance in explaining emerging market sovereign bond yield spread. Using Cross-Sectional Fixed-Effect Panel Estimator, we found that both default (as proxied by Credit Rating and Outlook Index) and non-default (as proxied by 3-month Fed Funds Futures) determinants has significant explanatory power to sovereign bond yield spread. Extensively, we also found the significance to add volatility of 3-month Fed Funds Futures and Fed Target Rate basis and volatility of advanced stock markets as variables to stand for non-default determinants in the model. The significance of the latter model is strengthened by higher forecasting as well as indicates the significant role of US market to emerging market sovereign bond market.

Keywords: *emerging market, sovereign bond, asset pricing, default determinant, financial market risk, excess return, credit rating, global liquidity, financial stability*

Introduction

Research about the existence of irrational exuberance[1] which makes asset looks more promising than it actually is, has been a call to deeper action on analysing financial market. With its growing amount, sovereign bond market becomes one of the most interesting market that has been explored these days related to asset pricing, especially knowing that sovereign credit event is no longer a novelty phenomena. Assets that are priced correctly will benefit the economy through the fact that it creates resilient and stable financial system which is a necessary condition for a sustainably growing economy. Some other researchers even articulate that studying yield is important for the purpose of understanding crisis (Arellano, 2007).

To answer the question above, a model should have a strong underlying emerging market theory. Problem that may encounter is when a sovereign entity like emerging market countries has to offer higher yield in order to attract lenders. This 'extra incentive', therefore, has been topic of discussion for years, whether it can be explained by only default determinants like credit rating and its outlook (Hartelius, 2008), terms of trade (Kucuk, 2010, Hilscher and Nosbuch, 2010), debt to Gross Domestic Product ratio (Bernoth and Erdogan, 2012), or it can also be explained by other than default determinants, such as liquidity (Hartelius, 2008), macroeconomic cycle (Kozhemiakin, 2005) and aggregate market risk (Kucuk, 2010, Bernoth and Erdogan, 2012).

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[1] firstly used by Alan Greenspan, the chairman of the Federal Reserve Board on December 5, 1996, referred to a belief that the stock market have been bid up to unusually high and unsustainable levels under the influence of market psychology (Shiller, 2000).

Eventhough some studies suggests that we should focus on non-default determinants, other empirical studies do not always show satisfying result, such as the one conducted by Eichengreen and Mody (1998), Kamin and von Kleist (1999), Sløk and Kennedy (2003), and McGuire and Schrijvers (2003), and Dignan (2003) that find a negative or inconclusive relationship for liquidity factor.

This paper attempts to distinguish between default and non-default determinants in explaining emerging market sovereign bond yield spread using fixed-effect approach and at the end of the day to try to analyse if there is a likeliness that a country's spreads are excessively high or excessively low, based on the former theory.

Literature review

Most of the literatures that specializes in asset pricing are focusing on basically two things that should be considered as main aspects to price an asset from its actual value, which are fundamental value (which in this paper is referred to as 'default component) and other extra amount that can rationally be added (which in this paper is referred to as 'non-default component') –this is in line with basic rational valuation of asset formula[2]. However, analysing the movement of an asset price is somewhat difficult, because in the later days, financial market has been inevitably getting more complex, volatile, thus many factors can account for a single change in the market. To be more specific, to observe emerging market is a different case, as seconded by Bekaert, et al. (1998) in the case that emerging market returns sharply differs from the behaviour of developed market returns. It is well known that emerging markets are more likely to experience shocks induced by regulatory changes, exchange rate devaluations, and political crises. This market is considered different enough that they are often considered as a lone category in asset class eventhough some standard portfolio analysis are often applied to these markets.

By conducting this study, we expect to find that there is no 'excess return' in the market as well as 'irrational' argument in explaining the high yield offered by emerging market governments (or that market is efficient enough and all other things than the fundamentals are in acceptable level), although it is pretty obvious from discussion above that emerging market is relatively more fragile therefore such thing has high likeliness to exist. Furthermore, it wants to encourage investors to improve the way they create expectation and see asset price, and therefore to object to look at default probability matrix such as one given by International Credit Rating Agency (CRA) alone to determine how much nominal yield compensation should require. Eventhough some of the results about non-default determinants significance does not seem really satisfying (such as the result of study conducted by Dignan (2003)), this idea is agreed by other researchers, such as Agrawal, Elton, Gruber, and Mann (2001) that found that even with historically extreme default rates, required premiums, because of expected losses, are too small to account for nominal spreads.

On the test of whether spread can be explained by fundamental improvement, Ciarlone, Piselli, and Trebeschi (2007) found that due to the particularly benign global financial conditions in recent years, spread seems to not follow the fundamental improvement, so the yield is cheaper than it actually is represented by its fundamentals. On the other hand, on the test whether spread can be explained by liquidity spillover, results has been less than satisfying, Eichengreen and Mody (1998), Kamin and von Kleist (1999), Slok and Kennedy (2003), and McGuire and Schrijvers (2003) all find a negative or inconclusive relationship.

