Estimating the Long-Run Creditworthiness of Pakistan

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Estimating the Long-Run Creditworthiness of Pakistan

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The paper analyses the long-run creditworthiness of Pakistan. The analysis is conducted on time series data of the years 1972-2013. Two Probit Models are estimated by Maximum Likelihood Method. Three specifications of Probit Model of long-run creditworthiness of Pakistan are estimated. These alternative specifications are due to measurement of expected net capital inflows/GDP ratio. It is found that with the inclusion of lagged net capital inflows/GDP ratio in the first Probit Model, the DS/GDP ratio and INV/GDP ratio are found to be significantly impacting the long-run creditworthiness of Pakistan. In the second Probit Model, when POP/GDP ratio is included as an alternate to INV/GDP ratio, the two alternative specifications for expected net capital inflows/GDP ratio mainly the current values of net capital inflows/GDP ratio and the lagged values of net capital inflows/GDP ratio, DS/GDP ratio and POP/GDP ratio all significantly impact the long-run creditworthiness of Pakistan.

Keywords: Long-run Creditworthiness, Pakistan, Probit Model, Maximum Likelihood Method (MLM).

1. INTRODUCTION

Pakistan has to incur foreign borrowing for higher economic growth, finance its balance of payment position and to effectively channel the borrowed money into investment and saving. Foreign debt acquired by a country can positively impacts its growth if it is utilised effectively. The real GDP growth of Pakistan during fiscal year 2013-14 was 4.14 percent which is less than targeted amount needed for its development goals. Pakistan is also vulnerable on its fiscal front. The overall fiscal deficit of Pakistan which is a difference between total receipts and expenditures including borrowing and other liabilities as a percentage of GDP has increased from 4.0 in year 2005-06 to 6.3 in year 2013-14. The reason behind increasing fiscal deficit as a percentage of GDP is the low tax to GDP ratio, ever increasing public debt, high interest payments and ineffective utilisation of the revenue. The tax to GDP ratio was just 8.7 percent at the end of the year 2013.

The foreign borrowing also helps Pakistan in achieving macroeconomic stability, economic growth and reducing poverty. Pakistan imports oil, fertilisers, chemicals and manufactured goods while its export structure still consists of primary agricultural

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products which is insufficient to pay the huge import bill in foreign currency. Pakistan constantly needs to borrow from World Bank, IMF and other financial institutions to offset the adverse effects of negative balance of payment position, finance the fiscal deficit and for the growth and development of the economy. World Bank provides financial and technical assistance to the government of Pakistan for a wide range of development and infrastructure projects like education, health, poverty reduction and other government reforms. IMF provides loans to Pakistan when it is unable to find adequate financing on affordable terms to meet its net international expenditures while maintaining required reserves for the future. In short IMF give loans when Pakistan is facing a negative balance of payment position. Debt servicing is another huge problem which Pakistan faces in addition to the growing debt. The debt service as a percentage of GDP has increased to 5.5 percent in year 2013.

Due to the ever- increasing debt, financial and lending institutions of the World do undertake the exercise to measure the creditworthiness of the recipient country through the financial and economic indicators and assess as to how the country would be able to repay its debt commitments on time. It is also common that a debtor country requests for re-scheduling of its huge external debt so that its burden be reduced for the time beings and also it is in the interest of creditor countries and institutions to get away from the complete loss of external debt owed to the developing country in case of bankruptcy and default.

The outstanding external debt of Pakistan has reached at $47.8 billion at the end of March 2014 which has raised the concerns of Pakistan's public policy makers and its creditors as to how would Pakistan repay this growing amount of external debt obligations? The main problem is that huge borrowing may not be sustainable in the future as the debt servicing consumes the precious foreign exchange needed for import requirements as well as the for the development of its economy. Pakistan's creditworthiness started deteriorating in 1971 when it rescheduled its debt amounting to $13.8 million, it faced an enormous amount of reduction in its foreign exchange earnings due to a brief halt in its exports from East Pakistan. Pakistan experienced debt-rescheduling in second half of 70's and then in the beginning of 80's decade because of the harder terms of the credit and shorter maturity periods led to high debt servicing.

