

Firm Attributes and Government External Debt as Determinants of Corporate Short Debt Maturity in a Post-CPEC Scenario

Rana Yassir Hussain^{*+}

Wen Xuezhou^{**}

Haroon Hussain^{***}

Ilyas Ahmad^{****}

Hira Irshad^{*****}

Muhammad Yasir Hayat Malik^{*****}

Abstract: *The current study investigates the influence of firm attributes and government external debt upon the short debt maturity of non-financial firms listed at the Pakistan Stock Exchange (PSX) in a post-CPEC (China Pakistan Economic Corridor) scenario. By using firm-level panel data, estimations are made through the random effect model with robust standard errors at the level and with lagged independent variables. We dealt endogeneity concerns by employing the system-GMM approach to the complete data sample of 331 firms over a period ranging from 2013 to 2017 and also the post CPEC period ranging from 2015 to 2017. The risk and asset tangibility are strong negative predictors of short debt maturity in Pakistani listed firms. The external debt had a positive and significant role in defining short debt maturity. These results were consistent for both the entire data period and the post CPEC period.*

Keywords: External Government Debt; Short Debt Maturity; Firm Attributes; CPEC

JEL Classification: H63, H81, G32

* UE Business School, Division of Management and Administrative Sciences, University of Education Lahore, Pakistan.

+ Rana Yassir Hussain is corresponding author. E-mail: yassir.hussain@ue.edu.pk

** School of Business, Jiangnan University, Wuxi, China.

*** Malik Firoz Khan Noon Business School, University of Sargodha, Pakistan.

**** UE Business School, Division of Management and Administrative Sciences, University of Education Lahore, Pakistan.

***** Department of Business and Management Sciences, Superior University, Sargodha, Pakistan.

***** Department of Mathematics, Division of Science and Technology, University of Education Lahore, Lahore, Pakistan.

Introduction

An optimal debt maturity structure is essential for the firm's sustainable operations and performance. Excessive use of short term debt exposes to rollover risk, which can cause harm if dealt inappropriately. However, the literature suggests that in the case of higher information symmetry, firms can use short term debt to their advantage instead of deteriorating business health. The use of more short term debt in the leverage maturity structure of firms in developing countries is evident in past researches like Fan, Titman, and Twite (2012) and Custódio, Ferreira, and Laureano, (2013). A plethora of researchers have tried to unscramble the factors that cause this overuse of short term debt in developed countries. However, evidence in emerging economies is scarce even though businesses are more vulnerable in such countries. Several micro and macro factors have been identified over the years targeting corporate debt maturity. Various authors discovered many firm-specific factors as significant predictors of leverage structure, in an organizational framework (Qiuyan, Qian, and Jing-jing, 2012; Orman and Köksal, 2017; Stephan, Talavera and Tsapin, 2011; Antoniou, Guney, and Paudyal, 2006). The widely acclaimed firm-specific variables included in current study are profitability, risk, liquidity, firm growth, taxes, and asset tangibility.

Similarly, researchers have also incorporated various macro-economic factors in their toil, like Orman et al. (2017). The national macroeconomic policies affect the performance and sustainable growth of the companies, as evidenced in the literature. Among these, one stream of research has focused on the relationship between government debt and corporate debt maturity. The underdeveloped nations like Pakistan are highly dependent on external borrowing and aid to roll their economic wheels. The governments are supposed to extend borrowed money to the business sector to promote trade and financial growth in the country. Still, in developing countries, acquired funds are usually utilized in mega projects instead of supporting domestic production. Subsidized loans at lucrative terms are crucial in the development of any sector in the economy. It is interesting to discover how corporate debt behaves with external government debt. It will have many implications for the governments in policy formulation and also for the investors willing to invest in debt securities. Past literature suggests that government loan instruments and corporate debt securities act as competitors. Graham, Leary, and Roberts (2014) established a strong relationship between government borrowing and corporate debt in publicly traded US-based non-financial firms. Recently, Demirci, Huang, and Sialm (2019) observed a crowding-out effect of government debt on corporate debt. The government debt and exchange rate had an insignificant positive impact on corporate short term leverage in their study. Previous literature has also unveiled fill the gap behavior on the part of corporate debt issuers. It states that if governments acquire more long term debt, the corporate sector adds liquidity to the market by issuing short term debt in the market (van Bakkum, Grundy and Verwijmeren, 2019). The current research recon-

