MARKET BASED ASSESSMENT OF EXTERNAL DEBT SUSTAINABILITY – EVIDENCE FROM PAKISTAN

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1. An Overview

Sound management of the external debt has been a key concern with the economic policy makers. Economists have used macro-economic indicators for assessing the burden of external debt, such as the ratios of the external debt to exports, debt to gross national product, debt servicing to exports, debt servicing to government revenues. Although these indicators enjoy wide acceptance as measures of a country's indebtedness, these are not well demarcated ratios, which, if exceeded, would signal an unacceptable level of debt. For example, the World Bank has followed a set of parameters, which are used to categorized "moderately" and "severely" indebted countries. However, countries with a higher export growth rates, for example, can support higher external debt relative to a country with a lower exports growth rate, Loser (2004); therefore, only broad guidelines of the external debt sustainability can be laid down. A failure to determine the appropriate levels of sustainable external debt has been a major reason that the external debt related problems have persisted for many developing countries; Muhanji and Ojah (2011).

Academic studies have also mainly been focused on the conventional debt measures, for example, academic research on public debt sustainability by Goktas and Hepsag (2015). Early warning systems (EWS) for sovereign debt crises have also been developed using key economic indicators, for example, Fuertes and Kalotychou (2007). On the other hand, a number of sovereign debt studies have made use of the market based indicators, such as sovereign bond yields. Most of these relate the bond yields to the conventional measures of indebtedness derived from the national accounts. Afonso and Rault (2010), for example, show that markets consider budgetary and external imbalances and inflation as relevant determinants of sovereign yields. Csonto and Ivaschenko, (2013) analyze the relationship between global and country-specific factors and emerging market debt spreads. Poghosyan (2012) studies the determinants of sovereign bond yields. Bellas et al. (2010) find that in the long run, fundamental indicators are significant determinants of emerging market sovereign bond spreads, while in the short run, financial volatility is a more important determinant. Ciarlone and Trebeschi (2005) develop an early warning system for debt crises which integrates the analysis based on macroeconomic variables with the approach based on risky market instruments. Increasing attention is also being paid to the Credit Default Swaps (CDS) spreads as indicators of the debt market perceptions of the sovereign creditworthiness.

The debt market indicators have assumed a greater relevance since in the recent decades there has been a remarkable increase in the private capital flows to the developing countries from issuance of international bonds. There has been a significant rise in new bond issuance by "frontier markets," including, first-time issuers in the international sovereign debt market,

particularly sub-Saharan African countries. Arslanalp and Tsuda (2014) estimate that about half a trillion dollars of foreign flows went into emerging market government debt during 2010–12, mostly coming from foreign asset managers. They also show how the investor based data can be used to assess countries' sensitivity to external funding shocks and to the rebalancing of the foreign investors' portfolio.

This paper evaluates the use of a market based approach to examine the question of external debt sustainability in the context of Pakistan. In comparison to the use of conventional measures of external indebtedness, e.g., debt to GDP ratio, we examine the marginal costs of external debt as indicated by the yields on the country's Eurobonds and the spreads on the Credit Default Swaps (CDS) traded in the international markets. A sharp increase in the bond yields or in the CDS spreads would signal that the country's external debt may be approaching an unsustainable level. This approach has the advantage that the data to evaluate debt sustainability is more frequently (daily) available, than that used in the conventional ratio analysis; national economic data may only be available with quarterly frequency, while country's credit ratings are changed infrequently. The yields and the CDS data is market generated and reflects the assessment of multitude of international market participants, while the economic data is generated by governmental agencies and may be susceptible to window dressing.

In this paper we study the relationship between sovereign debt ratings and the information contained in market based indicators namely, the yields on sovereign debt and the credit default swaps (CDS) spreads. We find that the debt yields and CDS spreads are significant predictors of sovereign debt ratings.

2. Conventional Assessment of External Debt

The use of conventional assessment tools can be subject to diverse interpretations and prognosis. It is illustrated by the polemics on the Pakistan's external debt in public press in 2017. On the one hand, a number of economic journalists and experts raised concerns over the Pakistan's growing external debt. On the other hand, country's finance minister painted a very different picture. The arguments have been based on analyses using conventional ratios and on projections as to the future course of the country's GDP and exports, using indicators such as: the Pakistan's External Debt and Liabilities (EDL) as percentage of exports, the EDL as percentage of foreign exchange earnings (include exports, remittances, foreign investment etc.), and the growth rate in the EDL; see, e.g., Khan (2016), Abbasi (2016), Bokhari (2016), Tirmizi and Masooma (2017).