Research Method

Data

Detail of each of the variables and their proxies are as follows.

a. *Emerging Market Bond Spreads*

For emerging market sovereign bond spread variable, we are using 33 countries

[2] In rational valuation formula, factors like volatility and bubble can have a justifiably rational level to be priced in assets (Cochrane, 2001).

based on JP Morgan's EMBI[3] criteria. The starting date of each country's index varies because of the strict liquidity and structural criteria. There will possibly be missing data in the middle of the series, therefore data splicing may be needed to get longer series (please refer to Appendix 1).

b. *Fed Funds Futures*

The Fed uses a target rate for Fed Funds to transmit of its monetary policy objectives and this rate has become a market-wide benchmark for various financial activities. For this reason, we look at the implied yield on the 3-month Fed Funds futures and evaluate how market expectations of future U.S. monetary policy affect the emerging market bonds.

c. *Volatility in the Fed Funds Futures Market*

Uncertainty of future U.S. monetary policy is perceived to have a large impact on the financial markets, making decisions about financial risk allocation more difficult. To measure this uncertainty, we used the difference between the implied yield of three-month Fed Funds futures contract and the target rate at a daily frequency. In a rolling 90-calendar day window, we calculated the standard deviation of the difference. The daily series of standard deviation was then averaged over each month.

d. *Volatility Index of S&P 500 (VIX)*

The Chicago Board Options Exchange (CBOE) Volatility Index, denoted "VIX," is based on the S&P 500 options prices. The VIX is often used as a proxy for investor's attitude toward risk and appears to explain movements of the emerging market bond spread in recent years. The spread compression seems to coincide with the reduction of the VIX, which is generally interpreted as increased investor risk appetite.

e. *Hartelius' Credit Ratings and Outlook Index (CROI)*

In order to define default determinant, this paper will follow the theory that credit rating is a most used measurement for default risk as, and improved by adding outlook attribute into it with some calculation and assumption that Credit Rating, Outlook, and obligor's risk has non-linear relationship (Hartelius, 2008)[4]. The calculated index can be seen in Table 1 below.

Methodology

After understanding the panel dataset, we will move into discussing what method we are using.

a. *Unit root test*

As a starting point, we examine the time series properties of our underlying variables. Where there is little theoretical reason to believe that there is non-stationary variable[5] in the long run, a unit root test is still needed to be conducted as the former theoretical reason does not necessarily warrant non-stationarity characteristic. However, If series are found non-stationary, further we will test for cointegration.

b. *Fixed effect model: general explanation*

As our research question is more descriptive- and less technical, it will be an advantage to use model that follows parsimonious principal which is accommodated by fixed-effect model. In general term, according to Brooks (2008), setup of estimating a panel data is as described in the following equation:

$$y_{it} = \alpha + \beta x_{it} + u_{it} \qquad 1)$$

where y_{it} is the dependent variable, α is the intercept term, β is a k×1 vector of parameters to be estimated on the explanatory variables, and x_{it} is a 1 × k vector of observations on the explanatory variables, $t = 1,\ldots,T; i = 1,\ldots,N$. The simplest way to deal with such data would be to estimate a pooled regression, which would involve estimating a single equation on all the data together, so that the dataset for y is stacked up into a single column containing all the cross-sectional and time-series observations, and similarly all of

[3] EMBI is a frequently used index and a rigorous benchmark in emerging market sovereign debt.

[4] Kaminsky et al. (2003) and Sy (2002) also refer to the importance of outlooks in their analysis of the spreads

[5] CROI is an index built by Hartelius (2008) which is constructed through dividing bonds into investment grade and non-investment grade categories, and further differenciate it with its negative, stable, and positive issuer outlook.

Table 1. Credit Rating-Outlook Index (CROI)[6]

Category: Sovereign Long-Term Credit Ratings	Credit Outlook (O)		
	Stable (STA)	Positive (POS)	Negative (NEG)
Aaa	1.0	0.0	2.7
Aa1	2.0	1.0	3.7
Aa2	3.0	2.0	4.7
Aa3	4.0	3.0	5.7
A1	5.0	4.0	6.7
A2	6.0	5.0	7.7
A3	7.0	6.0	8.7
Baa1	8.0	7.0	9.7
Baa2	9.0	8.0	10.7
Baa3	10.0	9.0	11.7
Ba1	11.0	10.1	12.7
Ba2	12.0	11.1	13.7
Ba3	13.0	12.1	14.7
B1	14.0	13.1	15.7
B2	15.0	14.1	16.7
B3	16.0	15.1	17.7
Caa1	17.0	16.1	18.7
Caa2	18.0	17.0	18.0
Caa3	19.0	18.0	19.0
Ca	20.0	19.0	20.0
C	21.0	20.0	21.0
D	22.0	21.0	22.0