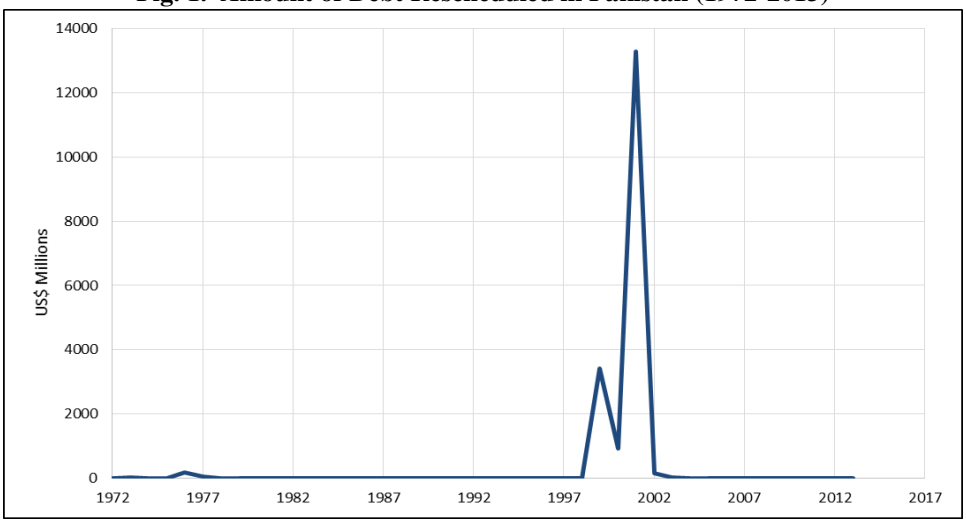
There was also a shift of composition of foreign inflows from grant-type assistance to loans repayable in foreign currency. A rescheduling of $1.8 billion debt under Paris Club creditors took place on January 23, 2001.

Internationally Brewer and Rivoli (1990), Haque, Kumar and Mathieson (1996) have empirically analysed the impact of economic and political determinants on creditworthiness ratings compiled by *Euromoney*, *Institutional Investor* magazine and *Economist Intelligence Unit* for developing countries. Frank and Cline (1971), Sargen (1977), Feder, *et al.* (1981), Moghadam, *et al*. (1991), Moghadam (1995) have empirically analysed the determinants of rescheduling of debt of developing countries. Siddiqui, *et al.* (2001) has empirically analysed the determinants of debt rescheduling for the case of Pakistan. The problem with these studies is that pure empirical analysis lack theoretical underpinnings. Kharas (1980) developed a theory of long-run creditworthiness for developing countries and then empirically tested it. I want to empirically analyse the long-run creditworthiness for the case of Pakistan, this will be the first empirical study in

Pakistan to have analysed the theory of long-run creditworthiness. The data for the variables of long-run creditworthiness of Pakistan is taken from years 1972 to 2013 which is the longest and most recent time series data taken to date.

To fulfil our objective we will use Probit model which is estimated by maximum likelihood method as the determination of long-run creditworthiness of Pakistan is a binary dependent variable.

Fig. 1. Amount of Debt Rescheduled in Pakistan (1972-2013)



Source: World Bank.

2. LITERATURE REVIEW

Frank and Cline (1971) used modified form of discriminant analysis which takes into account the variances in determinants of debt rescheduling among the countries to develop an index. By using discriminant analysis very high prediction rate can be obtained with just two determinants, the debt service ratio and the average maturity of debt.

Sargen (1977) used discriminant analysis which identify the economic determinants that can differentiate efficiently between rescheduling countries and non-rescheduling countries. The Results tell us that there is a regular pattern of past debt rescheduling. Liquidity debt rescheduling is caused by inflation and over-valued exchange rate.