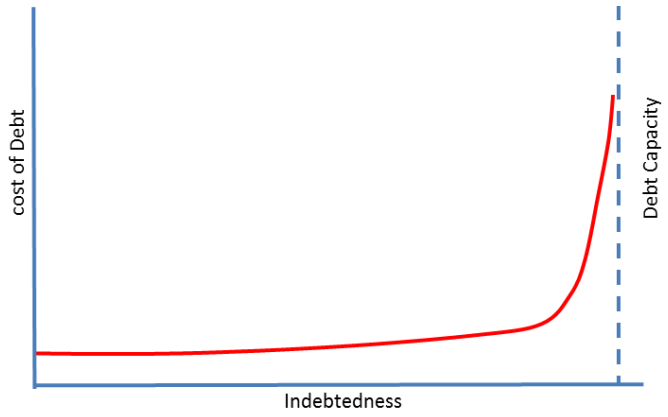
In the absence of a hard optimum or a cutoff debt-burden ratio economic data is prone to be interpreted variedly with diverse prognoses by judiciously selecting time periods and the statistical series. There is quite a bit of room for being either pessimistic or optimistic in making projections. Disagreements can easily arise as to the prudent level of debt, because there are no

universally accepted limits to debt levels, and economists differ widely as to the future course of the economy.

The traditional assessment of the external debt is reflected in the sovereign credit ratings from the debt rating agencies. Historically, debt ratings have been relied upon by investors in guiding their judgement about the risk level of a country's external debt. However, the global financial crisis has led to investors questioning the accuracy and timeliness the sovereign ratings may provide. They are seeking alternative measures of credit risk. In this paper, we empirically show that market based indicators may provide better guidance instead of sovereign ratings.

The finance theory suggests that as a country gets closer to its debt capacity its marginal cost of borrowing would increase sharply, as can be seen in the schematic diagram, Figure 1.Therefore, this paper addresses the external debt sustainability issue using an alternative approach. Instead of using the conventional measures of external indebtedness, e.g., debt to GDP ratio, we examine the marginal costs of external debt as indicated by the yields on the country's Eurobonds and the Credit Default Swaps (CDS) spreads being traded in the international markets. As noted above, a sharp increase in the bond yields or in the CDS rates would signal that the country's external debt may be reaching an unsustainable level.

Figure 1: Cost of Debt and Debt Capacity



3. Prediction of Sovereign Debt Ratings Using Market Based Indicators

The empirical evidence on sovereign debt ratings has focused mostly on its macroeconomic determinants; for example, Cantor and Packer (1996) identify per capita income, GDP growth, inflation, external debt, the level of economic development, and default history as determinants of sovereign debt ratings.

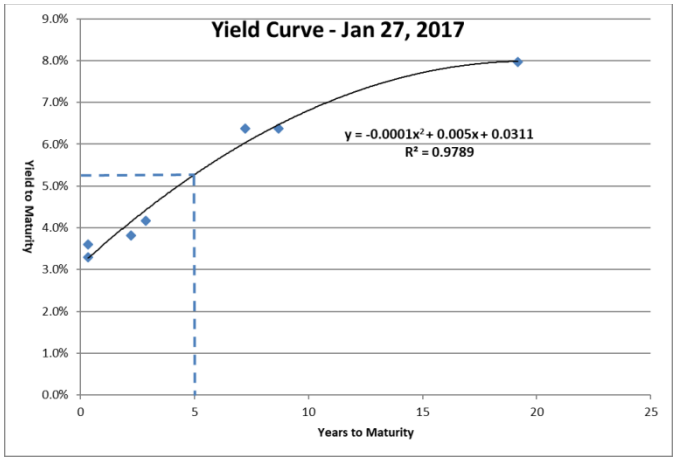
However, the academic research highlights the backward looking nature of the factors and macroeconomic measures used in the rating process. The macroeconomic variables are also only available at low frequencies; it means that the ratings evolve slowly. In comparison, the market based measures such as the bond yields and CDS spreads capture macroeconomic and global factors with high frequency. The market yields and CDS spreads are functions of forward looking default rates, global factors, and local macroeconomic factors.