siders the impact of government level external borrowing on the firm-level short term borrowing of non-financial listed firms along with firm-specific attributes. This study does not limit itself to borrowing through treasury securities but considers overall external debt, but excluding domestic debt. It has a focus on foreign debt acquired either through securities, foreign bonds, or by various international donor agencies, whereas past research is mostly confined to securities and does not consider the impact of total external borrowing. Moreover, this relationship is studied in a post-CPEC scenario as it is a multi-billion dollar project that mainly involves long term external financing (Mehtar, 2017). This financing is in the form of interest-free loans, concessional rate loans, and joint ventures between Chinese and local companies. However, the proportion of government debt in this foreign direct investment is much lower if viewed in terms of the total project value. Still, it is substantial if considered by a struggling nation's point of view. Currently, there is no research targeting the impact of CPEC on the debt maturity structure of the corporate sector in Pakistan. This paper is structured as the next section is about literature review and hypothesis development. The third section explains the basic methodology and the data used, and part four involves the result tables and their interpretations. In the end, this paper is concluded with a conclusion.

Theory & Hypothesis Development

Firm Attributes and Corporate Short Debt Maturity

A vast body of knowledge has been created over the years that address the contribution of firm-specific characteristics in the determination of firm leverage structure. Results regarding the direction of relationship between firm attributes and debt maturity ratio are mixed, and we cannot draw a definite line as to the positive or negative relationship between these variables. Stephan et al. (2011) proved the significance of particular firm-specific attributes involved in the determination of the debt maturity horizon in Ukrainian firms. They emphasized on using lagged variables of asset maturity, firm size, growth opportunities, turnover, earnings volatility, liquidity, leverage, access to bond markets, and taxes. The firm size, asset maturity, taxes, and liquidity had a positive impact on debt maturity. Whereas, growth, turnover, and earnings volatility had a negative impact on debt maturity measured through a ratio of long term debt to total debt. López-Gracia and Mestre-Barberá, (2011) applied difference and system GMM regression on the Spanish SMEs data and reported positive role of term structure of interest, interest rate volatility, firm volatility, debt, size, and asset maturity in defining debt maturity structure. They identified that tax rate and growth are negative predictors of debt maturity. Díaz-Díaz, García-Teruel, and Martínez-Solano, (2016) also studied the Spanish firms, and they emphasized

more on the role of family control in defining the debt maturity which turns out to be positive but negative for second-largest family shareholders. Further, asset maturity and leverage had a positive relationship with debt maturity but negative with growth opportunities.

Similarly, Orman et al. (2017) comprehensively discussed various firm-level attributes that affect debt maturity. They studied growth opportunities, firm size, tax rates, term wise interest rate structure, volatility, firm quality, liquidity, and asset maturity in Turkish non-financial firms. They also used macro factors like inflation, GDP growth, financial crisis, and corruption. Results proved that leverage, asset maturity, size, earning volatility, z-score, term structure of interest had a positive influence on debt maturity among the firm-specific attributes. The remaining firm-specific variables of the study, including growth, taxes, and interest volatility, influenced debt maturity negatively in the Turkish scenario.

Regarding taxes, Kubick, Lockhart (2017) mentioned that tax aggressiveness is strongly associated with short term debt maturity. They also reported a positive impact of abnormal earnings, market to book ratio, and stock volatility on short maturity. Terra (2011) made a comparative analysis between the USA and Latin America regarding the determinants of debt maturity ratio measured through long term debt divided by total debt and long term liabilities divided by total liabilities. The profitability influenced the debt maturity ratio positively, but it had a negative influence on the long term liability ratio for Latin America. However, for the USA, it had a negative influence on both ratios. Growth opportunities had a positive impact in all cases except for the long term liabilities ratio in the USA. Asset maturity, size, and tangibility had negative influence except for the debt maturity ratio in Latin America. Liquidity had a positive impact on long term debt maturity. Tax effects were negative but not for the debt maturity ratio in the USA. Business risk influenced the maturities positively when models applied to Latin American data but negative for USA data and vice versa for dividend yield. Keefe and Yaghoubi (2016) detected the positive impact of tangibility, firm size, and industry leverage on debt maturity. They reported a negative impact of cash flow volatility, firm age, profitability, growth, and R&D expenses on the debt maturity of US corporations.