Feder, Just and Ross (1981) used logit modelling with dependent variable as a dichotomous, dummy variable which takes 1 if debt rescheduling occurred and 0 if otherwise. The data for 56 developing countries was taken for year 1965 to 1976. There were 580 observations out of which 40 were associated to cases of debt-rescheduling. The independent variables used were debt service/exports, foreign exchange reserves to imports ratio, the ratio of net non-commercial foreign exchange inflows to debt service payments, the ratio of net commercial foreign exchange inflows to debt service payments, exports to GNP ratio and real per capita GNP to US per capita GNP. All the independent variables were of the expected sign and significant except the exports to GNP ratio.

Citron and Nickelsburg (1986) country risk model is used incorporating economic as well as political variables. The dependent variable is default where country renegotiate the terms of loan commitments because it becomes unable to pay back its outstanding debt. The economic policies which are forced on LDC's as a result of debt rescheduling cause the instability to increase more.

Moghadam, *et al.* (1991) used a Probit model to identify financial determinants of debt rescheduling for Latin America because of its geographical and sociopolitical significance to USA. The probability of debt rescheduling in Latin America correlates positively with Total Debt service as a percentage of GNP and negatively with International reserves to Debt Outstanding.

Moghadam (1995) compiled the data for each of the world's 91 debtor countries from 1980 to 1990.The World Bank has classified the debtor countries into six regions and in this study economic and political factors for each region is analysed. Political instability does help in determining the creditworthiness of regions.

Verma (2002) used four alternative measures of democracy to determine a sovereign country's decision to repay or default on its debt commitments. Probit model is used with the dependent variable as the probability of debt rescheduling which was taken as a proxy for the probability of default. The measures of democracy are found to be significant with the more democratic countries having high probability of default.

The developing country creditworthiness ratings developed by *Euromoney, Institutional Investor* magazine and *Economist Intelligence Unit* have been used in recent literature to determine the economic as well as political determinants of less-developed countries creditworthiness indicators.

Brewer and Rivoli (1990) used least square regression to test the impact of the political instability on the perception of creditworthiness of thirty most heavily indebted countries. The main objective of the study was to know whether international rating agencies give importance to political instability in their valuation of country's creditworthiness and what type of instability affect the perceived creditworthiness of a developing country.

Lee (1993) examined the determinants of country credit ratings prepared by *Institutional Investor* and *Euromoney.* The major focus on the relative importance of political instability on these credit ratings developed in order to assess the country creditworthiness. The results indicate that credit rating agencies assign more weight to the economic indicators of the country as opposed to political instability indicators.

Haque, Kumar and Mathieson (1996) empirically analysed the impact of economic determinants on creditworthiness ratings. The main objective of the study is to empirically analyse the economic determinants which impact the creditworthiness ratings and see if the impact of these factors display persistence in country credit ratings and also to examine the degree to which the determinants of credit ratings considerably vary across different regions in the world. The results indicate that ratings were considerably persistent over the time irrespective of recent economic or political developments in a country.

Balkan (2006) examines the role of political environment on borrower's ability to repay its loan. Two political risk variables are used; one the level of democracy index and second level of political instability index are used in a Probit model along with other economic variables. Negative relationship is found between the level of democracy and

probability of debt rescheduling of a country. Most of the economic variables are statistically significant.

Citron and Nickelsburg (1987) conclusion regarding contraction of government expenditure when there is political instability in the country as a requirement for debt rescheduling will cause more instability and economic chaos in the country so the LDC's should focus more on the democratisation in order for increased creditworthiness of the country supports the results of this study.

Siddiqui, *et al.* (2001) used Probit model to empirically analyse both economic and political determinants of debt rescheduling in Pakistan. The results show that financial determinants significantly impact the probability of debt rescheduling in Pakistan.

3. METHODOLOGY

The economic theory of creditworthiness of LDC's proposed by [Kharas (1984)] following the Harrod-Domar production framework where external financing is carried out by the government to carry out the expenditure requirements of its country and the benefits of investment goes to private sector. In order for the level of debt to become sustainable, the tax base should increase continuously which is determined by capital inflows and the government's propensity to invest. A developing country is creditworthy when it is on a path of ever increasing capital inflows so that the debt servicing does not dry the external resources needed for growing domestic consumption, development and investment needs of a country. A creditworthy country ensures that its debt commitments are met according to the original agreement.