Source: Hartelius (2008)

the observations on each explanatory variable would be stacked up into single columns in the x matrix. Then this equation would be estimated in the usual fashion using OLS. To see how the fixed effects model works, we can take equation (1) above, and decompose the disturbance term, u_{it}, into an individual specific effect, μi , and the 'remainder disturbance', v_{it}, that varies over time and entities (capturing everything that is left unexplained about y_{it}).

$$u_{it}=\mu_i+v_{it} \qquad 2)$$

So we could rewrite equation (1) by substituting in for u_{it} from (2) to obtain

$$y_{it}=\alpha+\beta x_{it}+\mu_i+v_{it} \qquad 3)$$

Where μ_i encapsulating all of the variables that affect y_{it} cross-sectionally but do not vary over time, which we do not have in this case. This model could be estimated using dummy variables, which would be termed the least squares dummy variable (LSDV) approach:

$$y_{it} = \beta x_{it} + \mu_1 D1_i + \mu_2 D2_i + \ldots + \mu_L DN_i + v_{it} \qquad 4)$$

where $D1_i$ is a dummy variable that takes the value 1 for all observations on the first entity (e.g. the first firm) in the sample and zero otherwise, $D2_i$ is a dummy variable that takes the value 1 for all observations on the second entity (e.g. the second country) and zero otherwise, and so on. When the fixed effects model is written in this way, it is relatively easy to see how to test for whether the panel approach is really necessary at all. This test would involve incorporating the restriction that all of the intercept dummy variables have the same parameter $(i.e.\, H_0\!:\mu_1=\mu_2=\ldots=\mu N)$. If this null hypothesis is not rejected, the data

[6] Stationarity series can be defined as one with a constant mean, constant variance, and constantautocovariances for each given lag (Brooks, 2008).

Table 2. Basic Model Estimation Result with CROI*

Dependent Variable: Log of EMBI Sovereign Bond Spreads (SPREAD)			
Explanatory Variables	Coefficient	Standard Error	p-value
Fundamentals (CROI)	0.171237	0.004922	0.0000**
3-month Fed Funds Future Rate (FED)	-0.053636	0.004006	0.0000**
Constant	3.724298	0.054652	0.0000**
R-squared	0.578196		

*The result based on cross-sectionally fixed effect regression using 4535 monthly observations
**Determining independent variable significant explanatory power
Source: Bloomberg, Author's Calculation, Moody's, Quandl

can simply be pooled together and OLS employed. If this null is rejected, however, then it is not valid to impose the restriction that the intercepts are the same over the cross-sectional units and a panel approach must beemployed.

c. *Basic model*
In this basic model, we are going to estimate fixed effect panel regression model with log of bond spreads (SPREAD) being the dependent variable while Credit Rating and Outlook Index (CROI) and the 3-month ahead US Fed Funds futures' rate (FED) being the independent variables. Below is the form of the basic model:

$$InSPREAD_{it} = \alpha_i + \beta_1 FUNDAMENTALIS_{i,t} + \beta_2 FED_{i,t} + e_{it} \quad 5)$$

Where e_{it} is a random error. The explanatory variables included in this regression are fundamentals and 3-month Fed Funds futures rate (FED).

d. *Extended model with volatility*
Next, we estimate the following fixed-effect panel regression model by OLS.

$$InSPREAD_{it} = \alpha_i + \beta_1 FUNDAMENTALIS_{i,t} + \beta_2 FED_{i,t} + \beta_3 VFED_{i,t} + \beta_2 VIX_{i,t} + e_{it} \quad 6)$$

where e_{it} is a random error. The explanatory variables included in this regression are: 3-month Fed Funds futures rate (FED); the volatility of the Fed Funds futures market (VFED) represented by the 90-day rolling standard deviation of the difference in fed funds futures rate and fed funds target rate; the Volatility Index (VIX) for the S&P 500; and the fundamentals.

Result and Discussion

a. *Unit root and cointegration test result*

Based on unit root test, not all individual variables is stationer in level data. As the test result shows, VFED and VIX does not have unit root in its level data, while results are still mixed for lnSPREAD and FED. Fundamental variable test result (CROI), on the other hand, cannot reject the null hypothesis, which means it contains unit root in its level data, while on its aggregate data (ACROI) the result is still mixed. In regard with the result, one option to do is to convert the data into first difference, because as we further test it, when first differenced, all variables are stationer. However, in this case, first differencing process most probably lead to less meaningful results, for example first difference data of Sovereign Bond Yield Spread (lnSPREAD) may have no meaning. In order to undermine the stationarity and focus on analysing the level data, we can conduct cointegration test which will examine whether some variables are moving together with or without some orders.