H_1 = There is a significant relationship between firm attributes and corporate short debt maturity.

Government External Debt and Corporate Short Debt Maturity

Previous literature has reported crowding out effect of government debt on corporate debt. If governments issue securities for loan acquisition, they will compete with corporate securities. If investors wish to have stable securities in their portfolios, they will prefer bonds and bills issued by the government over corporate investments.

Moreover, in weak economies, the rate of returns can be much higher in government securities. However, this phenomenon is more prevalent in the case of domestic debt acquired by the governments (Demirci et al., 2019). Badoer and James (2016) proposed that an increase in the maturity of government debt induces the firms to exhibit 'fill the gap' behavior, and in turn, they issue more short term debt. Governments can, therefore, use the debt maturity structure as a tool in their policy formulation (Lugo and Piccillo, 2019). van Bekkum et al., (2019) regarded government and corporate bonds as substitutes and saw reference rate as pre-requisite for gap-filling behavior. Greenwood, Hanson, and Stein (2010) reported an inverse relationship between government and corporate debt maturities. It implies that if sovereign debt with shorter maturities is supplied, the organizational debt maturity will increase and vice versa. However, this relationship is more evident when the ratio of government debt is higher, and the financial position of firms, as represented by the balance sheet, is more potent. Akkoyun (2018) also supported these views for a data set during World War I when the government required resources to fund the war expenditures. They also confirmed these phenomena for high rated firms paying stable dividends. Valev (2007) questioned the nation wise use of the short term and long term debt with a lender's perspective and found that fluctuations in output, foreign exchange reserves, and exchange rate are responsible for more use of short term debt. Erasmus (2009) observed the impact of firm attributes, inflation, GDP, exchange rate, and FDI on capital structure and the leverage maturity of listed firms from 1989 to 2008 in South Africa. He observed the reliance on equity and short term financing subject to the change in the economic environment after change in the government elected through a democratic process.

H₂= There is a significant relationship between external government debt and corporate short debt maturity.

CPEC Scenario

CPEC is a substantial part of the 'One Belt One Road' (OBOR) initiative of China. This corridor is regarded as a game-changer in the local press of Pakistan. It will be a re-establishment of the old silk road which served as a link for east Asian land-locked countries to the remaining world. This project involves the development of various infrastructure facilities and also the installations to boost energy needs in Pakistan. Multiple specialized economic zones and dry ports are also parts of development projects included in CPEC blueprints. It links China's Xinjiang province to the Gawadr port in Pakistan. It is a multi-billion and multi-sector project weighing over 62bn US dollars (Khetran and Khalid, 2019). Initially, this project was valued at 46bn US dollars as declared in April 2015, the date of its inception (Garlick, 2018). It is a massive investment in the country as Pakistan managed to attract a cumulative

amount of nearly 7bn US dollars only from 1970 to 2001 (Atique, Khan, and Azhar, 2004). Currently, 19b dollars spent on projects either completed or in progress. Its primary focus is on infrastructure development and development of energy projects in Pakistan through various financing tools. There are four basic modes through which such a considerable amount is planned to be utilized without creating a burden on Pakistan's weak economy, which include i) Investment, ii) Concessional Loans, iii) Interest-free loans, and iv) Grants. The 19b US dollars expanded till now include financing mix of 70% investment, 2% interest-free loan plus grants, and the remaining 28% are concessional loans (Chattha and Sayed, 2019). The economic, social, strategic, and geopolitical issues regarding CPEC have been highlighted in past research. Its impact on the micro aspects of businesses is in the phase of exploration and will be further emphasized as this project evolves. It is early to discuss because nearly 31% of the project financing consumed and that too mainly in the energy sector and road developments. The trade, industry, and overall businesses are expected to be benefitting in the long run. However, the colossal involvement of external resources leads us to consider the relationships defined earlier. Based on these facts, we can draw the following hypothesis:

H_3 = Firm attributes are significant determinants of short debt maturity in a post-CPEC scenario.