The two basic equations of the long-run creditworthiness for the case of Pakistan are as follows

$$CW_t = f\left[\left(\frac{NFE}{GDP}\right)_t, \left(\frac{DS}{GDP}\right)_t, \left(\frac{INV}{GDP}\right)_t, \epsilon_t\right] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.1)$$

$$CW_t = f\left[\left(\frac{NFE}{GDP}\right)_t, \left(\frac{DS}{GDP}\right)_t, \left(\frac{POP}{GDP}\right)_t, \epsilon_t\right] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.2)$$

Where,

CW_t = Creditworthiness of Pakistan (Measure as binary variable such as; 1=Debt Rescheduled during the year and 0= Debt Not Rescheduled during the year

NFE/GDP = Expected net capital inflows/GDP ratio. The net capital inflows includes private and public unrequited transfers and all the components of capital account from the balance of payments data as defined by the IMF.

DS/GDP = Total debt servicing of external debt/GDP ratio. The total debt service variable includes legal quantity of external obligations due and also the actual payments made in years where debt rescheduling occurred. However, the years where debt rescheduling did not occur only includes the actual payments made which is the sum of principal repayments and interest actually paid in currency, goods, or services on long-term debt, interest paid on short-term debt, and repayments (repurchases and charges) to the IMF.

INV/GDP = Investment/GDP ratio. The gross fixed capital formation data is taken as a proxy for investment.

POP/GDP = Total Population/GDP ratio.

According to the theory NFE/GDP ratio has a negative relationship with the probability of debt rescheduling meaning that with higher capital inflows, the country will be able to service its debt according to original commitments even if its level of income is less. The loans in the form of capital inflows helps the country to fulfil its consumption as well as investment requirements. A creditworthy country is on the path of ever-increasing capital inflows and there will be no need to consume up the domestic resources to fulfil the debt obligations. This is the reason net capital inflows/GDP ratio reduces the probability of a country to reschedule its debt.

DS/GDP ratio is positively related with the probability of debt rescheduling. As the country accumulates increasing amount of external debt, the pressure to service the debt as a ratio of GDP also becomes enormous and the probability that country will reschedule its debt is increased. Higher debt servicing is only sustainable when the country's level of income is high.

The variable INV/GDP ratio and POP/GDP ratio are used alternatively in the theory and both have opposite impact on the probability of debt rescheduling. With the increasing amount of new borrowings, the investment as a ratio of GDP is increased with the country's capital stock increasing at a sustainable level which decreases the probability that the country will reschedule its debt is decreased. The variable POP/GDP ratio is positively related with probability of debt rescheduling as the population/GDP ratio increases, the pressure on country's resources is increased due to increased consumption and it becomes difficult to fulfil the debt obligations on time. [Kharas (1984)].

As we have a binary choice variable model we are interested in estimating the conditional probability, PR ($CW_t = 1|x_t$), the probability that a representative in time period t chooses CW_t=1 conditional on dependent variable x_t

$$P\ (CW_t = 1|x_t) = F\ (x_t) = E\ [CW_t|x_t] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.3)$$

$F(x_t)$ is the functional form and the choice of functional form depends upon the econometrician.

Framing a Probability Model

We would like to alter Xβ into probability. That is, we need a function *F* such that

$$Prob(CW_t{=}1){=}(X_t\beta) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.4)$$

A normal selection of a function that interprets *X*β into a number between 0 and 1 in a workable way is a distribution function, or the cumulative density. In fact, binary response models can be explained this way. If we choose F to be the identity function, so that

$$Prob(CW_t = 1) = X_t\beta \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.5)$$

We get the linear probability model but such a choice for F does not produce the type of function we want, for nothing limits Xβ to lie between 0 and 1.