Country Credit Ratings (CCR): Pakistan's sovereign debt ratings from two major agencies, Standard and Poor's, and Moody's, are available. We convert the letter ratings to numerical values to create a rating score for comparison purposes.[1]

Pakistan like other developing countries has been able to tap in the financial markets for raising sovereign debt, as highlighted by the recent issue of US$1 billion *sukuk* bonds at 5.5 percent coupon rate. As of the beginning of 2017, the total Eurobonds and *sukuk* issued by Government of Pakistan (and its special purpose entities, SPVs) amount to $5.5 billion or about 9.5% of the public external debt. The market price information on the Eurobonds/sukuk allows us to compute Yield to Maturity on the securities. In addition, Credit Default Swaps are traded against the Sovereign and sovereign guaranteed securities. We use this information as follow:

1) *Yield to Maturity*: From the quoted prices of the securities, obtained from Data Stream (Thomas Reuters), their promised cash flows (periodic coupon and the principal payments) and time-to-maturity, yield-to-maturity is computed on a daily basis. Yield curve is constructed for each day based on the outstanding maturities of each bond. The daily yield curves are then employed to interpolate yield for five year maturity bonds, using polynomial curve fitting. This method, illustrated in Figure 2, is similar to the method used by the US Treasury to report constant-maturity-yields for various tenures. We thus obtain series of one, five, and ten year constant maturity yields which are then used for comparison with the US Treasury Constant Maturity Yields.

Figure 2: Determining Constant Maturity Yield



2) *J. P. Morgan Emerging Market Bond Indices (EMBI):* These are a set of bond indices to track bonds in the emerging markets constructed by J. P. Morgan. We use EMBIs for Asia, Pakistan and some selected countries for comparison and empirical analysis as explained in the next section.

3) *Credit Default Swap (CDS):* It is a contract designed to transfer the credit exposure of fixed income products between two or more parties. The buyer of the swap agrees to makes payments to the swap's seller until a maturity date. In return, the seller agrees that, in the event

[1]Standard & Poor's ratings are issued in letter grades from "AAA" to "D." Moody's follow a similar system from Aaa to D. S&P's BBB implies "Adequate financial performance but may be adversely affected by economic downturn. The "BBB-"rating is the lowest grade that will likely be considered by investors. These letter grades are further shaded by debtor's "outlook". We assign a score of 12 to the "BBB-"rating.

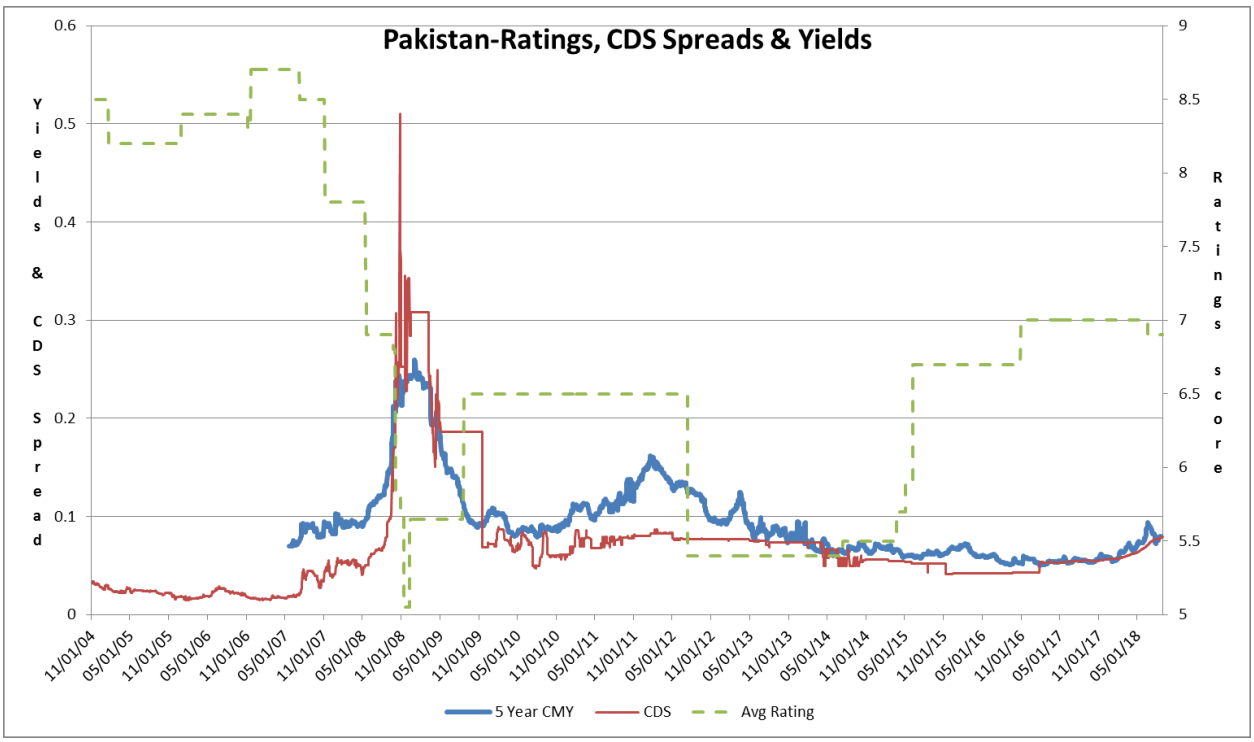
that the debt issuer defaults or experiences a credit event, the seller will pay the buyer the security's premium as well as all interest payments that would have been paid between the event time and the security's maturity date. An IMF (2013) study finds that sovereign CDS are generally reliable market indicators of sovereign credit risk—reflecting the same economic fundamentals and other market factors. However, CDS markets appear to incorporate information faster than bond markets during periods of stress. CDS spreads, therefore, reflect the default probabilities of the underlying security and provide insurance to the security holder against default. The CDS spreads were obtained from DataStream and are used in the empirical exercise in this study. The sovereign CDS contracts we use in our analysis are 5-year, US dollar denominated contracts.