From the countegration test result, it can be concluded that all four variables are cointegrated moving at least in order 1. This finding is important because beside providing justification for us to continue using the current form of data to our model, it also substantiates that there is a long run relationship between US market and emerging market which maybe of interest

Table 3. Extended Model with Volatility Estimation Result: with CROI and aggregated CROI (ACROI)*

Dependent Variable: Log of EMBI Sovereign Bond Spreads (SPREAD)							
Explanatory Variables	Coefficient	Standard Error	p-value	Explanatory Variables	Coefficient	Standard Error	p-value
Default component: Fundamentals (CROI)	0.169170	0.004242	0.0000	Default component: Fundamentals (ACROI)	0.150533	0.007305	0.0000
Non-default component: 3-month Fed	-0.037515	0.003630	0.0000	Non-default component: 3-month Fed	-0.072996	0.004775	0.0000
Funds Future Rate (FED)				Funds Future Rate (FED)			
Volatility of the Fed Funds futures market (VFED)	-0.115006	0.058679	0.0501	Volatility of the Fed Funds futures market (VFED)	-0.110278	0.065266	0.0912
Volatility Index (VIX)	0.033845	0.001098	0.0000	Volatility Index (VIX)	0.030149	0.001240	0.0000
Constant	3.010286	0.051463	0.0000	Constant	3.821622	0.055628	0.0000
R-squared	0.686956			R-squared	0.612898		

*the result based on cross-sectionally fixed effect regression using 4535 monthly observations. Aggregated CROI is computed using each countries' market capitalization weight.
Source: Bloomberg, Author's Calculation, Moody's, Quandl

for both researchers or market participants in international diversification matter[7].

b. *Basic Model Estimation Output*

As mentioned in the previous chapter, we first estimate a fixed effects panel regression model with the log of bond spreads (SPREAD) as the dependent variable and only two explanatory variables; fundamentals as captured by rating (CROI) and 3-month fed funds future rate (FED). Table 2 below indicate the regression result based on this model. Although we intended to run the model for 33 countries as suggested by Hartelius (2008), due to limited data availability on the credit ratings and outlooks, 27 countries are included in the estimation[8].

As can be seen from Table 2 above, both default and non-default components can significantly explain sovereign spread as their p-value are all smaller than 5% significance level which implies that null hypothesis of no significant relationship between dependent and related independent variable can be rejected. If we look at each variable, it can be seen that default component has positive contribution to the spread, which is theoretically true, because the higher is the log of CROI, the higher the default risk of an obligor / issuer, and the higher the spread of the yield its bond gives. In the case of non-default component, which is 3-month Fed Funds future rate, the lower the rate, the higher the spread which is quite untrue theoretically because lower rate should mean more liquidity in the market, and therefore should make the spread more compressed. Fact that we find signifi-

[7] There is a study especially in stock market matter that was conducted by Wong, et al. (2004) that highlight a similar finding that t there is co-movement between some of the developed and emerging markets.

[8] Algeria, Cote d'Ivoire, El Savador, South Korea, and Ukraine are excluded because of lack availability in spread data, while Argentina is excluded because the crisis values for its spreads in 2001–2002 represented extreme outliers relative to any other historical period.