Choosing F to be standard normal yields an attractive possibility, the Probit model:

$$Prob\ (CW_t = 1) = \emptyset(X_t\beta) = \int_{-\infty}^{X_t\beta} \frac{1}{2\pi} \exp\left(-\frac{z^2}{2}\right) dz \quad \ldots \quad \ldots \quad \ldots \quad (3.6)$$

The standard normal transformation $\emptyset$ (.) constrains the probability to lie between 0 and 1, or

$\lim_{z\to+\infty} \emptyset(z) = 1$ and $\lim_{z\to-\infty} \emptyset(z) = 0$

In this study we'll use a Probit model to test the long-run creditworthiness of Pakistan. Probit was introduced by Bliss (1934), and the reason for using Probit model in this study is that it transforms a dichotomous dependent variable into a probability and constrains it to lie between 0 and 1. The dependent variable y_t is a dummy which assumes one of two possible values, '1' if Pakistan reschedules debt in given year t and '0' if it doesn't.

Long Run Creditworthiness Model of Pakistan

We have a variable CW takes on of two possible values, 0 and 1. Describing a latent variable CW' such that

$$CW_t' = X_t\beta + \epsilon_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.7)$$

We do not observe CW', but rather CW, which takes on values of 0 or 1 according to the following rule

$$CW_t = \begin{cases} 1 & if\ CW_t' > 0 \\ 0 & otherwise \end{cases} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.8)$$

We also assume that $\epsilon_t \sim N(0, \sigma^2)$, now remember that in comparison with linear probability model, CW_t'(conditional on X) is distributed normally in the probit model, although its realisation CW_t is not. We'll now generate our first Probit Model

Model 1:

$$\begin{aligned} Prob(CW_t = 1) &= prob(CW_t' > 0) \\ &= prob(X_t\beta + \epsilon_t > 0) \\ &= prob(\epsilon_t > -X_t\beta) \\ &= prob\left(\frac{\epsilon_t}{\sigma} > -\frac{X_t\beta}{\sigma}\right)^1 \end{aligned} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.9)$$

We can now write Equation (4.9) as

$$\begin{aligned} &= prob\left(\frac{\epsilon_t}{\sigma} > -\frac{X_t\beta}{\sigma}\right) \\ &= prob\left(\frac{\epsilon_t}{\sigma} < \frac{X_t\beta}{\sigma}\right) \\ &= \emptyset\left(X_t \frac{\beta}{\sigma}\right) \end{aligned} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.10)$$

[1] Dividing by σ is useful because the quantity ϵ/σ is distributed as *standard* normal (Johnston and DiNardo, 1997)

$$Prob(CW_t = 1) = \emptyset\left(\alpha_o + \beta_1\left(\frac{NFE}{GDP}\right)_t + \beta_2\left(\frac{DS}{GDP}\right)_t + \beta_3\left(\frac{INV}{GDP}\right)_t\right) \quad \ldots (3.11)$$

$$CW_t = \alpha_o + \beta_1\left(\frac{NFE}{GDP}\right)_t + \beta_2\left(\frac{DS}{GDP}\right)_t + \beta_3\left(\frac{INV}{GDP}\right)_t + \epsilon_t \quad \ldots \quad \ldots (3.12)$$
$$\epsilon_t \sim N(0, \sigma^2)$$

Where the dependent variable is the creditworthiness of Pakistan, α denotes the intercept, all β's denote the coefficients associated with independent variables

Model 2:

$$CW_t = \alpha_o + \beta_1\left(\frac{NFE}{GDP}\right)_t + \beta_2\left(\frac{DS}{GDP}\right)_t + \beta_3\left(\frac{POP}{GDP}\right)_t + \epsilon_t \quad \ldots \quad \ldots \quad \ldots (3.13)$$
$$\epsilon_t \sim N(0, \sigma^2)$$

A Probit model is estimated using the maximum likelihood method (MLM). The numerical procedure of MLM was proposed by Fisher (1922). From equation (4.10) we observe that deriving likelihood function is straightforward, as

$$Prob(CW_t = 1) = \emptyset\left(X_t\frac{\beta}{\sigma}\right)$$

It follows that

$$Prob(CW_t = 0) = 1 - prob(CW_t = 1) = 1 - \emptyset\left(X_t\frac{\beta}{\sigma}\right)$$