CDS have become a major instrument used to provide insurance against the risk of credit events. In efficient markets, the CDS spread appropriately price the potential credit risk, however, the theoretical literature suggests that CDS spreads are a function of both a risk-free rate, and a risk-neutral measure of default intensity. Additional factors that seem to affect the CDS spread dynamics include global factors as well as macroeconomic and local factors. Since the CDS spreads are a forward-looking measure of sovereign default, global factors, and macroeconomic fundamentals, the CDS could be a viable alternative to sovereign debt ratings.

Figure 3 contains plots for the 5-year constant maturity yields, the CDS spreads (left axis) and the sovereign debt ratings scores (right axis) for Pakistan over Nov-2004 to August-2018 period. It is visually detectable that the yields on Pakistan securities are positively related to the CDS spreads, which in turn reflect the country's default risk. On the other hand, the credit ratings are inversely related to the yields. It is noteworthy that the yields spiked sharply to over 25% during the Global Financial Crisis period 2007-09, along with a sharp increase in the CDS spreads, while the credit ratings dropped precipitously. Another rise in the yields is seen over the year 2011; it, however, is not accompanied by an increase in the CDS spreads. It, therefore, seems to be a reflection of the tighter international financial markets rather than country's credit worthiness, as also reflected by the steady credit ratings. Post GFC period we see a sharp drop in Pakistan yields, followed by a upward trend over 2009-2011 period. There is, however, a general downward trend since January 2012 in the yields, to the accompaniment of improvements in the credit ratings and decrease in the CDS spreads.

More recently in 2018, the CDS spreads and yields have seen a sharp increase which reflects the country's deteriorated balance of payment and reserve positions. These are also affected by rise in the US interest rates and resulting capital outflows from emerging markets, and have adversely impact exchange rates for a number of countries.

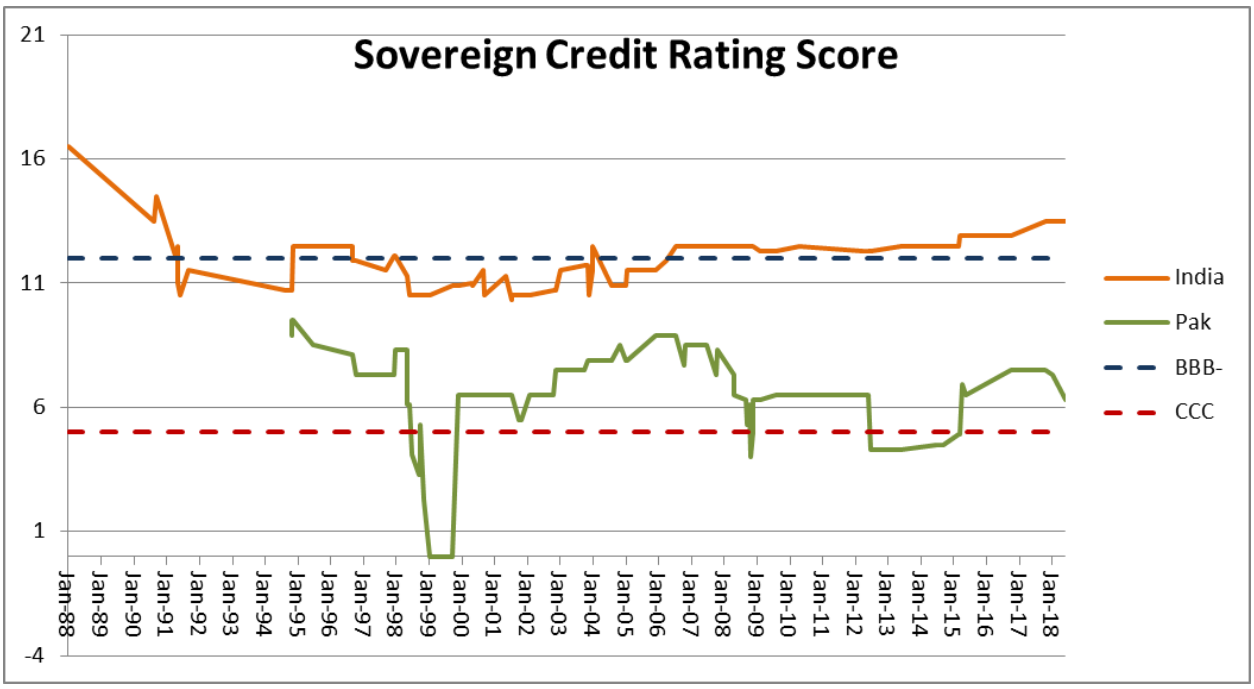
Figure 3; Pakistan Sovereign Ratings, CDS Spreads and Yields