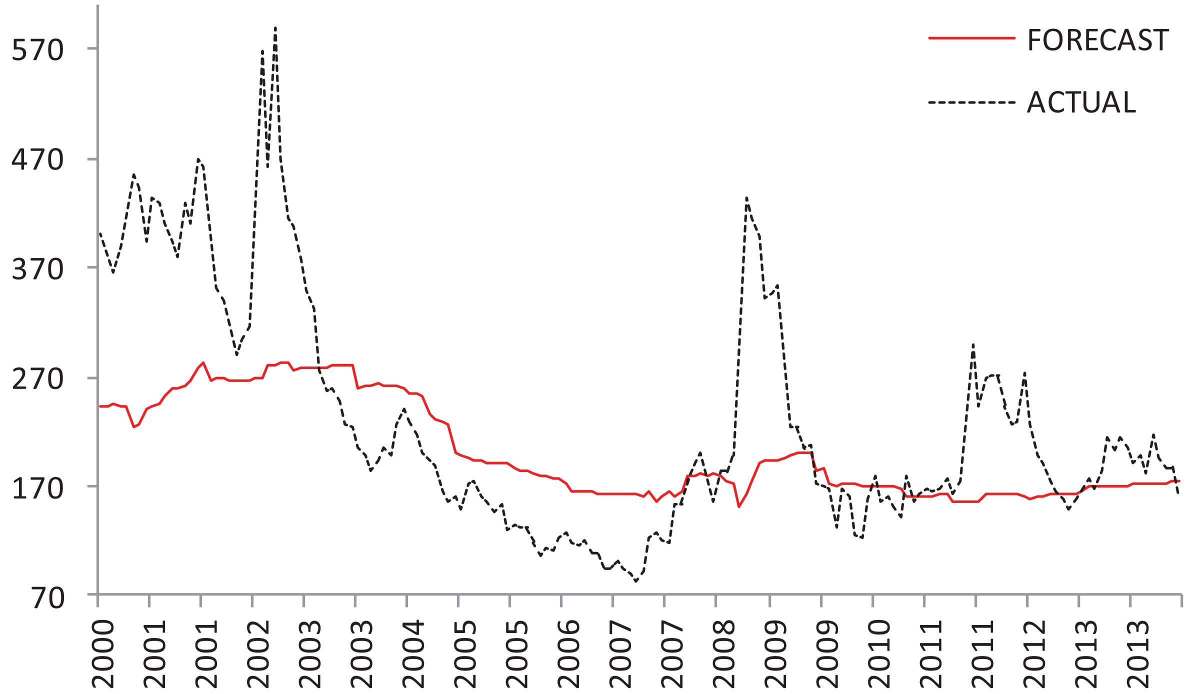

Figure 1. EMBI Sovereign Bond Yield Spread: Actual vs Forecast from Basic Model
Source: Bloomberg, Quandl, Author's Calculation, Eviews

cant explanatory power in basic model, is in line with literatures in general and yet contrasting with some papers. From Hartelius (2008), it is crucial to note that the variables in the basic model did not show significant explanatory power (which lead to conclusion to extend the model by adding volatility variables) and Dignan (2003) which finds that market participants should focus to default component rather than non-default component.

In term of R-squared, as we can see, the R-squared is 57% which means the model can explain 57% of the actual relationship between sovereign spread and its default and non-default components. In term of relationship sign between variables, as can be seen from the table, CROI has positive sign of relationship which means degradation of CROI will be compensated by higher yield, which means default risk move in the same direction with overall risk represented by yield spread. For the FED variables, the sign is negative which means any monetary tightening will lower yield spread, which is not likely the case when monetary tightening is expressed by higher interest rate. An improvement to the model is then expected.

c. Extended Model with Volatility Estimation Result

Next, we add volatility variable to the model. Besides, we will also add aggregated CROI to smoothen the country's profile variability. As can be seen from Table 3 above, all variables in the former model that use individual countries' CROI shows significant explanatory power with 95% confidence level. This particularly can be seen from the p-value of all independent variables which are lower than 5%. However, in the latter model above, it can be seen that one of the non-default component variable, Volatility of 90 days Fed Funds Future 3-month and Fed Target Rate basis (VFED) has p-value bigger than 5% which means it null hypothesis of no relationship between VFED and lnSPREAD cannot be rejected. Eventhough it cannot be rejected, we can still use our judgement if 10% significance level is also enough to determine the goodness of fit of the model.

In terms of R-squared, we can see that the R-squared level is improving from 57% explanatory power from the basic models to

Table 4. Sign Prediction Power Basic Model

Model	Number of correct sign	Number of incorrect sign
Basic Model	Aggregated: 86 of total 167 51,5%	Aggregated: 81 of total 167 48,5%
	Country-Specific: 2329 of total 4535 51,3%	Country-Specific: 2206 of total 4535 48,7%

Source: Eviews, Author's Calculation

69% from the extended model 1 and 61% from the extended model 2.

For the sign of the variables, we can see that default risk has correct sign, which is positive for that means the higher the risk, the higher the spread. However, the case is pretty mixed for non-default component. While VIX sign is correctly positive, for FED and its extended variable, VFED, the sign is negative which is contradictive with the theory that the more liquid the market, the lower the spread that should be compensated in the yield. A dummy variable which should have been able to signify structural break maybe of interest for further research.

In term of significance of default and non-default determinants in explaining spread, this paper' findingis in line with most of literatures (as explained before). In term of model's goodness, other literature for example Comelli (2012), Csonto and Ivaschenko (2013), Hartelius (2007) with similar model structure (non-rating fundamental variables and liquidity) has about 57-77% R-squared which therefore, our model is in line with the exisiting literature.

d. *Forecast result*

In presenting the forecast result, we are going to divide each model into two subcategrories as used in generating estimation output, which are 1 for model using country-specific CROI and 2 for model using aggregated CROI. Furthermore, as the forecasted sovereign spread is in natural log form, we will convert it back to its actual value using following formula:

$$\textit{spread (in basis points)} = e^{\text{forecasted ln } \textit{SPREAD}}$$

d.1 Basic Model

Figure 6 above shows us the *re*sult of out of sample forecast using Basic Model. Eventhough the estimation result shows the capability of the model to explain relationship between variables in the panel, in terms of forecasting, the model's forecasted data gets deviated quite a lot from the actual data, as we can see on the Figure 1 above especially during extremely volatile period like 2002-2003, 2008-2009, and 2011-2012. It can be noted also that in the earlier period, the model seemed to have very low contribution to the sovereign spread analysis, this is suspected to be due to the overall increasing market volatility's effect that spill over sovereign bond market –recall how differently market has behaved ever since one of the most dramatic bull market in most of developed market like us for instance, which is on 1982 that resulted in an asset price rocketing, especially on 2000s when it was referred to as millennium boom (Shiller, 2001) which incorporate many precipitating factors such as internet openness, baby boom, or other events (Shiller, 2001).So clearly no model would have predict this highly extraordinary situation.