If we have iid sampling, the likelihood for the sample is the product of the probability of each observation. Denoting 1,…,*m* as the *m* observations such that CW_t=0, and *m*+1,…,*n* as the *n*-*m* observations such that CW_t=1, yields

$$L = Prob(CW_1 = 0).Prob(CW_2 = 0) \ldots Prob(CW_m = 0) \\ .Prob(CW_{m+1} = 1) \ldots Prob(CW_n = 1) \quad \ldots \quad \ldots \quad \ldots \quad \ldots (3.14)$$

$$= \prod_{i=1}^{m}\left[1 - \emptyset(X_t\frac{\beta}{\sigma}\right] \prod_{i=m+1}^{n}\emptyset(X_t\frac{\beta}{\sigma}) \quad \ldots \quad \ldots \quad \ldots \quad \ldots (3.15)$$

$$= \prod_{i=1}^{n}\emptyset\left(\mathrm{X_t}\frac{\beta}{\sigma}\right)^{y_t}\left[1 - \emptyset\left(X_t\frac{\beta}{\sigma}\right)\right]^{1-y_t} \quad \ldots \quad \ldots \quad \ldots \quad \ldots (3.16)$$

When we work with log-likelihood function, we have $l\left(\frac{\beta}{\sigma}\right) = \ln(L)$ … (3.17)

$$= \sum_t\left\{y_t.ln\left[\emptyset\left(X_t\frac{\beta}{\sigma}\right)\right] + (1 - y_t).ln\left[1 - \emptyset\left(X_t\frac{\beta}{\sigma}\right)\right]\right\}^{2} \quad \ldots \quad \ldots (3.18)$$

Note: The log-likelihood is bounded above by zero

$ln[\emptyset(.)] \leq 0$ and $ln[1 - \emptyset(.)] \leq 0$

The statistical software package STATA is used for estimating our Probit Model.

[2]β/σ always appear together and for the simplicity σ is normalised to one [Johnston and DiNardo (1997)].

Diagnostic Tests

Pseudo R-Squared also known as McFadden's R-Squared (1997) is used to test the goodness of fit of the model.

McFadden's R^2 is

$$R^2=1-\frac{ln\, L\hat{}(M_{Full})}{lnL\hat{}(M_{Intercept})} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots (3.19)$$

The Log-likelihood Ratio Chi-Square test is a test against null hypothesis that slope coefficients are all equal to zero.

$$2[l(\alpha,\beta)-l(\alpha,0)]^a \sim \chi^2(k-1) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots (3.20)$$

In Equation (4.20) the term $l(\alpha,\beta)$ is the maximised value of the log-likelihood of the model being estimated, $l(\alpha,0)$ is the value of the log-likelihood for a Probit with only intercept and k-1 is the number of slope coefficients.

The time series data used in this study is collected for the years 1972-2013. The total observations used in this analysis are 42 years for the country Pakistan of the variables; Debt Rescheduling, Gross Domestic Product GDP (current US$), Total Debt Service on external debt (current US$) and Gross Fixed capital formation (current US$) and Total Population taken from World Development Indicators, The World Bank.

The data for the variable Net capital Inflows is taken from Pakistan's Balance of Payments from State Bank of Pakistan for years 1972-2013.State Bank is the central bank of Pakistan which was inaugurated on July 1, 1948 by Quaid-e-Azam Muhammad Ali Jinnah the first Governor General of Pakistan.

4. RESULTS AND DISCUSSION

The readiness of creditors to advance is based on the confidence in the country's long-run creditworthiness. As explained earlier, this in result depends on the expectation of capital flows in the present time period. The three specifications of Probit Model of long-run creditworthiness of Pakistan are being estimated. The alternative specifications are due to the measurement of expected net capital inflows/GDP ratio[3] such as;

(1) Current values of net capital inflows/GDP ratio as $\left(\frac{NFE}{GDP}\right)_t$, using the actual values as a proxy for expected values of net capital inflows/GDP ratio.