A key factor which affects yields and cost of borrowing is the sovereign ratings. We show Pakistan's credit ratings in Figure 4. It can be seen that Pakistan's ratings have been below investment grade (BBB-) consistently since 2004, and at times have fallen below 'CCC', indicating "vulnerable financial condition," for some periods. In the recent years Pakistan's ratings have indeed seen improvement. The latest upgrade has been in October 2016 was by Standard and Poor's to "B" with "Stable" outlook. Despite the recent uptick Pakistan ratings are still many notches below the investment grade.

In 2018 the country's sovereign debt was downgraded by Fitch to B-Negative on January 25, and by Moody's to B3-Negative in June 20 2018.

Figure 4: Pakistan's Sovereign Ratings



For comparison, we plot yields on the J. P Morgan Emerging Market Bond Indices (EMBI) for Pakistan, Asia group averages, and some selected countries in Figure 5. We observe that the EMBI yields for Pakistan declined from a peak reached in 2001 and were within the range of yields for the peer group until about the onset of the Global Financial Crisis (GFC). The yields seem to disproportionately rise during the GFC period. A disproportionate response is also seen over the period 2010-2011 when the Pakistani yields are seen to shoot up in reaction to somewhat mild increase in other series. Since the beginning of 2012 we do observe a continuing decline in the yields, which in the more recent times seems to bring these closer to the yields for the peer group.

Though the Pakistani yields seem to be converging to yields for other Asian countries, we note that the yield-spreads between Pakistan and others countries are still substantial, as can be seen in the next figure. Figure 6 graphs yield spread for Pakistan over the Asian averages and for Pakistan over the Indian yields. We note a sharp decline in the yield-spreads over their peak in March 2013, which continued till about May 2014. Then, there is a jump in the yields, which is followed by a period when yields fluctuate within a range; about 2½ % over the Asian average and 3½ % over the Indian yields. The more recent period, since January 2016, has seen a downward trend in the spreads, which were close to their historic lows of just over 1%and 2% (the minimum was about 0.5% for a brief period February-March 2014).