On the other hand, 2008-2009 was the event of the subprime-mortgage crisis in the US that has turned to be global-scale financial crisis that also spilled over sovereign bond market. Similar with that, in 2011-2012 was generally hard time for sovereign obligor since the biggest 'scene' happened during that period –recall Eurozone debt crisis. Factors like this is very likely to not be able to be captured in a model.

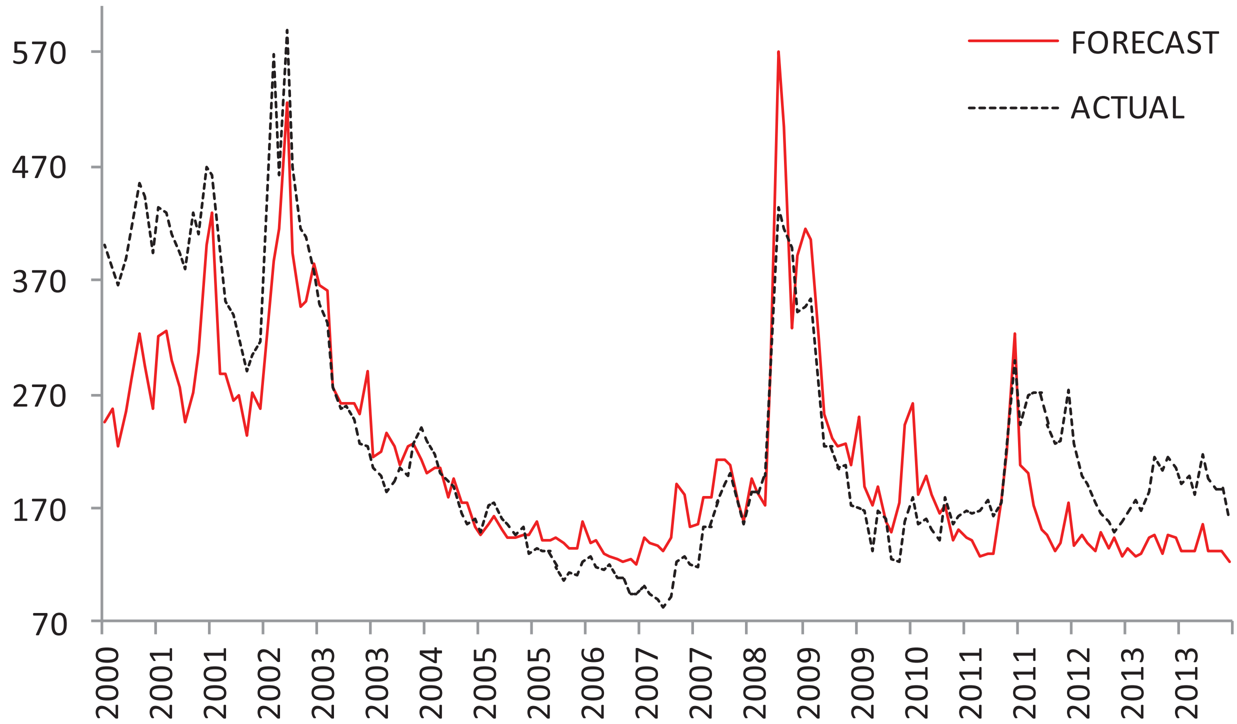

Figure 2. EMBI Sovereign Bond Yield Spread: Actual vs Forecast from Extended Model
Source: Bloomberg, Quandl, Author's Calculation, Eviews

Table 5. Sign Prediction Power Extended Model with Volatility

Model	Number of correct sign	Number of incorrect sign
Extended Model with Volatility	Aggregated: 116 of total 167 69,46%	Aggregated: 51 of total 167 30,53%
	Country-Specific: 3058 of total 4535 67,4%	Country-Specific: 1477 of total 4535 32,6%

Source: Eviews, Author's Calculation

To state some conclusions, the model seem able to capture the trend or the sign of change of actual lnSPREAD, but not the amount. For sign prediction, it can be seen from Table 4 below that basic model is about half good in predicting sign of change of the actual spread. Compared to other literature like Comelli (2012) that has about 68% success rate in predicting direction of lnSPREAD's monthly changes, this basic model is not yet good in general therefore it is recommended to look further to our other models.