(2) Lagged values of net capital inflows/GDP ratio as $\left(\frac{NFE}{GDP}\right)_{t-1}$,as annual time series data is used and the debt rescheduling occurs within the same year ,there can be a problem of simultaneity so lagged values are used as a proxy for expected net capital inflows/GDP ratio.

(3) Current and lagged values of net capital inflows/GDP ratio. Change of state from rescheduling to non-rescheduling can have a simultaneity problem so a mix of current and lagged values is used as a proxy for expected net capital inflows/GDP ratio.

[3] Expectations model by Kharas (1984)

The first Probit Model's maximum likelihood coefficients and their Z-statistics are given in Table 1. The joint significance of equations is measured by Log-Likelihood Ratio Chi-Square Test; for first two regressions, it is distributed Σ^2 with 3 degrees of freedom and for the third regression, it is distributed Σ^2 with four degrees of freedom. The first two regressions are significant at 5 percent level and the third regression is significant at 10 percent level.

All the three specifications of first model show that DS/GDP ratio has expected sign and is significant at 18 percent level. The INV/GDP ratio is significant at 18 percent level for the second specification of first Probit Model.

The positive sign of DS/GDP ratio shows that with the growing pressure of debt servicing/GDP ratio, the probability of debt rescheduling is increased for the case of Pakistan which ultimately reduces the country's creditworthiness. The negative sign of INV/GDP ratio shows that with increasing investment to GDP ratio, the probability of debt rescheduling is reduced for the case of Pakistan which increases the country's creditworthiness.

Table 1

Long Run Creditworthiness Model (3.12) of Pakistan

	1	2	1
Constant	1.22	1.94	1.76
	(0.63)	(0.95)	(0.85)
$(NFE/GDP)_t$	-5.57		-4.91
	(-0.99)		(-0.51)
$(NFE/GDP)_{t-1}$		-4.31	-0.21
		(-0.74)	(-0.02)
$(DS/GDP)_t$	21.54	21.16	20.12
	(1.38)*****	(1.34)*****	(1.30)*****
$(INV/GDP)_t$	-14.22	-18.97	-17.27
	(-1.05)	(-1.37)*****	(-1.21)
Diagnostic Tests			
Log-Likelihood	-21.25	-20.90	-20.77
Log-Likelihood Ratio Chi-Square Test	7.75**	7.76**	8.03***
Pseudo R^2	0.1542	0.1565	0.1620

* Significant at 1 percent level ** Significant at 5 percent level *** Significant at 10 percent level.
**** Significant at 15 percent level ***** Significant at 18 percent level.

The elasticities of Rescheduling Probabilities are shown for the regression having the highest Likelihood. Table 2 shows that with one percent increase in debt service/GDP ratio, the probability of debt rescheduling will increase by 1.01 percent. However, using lagged values of net capital inflows/GDP ratio in Table 3 we found out that DS/GDP ratio and INV/GDP ratio are significant and it was found that with one percent increase in debt service/GDP ratio, the probability of debt rescheduling will increase by 0.99 percent and with one percent increase in investment/GDP ratio, the probability to reschedule debt will decline by 3.88 percent. The results of first Probit Model indicate that expected net capital inflows are not important in the long-run creditworthiness as the debt problems cannot be solved by constantly borrowing from abroad and structural changes must be taken in order to increase the long-run creditworthiness of Pakistan [Kharas (1984)].

Table 2

Elasticities of Rescheduling Probabilities for Equation 1 of Model 3.12

	Absolute Change	Percentage Change
Expected net capital inflows/GDP ratio	-1.62	-0.06
Debt Service/GDP ratio	6.24****	1.01****
Investment/GDP ratio	-4.12	-2.92

Table 3

Elasticities of Rescheduling Probabilities for Equation 2 of Model 3.12

	Absolute Change	Percentage Change
Expected net capital inflows/GDP ratio	-1.26	-0.04
Debt Service/GDP ratio	6.18****	0.99*****
Investment/GDP ratio	-5.54****	-3.88*****

The second Probit Model's maximum likelihood coefficients and their Z-statistics are given in Table 2. The joint significance of equations is measured by Log-Likelihood Ratio Chi-Square Test; for first two regressions, it is distributed $\sum^2$ with 3 degrees of freedom and for the third regression, it is distributed $\sum^2$ with four degrees of freedom. All three regressions are significant at 1 percent level.