Figure 5: JPM EMBI Yield-to-Maturity

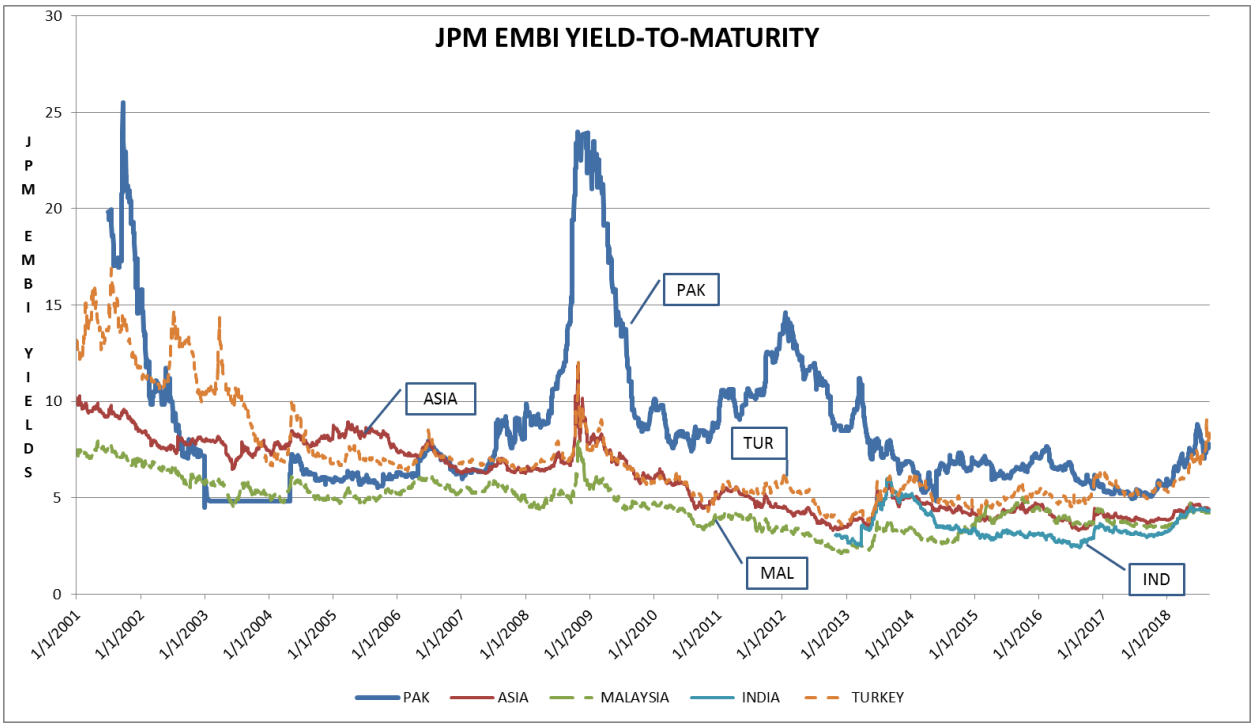
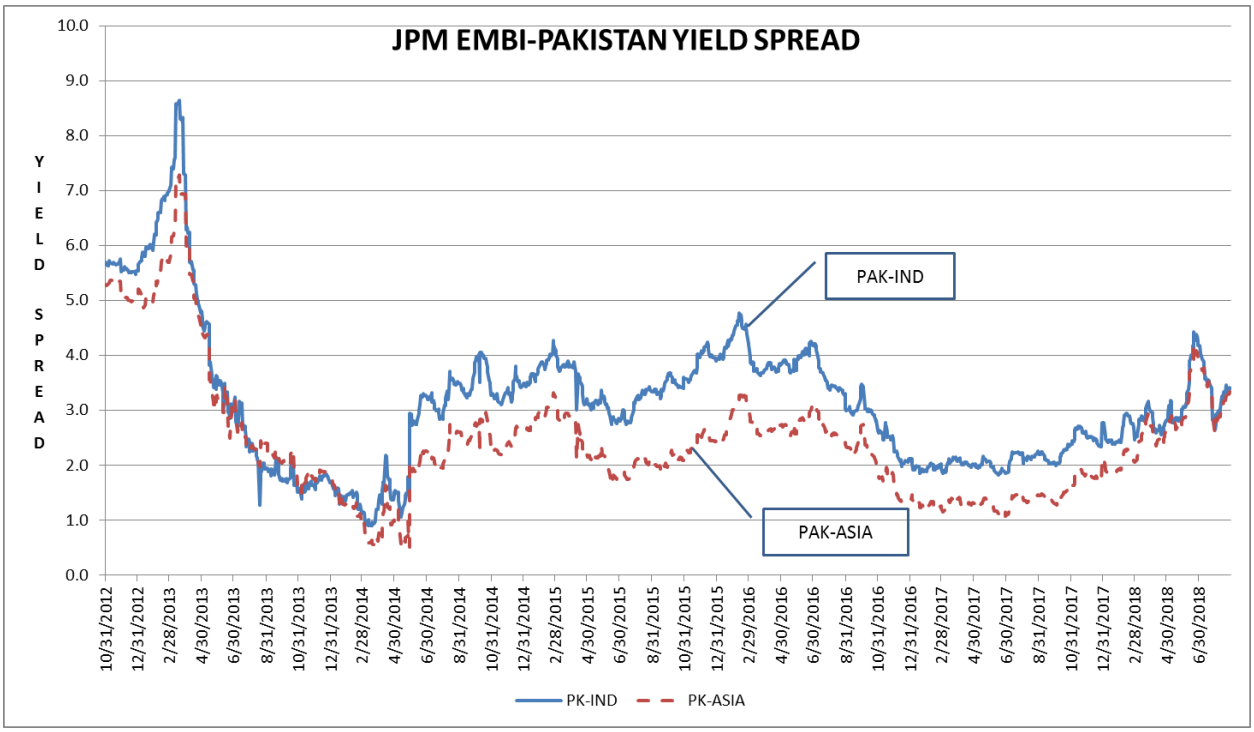


Figure 6: Yield Spreads

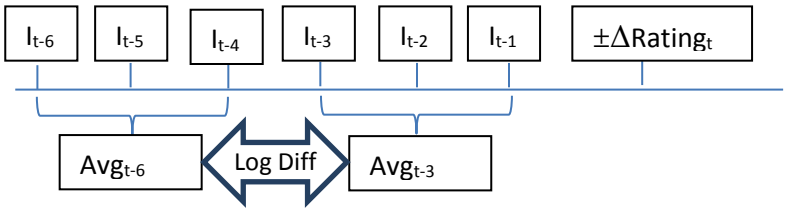


4. Empirical Tests on Yields

In this section we study the relationship between sovereign debt ratings (CCR) and the information contained in market based indicators of namely, the yields on sovereign debt and the credit default swaps (CDS) spreads. We find that the debt yields and CDS spreads are significant predictors of sovereign debt ratings.