d.2 Extended Model with Volatility

It can be said that model can forecast the data well, especially around 2001 to 2011, but the forecast deviates quite high before and after that period eventhough speaking about trend it still resembles the actual data. The model does less well in the early part of the sample in part because the sample is sparse and the volatility of actual spreads is quite high. The figure shows that the out-of-sample forecasting ability of the model has increasingly deviated from actual spreads—with the estimated spreads at the end of our sample some 140 basis points above actual spreads. This may reflect an additional "search for yield" that is not captured by the VIX index and the low level of interest rate volatility. Deviations could also be explained by structural shifts in the parameters or a faster decline in issuance of external debt than the previous period, which we do not control for. This "search for yield" phe-

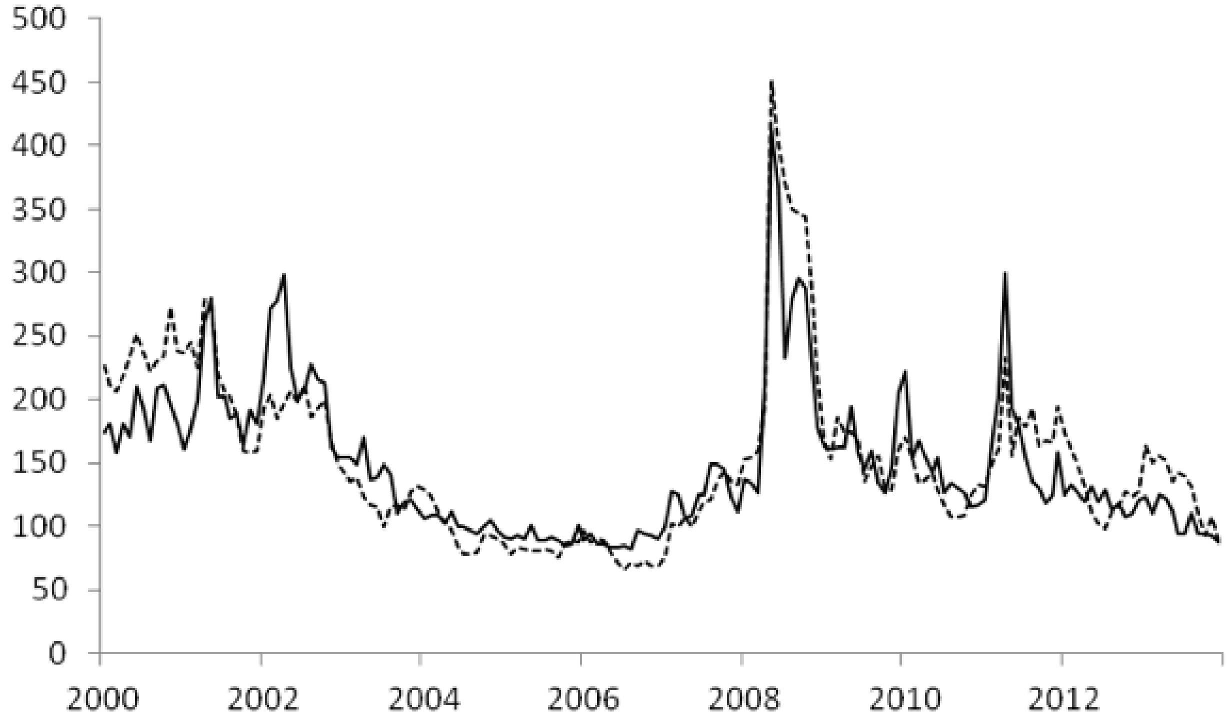

Figure 9. Malaysian Bond Yield Spread: Actual vs Model June 2000–May 2014
Source: Eview

nomena seemed to continue to happen in the latter period.

In term of sign predicting power, as can be shown in Table 5 below, the performance of extended model 1 is much better than basic models.This fact also resembles what is shown in the graphic as well as proving that unlike our basic models, our extended models are equally good with literature in general which has about 68% success rate in sign prediction.

d.3 Countries example: extended model with volatility

As can be seen from two country examples above, graphically speaking, models are good enough to predict the actual bond yield spread, especially for country with high market capitalization (country with low market capitalization does not really fit with the model). The similar problem detected in the early of the period (2000s) when forecast deviates from the actual quite largely, name more than 100 bps.

Conclusion

While it is difficult to see the proportion of non-default component from the model, the estimations show that non-default component, which in this case is US interest rate variables clearly have an effect on emerging market debt spreads. This implies that major developed countries markets such as US can play a role in reducing the risk of any turbulence in the emerging bonds market. A clear communication strategy by the Fed that helps shape market expectations can sustain financial stability by controlling the volatility of the expected U.S. monetary policy in low position, thus contributing to a more modest increase in emerging market spreads when fundamentals start to deteriorate. If much of the behaviour is attributable to non-fundamental factors, we must be aware of the possibility that excessive liquidity has led to another macro-financial risk, which is highly leveraged market.