H_4 = Government external debt is a significant determinant of short debt maturity in a post-CPEC scenario.

Materials and Methods

The firm-level data are extracted from the audited annual reports of the non-financial listed companies and the financial statement analysis (FSA) published by the State Bank of Pakistan (SBP). A total of 369 firms are listed on the PSX at the end of 2017. The final data set reduced to 331 non-financial firms due to missing values over five years, ranging from 2013 to 2017.

Table 1: Sector-wise Distribution of the Sample

Economic Groups	Total	Dropped	Included
1) Textiles	136	06	130
2) Sugar	30	02	28
3) Food	16	03	13
4) Chemicals, chemical products, and Pharmaceuticals	43	07	36
5) Manufacturing	31	04	27
6) Mineral products	9	03	06
7) Cement	17	00	17
8) Motor vehicles, trailers, and auto parts	18	00	18
9) Fuel & Energy	22	07	15
10) Information, Communication & transport Services	11	01	10
11) Coke and refined petroleum products	10	01	09
12) Paper, paperboard and products	9	01	08
13) Electrical machinery and apparatus	7	01	06
14) Other services activities	10	02	08
Total	369	38	331

Source: Extracted from Financial Statement Analysis published by SBP. (FSA 2012-17 for non-financial firms)

This data set is further analyzed for three years from 2015 to 2017 after the inception of CPEC in April 2015 to study the relationship among focus variables in a post-CPEC scenario. The country-level data relating to government external debt and exchange rate in terms of US dollars were taken from the Economic Survey of Pakistan available at the official website of the Ministry of Finance. The variables with their respective proxies and measurement technique are reported in table 2.

Table 2: Variables, their notations, and measurement techniques

Variable	Notation	Measurement	Author
<i>Dependent Variable</i>			
Short Debt Maturity	SMTR	1-Debt Maturity Ratio(DMR) Where DMR = Long term debt scaled by total debt	Hussain et al. (2020), Xuezhou et al. (2022)
<i>Independent Variable</i>			
<i>Firm-Specific</i>			
Profitability	PROF	Net income scaled by total assets	Habib et al. (2022), Fraisse & Laporte (2022)
Risk	SDPROF	The standard deviation of ROA for last five years	Hussain et al. (2022)
Liquidity	LIQ	Current assets scaled by current liabilities	Hussain et al. (2021)
Firm Growth	FG	Rate of change in total assets	Mei-Sheng et al. (2023)
Taxes	LnTAX	Natural log of tax expenses	Luo (2023), Hussain et al. (2018)
Asset Tangibility	AT	Fixed assets scaled by total assets	Xuezhou et al. (2020)
<i>Macro-economic</i>			
Government External Debt	LnGED	Natural log of external government debt	Morlin (2022), Sadiq et al. (2022)

The above table 2 gives a description of all the variables used in this study. The dependent variable named short debt maturity is measured through a proxy denoted by SMTR is estimated subtracting debt maturity ratio from value 1. The value 1 represents the total debt, and subtracting the long term debt maturity ratio from it constitutes a short term debt ratio. We measured debt maturity ratio as a ratio of long term debt to total debt (Ezeoha, 2008). The independent firm-specific variables of this study include profitability, risk, liquidity, firm growth, taxes, and asset tangibility. We measured profitability as the ratio between net income and total assets (Saeed and Sameer, 2017). For the measurement of risk, we used the standard deviation of profitability. So, we used profitability data five years before the study period (Palich, Carini, and Seaman, 2000). Liquidity measured through the current ratio, similarly to Goel, Chadha, and Sharma (2015). The rate of change in total assets is attributed to firm growth (Bei & Wijewardana, 2012). Taxes are the logarithmic value of tax expenses (Ezeoha, 2008), and asset tangibility is measured by fixed to total assets ratio (Mota and Moreira, 2017). The independent macro-economic variable in this study is external debt.