Figure 7 illustrates the relationship between our constructed variable based on market yields and CDS spreads, and the CCR variable, which is the dependent variable in our annual analysis.

Figure 7: Diagram Relating Market Indicators (yields/CDS) to Rating Changes



We address the question "Can the rate of change in yields/CDS spread predict future sovereign debt rating changes?"

Our dependent variable, $\pm\Delta$rating, is an indicator variable that is equal to one when there is a change in the CCR, and zero if there is no change. Our independent variable is the log difference in non-overlapping three months averages yields/CDS spread, lagged back one month (λ). We then run a regression of the form $P(\pm\Delta rating_t) = G(\alpha_{t-1} + \beta\ \lambda_{t-1})$. The control group is comprised of observations where there were no rating changes while the treatment group is comprised of observation with positive/negative rating changes.

We separately run the logit models for the positive and the negative changes in the country's rating using the following five market derived indicators as independent variables:

1) Country's CDS Spread
2) Five Year Constant Maturity Yield for Pakistan
3) EMBI Yields Index for Pakistan
4) CMY Spread = Constant Maturity yield spread between Pakistan and the US Treasury bonds
5) EMBI Spread = Yield Spread between EMBI Pakistan and Asia

5. Results:

Detailed results from running the logit models are placed as Table 1 at the end. These are summarized as below:

Table 1A: Summary Results of Logit Models				
±Δ Ratings	**Positive CCR Change**		**Negative CCR Change**	
Indicator	**Sign**	**Significance**	**Sign**	**Significance**
1) CDS Spread	Negative	**	Positive	**
2) Five Year CMY	Negative	*	Positive	**
3) EMBI Yields Index	Negative	*	Positive	**
4) CMY Spread	Negative	**	Positive	**
5) EMBI Spread	Negative	**	Positive	**
*** and * indicate statistical significance at 5% and 10% level*				

The results show that an increase in a market indicator's value, decreases the probability of a positive rating change, but increases the probability of a negative rating change. On the other hand, a decrease in a market indicator's value increases the probability of a positive ratings change, while decreasing the probability of a negative rating change. Thus, all coefficient signs are as expected. The estimated coefficients are statistically significant in all cases at 10% or lower level of significance; in almost half of the cases these achieve a significance level of 5% or better. Though the achieved level of significance is not very high, yet it is remarkable in view of the small sample size.

6. Conclusions and Implications

This paper examines whether market based indicators such as CDS spreads and yields can be used to evaluate the burden of external debt. We take a change in the country's sovereign debt rating as an indication of the improvement or deterioration in the country's debt carrying capacity. Using Pakistan as a study case, we employ logit models to see if the rating changes can be predicted by the market based indicators. Our empirical exercise shows that such indicators can be useful in predicting rating changes, and hence in making a judgement as to the direction of a country's debt bearing capacity.

Therefore, it appears that the market pricing of the Eurobonds and the related derivative securities (CDS) can provide valuable market signals as to the marginal cost and the future sustainability of the external debt. The sovereign bond yields and the Credit Default Swap spreads can be employed to monitor and manage the risk exposure of the external debt.

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Table 1: Results from LOGIT Models