While liquidity plays an important role, emerging market economies also have a role. To avoid sudden increases in spreads they must put policies in place during "good times" to help insure that their overall fundamentals will not deteriorate. Even when the U.S. interest rate increases, the model shows that they can still offset any negative impact by continuing to improve good economic policies that contribute to better credit ratings.

The model attempts to examine the role of U.S. interest rate effects, global risk appetite, as non-default determinants and emerging market fundamental as default determinant by using a more refined variable for fundamentals following general ideas applied in many other literatures. The new variable utilizes not only rating changes but incorporates the outlooks of obligor as well. This improves some, but not a big deal, of explanatory power. The model is explicitly designed as a descriptive model for the determinants of emerging market bond spreads and does not account for the supply-side of the sovereign emerging market bond market. Future research could attempt to model both the demand and supply side of the market to better capture the effects of U.S. interest rates on emerging market bond spreads. Other areas that author will suggest for future research to cover are as follows.

First, one can also stress more on the measurement of default risk and incorporate more deep investigation either from market participants, academicians, or obligors to get more accurate and wide view on understanding default risk. The use of credit rating has strong theoretical reason, but yet, research on scrutinizing them in wider horizons will surely point our richer findings. Lastly, model that can separate the liquidity effect –thus can help out investors on calculating amount of liquidity factor that has to be compensated to spread–must also be endorsed to be studied[9].

Furthermore, deeper investigation on market efficiency and existence of excess spread (amount that cannot be explained by all relevant variables in the form of default and non-default determinants) should be of interest of further research. This is related to one important finding this research articulates, which is the deviation from forecast values especially in the beginning period of forecast sample which may indicate an existence of excess spread. This must be of interest of further research to actually stress on what makes the spread hiked that high in some periods, is it because there is another factor or variable that explain the spread or is it due to irrational market behaviour that leads to existence of ‘excess spread’?

Lastly, doing further regional analysis which will lead to more interesting finding as well as more correct picture of the market such as the finding of Remolona, Scatigna, and Wu (2008) which finds that Emerging Asian market are the considered as the most mispriced market compared to other market regions[10].

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[9] Not so many literatures that author know of, can do such thing. One similar example is factor model adapted by Badaoui, Cathcart, and El-Jahel (2012) and individual bond pricing model by Dignan (2003).By using factor model, they find that that sovereign bond spreads are less impacted by liquidity risk than CDS spread, for instance they find sovereign bond spreads is explained by default risk 97,08% and 1,73% liquidity risk while CDS spread is explained half by liquidity risk.

[10] Remolona, Scatigna, and Wu (2008) found interesting discovery that actual sovereign risk level is most divergent in Asian region and sovereign risk premia is surprisingly highly correlated. The author judges that it maybe is due to common pricing of Asian sovereign debt after the Asian financial crisis which makes investors see all Asian sovereign bonds as in a basket in price formulation, therefore it is considered as mispriced, that is, underpricing the risk in lower-rated sovereigns that have remained fundamentally weak postcrisis (demanding a relatively lower risk premium) at the expense of higher-rated sovereigns which are being potentially unfairly penalized by investors (with a relatively higher risk premium than is warranted by their restored sovereign risk levels).

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APPENDIX 1
EMBI Sovereign Spread Data Availability June 2000—May 2014

Country (as listed in EMBI)	Data available
Algeria	N/A*
Argentina	June 2000—May 2014
Brazil	June 2000—May 2014
Bulgaria	June 2000—December 2013
Chile	June 2000—May 2014
China	June 2000—May 2014
Colombia	June 2000—May 2014
Cote d'Ivoire	N/A*
Croatia	June 2000—May 2014
Dominican Republic	November 2001—May 2014
Ecuador	June 2000—May 2014
Agypt	July 2001—May 2014
El Salvador	N/A*
Hungary	June 2000—May 2014
Lebanon	June 2000—May 2014
Malaysia	June 2000—May 2014
Mexico	June 2000—May 2014
Morocco	June 2000—May 2014
Nigeria	June 2000—May 2014
Pakistan	June 2001—May 2014
Panama	June 2000—May 2014
Peru	June 2000—May 2014
Philippines	June 2000—May 2014
Poland	June 2000—May 2014
Russia	June 2000—May 2014
South Africa	June 2000—May 2014
South Korea	N/A*
Thailand	June 2000—March 2006
Tunisia	May 2002—May 2014
Turkey	June 2000—May 2014
Ukraine	N/A*
Uruguay	May 2001—May 2014
Venezuela	June 2000—May 2014

*Countries therefore are deleted from sample lists
Source: Bloomberg