We applied the Hausman (1978) specification test to confirm the suitability of fixed effect and random effect regressions in our data analysis. Further, Breusch pagan (1979)/ Cook Weisberg (1983) test is applied to check the heterogeneity in study variables. To ensure that heterogeneity may not spoil our coefficient estimates, we used robust standard errors. The basic model of analysis based on dependent and independent variables is shown in regression equations below:

$$SMTR = \alpha + \beta_1 PROF + \beta_2 SDPROF + \beta_3 LIQ + \beta_4 FG + \beta_5 \ln TAX + \beta_6 AT + \beta_8 \ln GED + \varepsilon_{it} \quad (1)$$

Above equation (1) includes a proxy for short debt maturity as the dependent variable and the notation PROF is a proxy for profitability measured through return on assets, SDPROF is a proxy for risk calculated by taking the standard deviation of return on assets by using the return on assets of previous five years. The variable liquidity is denoted by LIQ, which is measured by the current ratio. Firm growth represented by FG is a rate of growth in total assets obtained through the division of current year total assets by previous year total assets. The proxy for tax expenses is the logarithmic value of tax expenses shown as $\ln TAX$. Asset tangibility is represented by AT, a ratio of fixed assets to total assets. The external government debt is represented by $\ln GED$.

$$SMTR = \alpha + \beta_1 PROF_{(t-1)} + \beta_2 SDPROF_{(t-1)} + \beta_3 LIQ_{(t-1)} + \beta_4 FG_{(t-1)} + \beta_5 \ln TAX_{(t-1)} + \beta_6 AT_{(t-1)} + \beta_7 \ln GED_{(t-1)} + \varepsilon_{it} \quad (2)$$

Equation (2) is designed to analyze further the role of predictor variables in a lagged framework. One year lagged values of all the dependent variables (PROF, SD-PROF, FG, $\ln TAX$, LIQ, AG, and $\ln ED$) are regressed against the dependent variable

at the level. The notation $(t - 1)$ represents one past period values of the dependent variable. The term α represents constant, β are the slope coefficients, and error terms are denoted by.

To assess the impact of firm-specific attributes on short term debt maturity and tackling the possible endogeneity in the panel data, we used the GMM estimation models developed for dynamic panel data estimation by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). The GMM approach has several merits, such as it incorporates the time series elements of the data, and also allows controlling the firm-specific effects at the same time. The lagged variables are also incorporated as repressors. The application of the GMM model has another advantage as it controls the endogeneity of study variables. Following the footsteps of Arellano and Bover (1995) and Blundell and Bond's (1998), the basic regression model can be written as:

$$y_{it} = \alpha + \sum_l k_l y_{it-l} + \beta X_{it} + \eta_i + \varepsilon_{it} \quad (3)$$

In the above equation (3), the term y_{it} stands for the dependent variable (SMTR), X denotes all the independent variables (PROF, SDPROF, FG, lnTAX, LIQ, AG and lnGED). The notation η_i stands for firm-specific effects and ε_{it} denotes error term. The notation l represents the number of lags used in the GMM approach, whereas i and t represent firms and periods, respectively. The above equation (3) is differenced to obtain the equation (4) given below to cure the firm-specific effects that may arise due to time-invariant unobserved heterogeneity.

$$\Delta y_{it} = \alpha + \sum_l \Delta y_{it-l} + \beta \Delta X_{it} + \Delta \varepsilon_{it}, \quad l > 0_0 \quad (4)$$

Further, propositions of Arellano and Bover (1995) and Blundell and Bond (1998) observed by letting the equations at the level to be incorporated in estimations of the models. Under these parameters, the differenced variables act as instruments for the equations at the level. The ultimate system of equations that incorporates both sets of the equation at level and difference can be cumulatively viewed in equation (5).

$$\begin{bmatrix} y_{it} \\ \Delta y_{it} \end{bmatrix} = \alpha + k \begin{bmatrix} y_{it-p} \\ \Delta y_{it-p} \end{bmatrix} + \beta \begin{bmatrix} X_{it} \\ \Delta \beta_{it} \end{bmatrix} + \varepsilon_{it} \quad (5)$$

This study employs system GMM due to higher accuracy in comparison to the difference GMM, and it also solves the unit root issue (Tan, 2016). One-step system GMM is preferred over the two-step system GMM because it is less biased, and also the estimations have low standard deviation (Judson and Owen, 1999). We used Sargan (1958) test to tackle the over-identification problem suggested by Arellano and Bond (1991) and to ensure the validity of instruments used. The instruments found

correlated to the error term rejecting the alternate hypothesis and proving both of our dynamic GMM panel models as valid.