In the second Probit Model all the three economic ratios, NFE/GDP ratio, DS/GDP ratio and POP/GDP ratio are significant.

Table 4

Long Run Creditworthiness Model (3.13) of Pakistan

	1	2	3
Constant	-2.04	-2.35	-2.24
	(-2.13)*	(-2.32)*	(-2.20)**
$(NFE/GDP)_t$	-15.88		-26.99
	(-2.57)*		(-1.74)***
$(NFE/GDP)_{t-1}$		-18.41	2.56
		(-2.51)*	(0.19)
$(DS/GDP)_t$	30.40	32.86	27.45
	(1.71)***	(1.71)***	(1.44)****
$(POP/GDP)_t$	475.27	663.02	874.43
	(2.73)*	(2.73)*	(3.05)*
Diagnostic Tests			
Log-Likelihood	-16.54	-15.57	-13.37
Log-likelihood Ratio Chi-Square Test	(17.17)*	(18.42)*	(22.82)*
Pseudo R^2	0.3416	0.3716	0.4604

The elasticities of Rescheduling Probabilities are shown for the regression having the highest Likelihood. Table 4 shows that with one percent increase in current values of net capital inflows/GDP ratio, to reschedule debt will decline by 1.82 percent. With one percent increase in Debt servicing/GDP ratio, the probability to reschedule debt will increase by 1.53 percent and with one percent increase in Population/GDP ratio, the probability to reschedule debt will increase by 1.55 percent. The results of the second Probit Model indicate that with the inclusion of POP/GDP ratio as an alternate to INV/GDP ratio, the Expected net capital inflows/GDP ratio, Debt servicing/GDP ratio and Population/GDP ratio all significantly impact the long-run creditworthiness of Pakistan. The possible reason behind it would be that inverse of per capita income is a misleading indicator of the economic health of any country because it does not tell us how the resources are being distributed and with its inclusion the expected net capital inflows/GDP ratio seem to be impacting the long-run creditworthiness of Pakistan.

Table 5
Elasticities of Rescheduling Probabilities for equation 1 of Model 3.13

	Absolute Change	Percentage Change
Expected net capital inflows/GDP ratio	-3.55*	-1.82*
Debt Service/GDP ratio	6.80***	1.53***
Population/GDP ratio	106.80*	1.55*

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

In the first Probit model only DS/GDP ratio was significant but when using lagged value of NFE/GDP ratio as an alternative specification for expected capital inflows the INV/GDP ratio also came out to be significant, this could possibly mean that last year's net capital inflows impact the long-run creditworthiness of Pakistan through DS/GDP ratio and INV/GDP ratio. In the second Probit model all the estimated coefficients NFE/GDP ratio, DS/GDP ratio and POP/GDP ratio were significant for the first two specifications of expected net capital inflows. With the inclusion of POP/GDP ratio which is an inverse of per capita income as an alternate to INV/GDP, the Log-likelihood ratio test came out to be significant at 1 percent and all the estimated coefficients were also significant with the signs according to *a priori* expectations. It means that in case of Pakistan the per capita income is very important in analysing the country's creditworthiness. The second Probit model with the third specification of using a mix of current and lagged values of net capital inflows/GDP ratio as an alternate to expected net capital inflows/GDP ratio, the current values of net capital inflows/GDP ratio was significant whereas the lagged values of net capital inflows came out to be insignificant.

In order to increase the creditworthiness of Pakistan the Policymakers should develop policies to efficiently manage the external debt. The borrowed resources should be used for investment in social and human capital. If the external debt is used up in consumption requirements of the economy, then the country will get trapped up in vicious cycle of indebtedness.

This study has estimated the long-run creditworthiness of Pakistan and the impact of global financial crisis on long-run creditworthiness of Pakistan. There is a need to estimating the long-run creditworthiness of all South Asian economies as they are interconnected and comparable.

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