Dependent Variable: POSITIVE RATING CHANGE					**Dependent Variable: NEGATIVE RATING CHANGE**				
MODEL 1A: Independent Var: CDS Spread					**MODEL 1B: Independent Var: CDS Spread**				
Variable	Coeff	Std. Error	z-Stat	Prob.	Variable	Coeff	Std. Error	z-Stat	Prob.
CDS Spread	-9.725	4.066	-2.392	0.017 **	CDS Spread	5.323	2.414	2.205	0.027 **
Constant	-1.063	0.579	-2.248	0.024 **	Constant	-1.112	0.416	-2.670	0.008 ***
McFadden R^2	0.260	Log likelihood		-18.845	McFadden R^2	0.219	Log likelihood		-18.121
Akaike info crit.	1.069	LR statistic		13.230	Akaike info crit.	1.032	LR statistic		10.159
Schwarz criterion	1.154	Prob(LR statistic)		0.000	Schwarz criterion	1.117	Prob(LR statistic)		0.001
Obs with Dep=0	25	Total obs		39	Obs with Dep=0	28	Total obs		39
Obs with Dep=1	14				Obs with Dep=1	11			
MODEL 2A: Independent Var: Constant Maturity Yields					**MODEL 2B: Independent Var: Constant Maturity Yields**				
Variable	Coeff	Std. Error	z-Stat	Prob.	Variable	Coeff	Std. Error	z-Stat	Prob.
CM-Yield	-6.113	3.136	-1.950	0.051 *	CM-Yield	6.398	3.019	2.119	0.034 **
Constant	-0.976	0.579	-2.248	0.028 **	Constant	-1.150	0.464	-2.479	0.013 **
McFadden R^2	0.143	Log likelihood		-17.026	McFadden R^2	0.173	Log likelihood		-15.726
Akaike info crit.	1.189	LR statistic		5.698	Akaike info crit.	1.108	LR statistic		6.572
Schwarz criterion	1.281	Prob(LR statistic)		0.017	Schwarz criterion	1.199	Prob(LR statistic)		0.010
Obs with Dep=0	22	Total obs		32	Obs with Dep=0	23	Total obs		32
Obs with Dep=1	10				Obs with Dep=1	9			
MODEL 3A: Independent Var: EMBI Pak					**MODEL 3B: Independent Var: EMBI Pak**				
Variable	Coeff	Std. Error	z-Stat	Prob.	Variable	Coeff	Std. Error	z-Stat	Prob.
EMBI-Pak	-5.106	2.612	-1.955	0.051 *	EMBI-Pak	6.324	2.832	2.233	0.026 **
Constant	-0.586	0.579	-2.248	0.099 *	Constant	-1.162	0.410	-2.835	0.005 ***
McFadden R^2	0.097	Log likelihood		-23.905	McFadden R^2	0.148	Log likelihood		-20.047
Akaike info crit.	1.295	LR statistic		5.115	Akaike info crit.	1.102	LR statistic		6.959
Schwarz criterion	1.380	Prob(LR statistic)		0.024	Schwarz criterion	1.187	Prob(LR statistic)		0.008
Obs with Dep=0	25	Total obs		40	Obs with Dep=0	29	Total obs		40
Obs with Dep=1	15				Obs with Dep=1	11			

Table 1 (cont.): Results from LOGIT Models

Dependent Variable: POSITIVE RATING CHANGE					**Dependent Variable: NEGATIVE RATING CHANGE**				
MODEL 4A: Independent Var: Yield Spread					**MODEL 4B: Independent Var: Yield Spread**				
Variable	Coeff	Std. Error	z-Stat	Prob.	Variable	Coeff	Std. Error	z-Stat	Prob.
Yield Spread	-5.185	2.572	-2.016	0.044 **	Yield Spread	5.945	2.465	2.412	0.016 **
Constant	-0.957	0.579	-2.248	0.056 *	Constant	-1.647	0.625	-2.635	0.008 ***
McFadden R^2	0.193	Log likelihood		-14.188	McFadden R^2	0.293	Log likelihood		-11.134
Akaike info crit.	1.156	LR statistic		6.789	Akaike info crit.	0.938	LR statistic		9.222
Schwarz criterion	1.251	Prob(LR statistic)		0.009	Schwarz criterion	1.033	Prob(LR statistic)		0.002
Obs with Dep=0	19	Total obs		28	Obs with Dep=0	21	Total obs		28
Obs with Dep=1	9				Obs with Dep=1	7			
MODEL 5A: Independent Var: EMBI Spread					**MODEL 5B: Independent Var: EMBI Spread**				
Variable	Coeff	Std. Error	z-Stat	Prob.	Variable	Coeff	Std. Error	z-Stat	Prob.
EMBI Spread	-4.088	1.911	-2.139	0.032 **	EMBI Spread	3.766	1.645	2.289	0.022 **
Constant	-0.564	0.579	-2.248	0.150	Constant	-1.341	0.457	-2.934	0.003 ***
McFadden R^2	0.140	Log likelihood		-20.690	McFadden R^2	0.159	Log likelihood		-17.031
Akaike info crit.	1.261	LR statistic		6.734	Akaike info crit.	1.057	LR statistic		6.426
Schwarz criterion	1.349	Prob(LR statistic)		0.009	Schwarz criterion	1.145	Prob(LR statistic)		0.011
Obs with Dep=0	22	Total obs		36	Obs with Dep=0	27	Total obs		36
Obs with Dep=1	14				Obs with Dep=1	9			

Method: ML - Binary Logit (Quadratic hill climbing)