Results and Interpretation

Table 3: Descriptive Statistics and Correlations

Variables	Obs	Mean	S.D	SMTR	PROF	SDPROF	LIQ	FG	lnTax	AT	lnED
SMTR	1655	0.73	0.22	1							
PROF	1655	3.18	46.42	-0.04*	1						
SDPROF	1655	125.82	2135.11	-0.13***	0.25***	1					
LIQ	1655	2.10	9.72	0.02	0.01	-0.01	1				
FG	1655	0.092	0.47	-0.06**	-0.05*	0.45***	-0.01	1			
lnTax	1655	16.42	0.34	-0.01	0.01	-0.002	0.003	10.001	1		
AT	1655	0.56	0.23	-0.37***	-0.02	0.01	-0.17***	0.04*	-0.02	1	
lnGED	1655	16.42	0.12	0.08***	-0.03	-0.00	0.01	0.01	0.02	0.01	1

Note: The notations SMTR represents short term debt maturity, PROF stands for firm profitability, and SDPROF is a measure of firm risk. Similarly, LIQ represents liquidity, FG for firm growth, lnTAX is for the logarithmic value of taxes, AT for asset tangibility, and lnGED represents the natural log of external government debt. The signs *, ** and *** show level of significance at 0.1, 0.5 and 0.01, respectively.

The above table-3 explains the mean and standard deviation of the study variables along with the correlation among them. The data sample consists of 331 listed non-financial firms for five years, making a total count of 1655 observations. The mean value of short term debt maturity is 0.73, and its standard deviation is 0.22. Profitability measured through return on assets has a mean value equal to 3.18 and with a standard deviation of 46.42. Risk is measured through standard deviation of return on assets as represented by SDPROF has an average of 125.8 and deviations from the mean account for 2135.11. The liquidity of the firms measured through the current ratio has a mean value of 2.10 and a standard deviation of 9.72. Firm growth has an average of 0.092, and the variation from this average is 0.47. The mean value of taxes accounts for 16.42, with a standard deviation of 0.34. Asset Tangibility has an average of 0.56, with a predicted variation of 0.23. The only macro-economic of the study is external government debt; the mean of the logarithmic value of this debt is 16.42 and having a standard deviation of 0.12. This table also reports the correlations among study variables, which is also an indication of the multicollinearity among variables if their values are high and significant, usually more than 50% can be a matter of concern. However, in the current scenario, none of the variables exhibited a high correlation, as can be seen in the above table.

Table 4: Variance Inflation Factor

Variable	VIF	1/VIF
PROF	1.11	0.902246
SDPROF	1.38	0.725333
FG	1.29	0.772502
lnTAX	1.00	0.998573
LIQ	1.03	0.970690
AT	1.03	0.968102
lnGED	1.00	0.997800
Mean VIF	1.12	

Note: The notations PROF stands for firm profitability. SDPROF is a measure of firm risk. Similarly, LIQ represents liquidity, FG for firm growth, lnTAX is for the logarithmic value of taxes, AT for asset tangibility, and lnGED represents the natural log of external government debt. The signs *, ** and *** show level of significance at 0.1, 0.5 and 0.01, respectively.

To further investigate the issue of multicollinearity in this study, we calculated the variance inflation factor (VIF) for each variable. The decision regarding multicollinearity is based on a cut-off point, usually 10. It means that a value exceeding 10 for any of the variables under consideration denotes high multicollinearity. In this case, we cannot proceed further unless we solve this issue. However, in this particular case, there is no issue of multicollinearity as the VIF values are much lower than the cut-off point. Similarly, mean VIF is also much less, indicating no multicollinearity among study variables.

Table 5: Multivariate Regression Results

Variable	Overall (2013-2017) (RE)	Post CPEC (2015-2017) (RE)
Constant	-0.75617** (0.3707)	-0.05794 (0.3595)
PROF	0.00008** (0.0000)	-0.00000 (0.0000)
SDPROF	-0.00001*** (0.0000)	-0.00001*** (0.0000)
FG	0.00000*** (0.0000)	-0.00000 (0.0000)
lnTAX	-0.00274* (0.0015)	-0.00413*** (0.0014)
LIQ	-0.00059 (0.0004)	-0.00023 (0.0002)
AT	-0.25916*** (0.0450)	-0.27979*** (0.0473)
LnGED	0.15120*** (0.0336)	0.09194** (0.0326)
R-square	0.1606	0.1481
Breusch Pagan/Cook Weisberg test	80.24***	56.51***
Hausman	9.50	7.18

Note: The notations PROF stands for firm profitability. SDPROF is a measure of firm risk. Similarly, LIQ represents liquidity, FG for firm growth, lnTAX is for the logarithmic value of taxes, AT for asset tangibility, and lnGED represents the natural log of external government debt. The standard errors presented within parenthesis. The signs *, ** and *** show level of significance at 0.1, 0.5 and 0.01, respectively.

Table 5 report random effects (RE) multiple regression results with robust standard errors as the values for Hausman test are insignificant in both cases (coeff = 9.50 at p-value > 0.1 & coeff = 7.18 at p-value > 0.1). The firm profitability (PROF) has a positive impact on short term maturity at 10% level significance for the complete sample, and it is negative for the post CPEC period but insignificant. Firm-level risk represented by the standard deviation of profitability (SDPROF) influences short debt maturity negatively, and this influence is significant at a 1% level of significance, i.e. (p<0.01). Firm growth has a significant positive impact on short maturity of debt in the overall sample but the insignificant negative impact for the post CPEC period. The taxes have a significant negative role in describing the short debt maturity of the listed non-financial firms in Pakistan. The firm liquidity represented by notation LIQ has negative coefficient values, and also the coefficients are insignificant in both cases. Asset tangibility also has a negative and significant impact on short term debt levels both for the total study period and post CPEC period in this analysis. External debt is significantly and positively defining the short term debt maturity in this analysis for both cases i.e. complete period (coeff = 0.15 & p-value < 0.01) and post CPEC period (coeff = 0.09 & p-value < 0.05). Breusch Pagan/Cook Weisberg test is used to check the heteroskedasticity. It rejects the null hypothesis of no heteroskedasticity as the p-value is much less than 0.01 in both cases. The R-squared value is good, proving the reasonable predictive power of this model.

Table 6: Multivariate Regression Results with Lagged Variables

Variable	Overall (2013-2017) (RE)	Post CPEC (2015-2017) (RE)
Constant	-1.1968** (0.4943)	-1.07417** (0.4802)
PROF _(t-1)	0.00004 (0.0000)	0.00006 (0.0000)
SDPROF _(t-1)	-0.00001*** (0.0000)	-0.00001*** (0.0000)
FG _(t-1)	0.00000*** (0.0000)	0.00000*** (0.0000)
lnTAX _(t-1)	0.00124 (0.0016)	-0.00025 (0.0014)
LIQ _(t-1)	-0.00058 (0.0007)	-0.00062 (0.0010)
AT _(t-1)	-0.18949*** (0.0410)	-0.20631*** (0.0451)
lnGED _(t-1)	0.18292*** (0.0449)	0.17496*** (0.0437)
R-square	0.1343	0.1323
Breusch Pagan/Cook Weisberg test	66.45***	58.12***

Note: The notations PROF_(t-1) stands for firm lagged profitability, SDPROF_(t-1) is a measure of lagged firm risk. Similarly, LIQ_(t-1) represents lagged liquidity, FG_(t-1) for lagged firm growth, lnTAX_(t-1) is for logarithmic value of lagged taxes, AT_(t-1) for lagged asset tangibility and lnGED_(t-1) represents natural log of lagged government external debt. The standard errors presented within parenthesis. The signs *, ** and *** show level of significance at 0.1, 0.5 and 0.01, respectively.

In table 6, we present multivariate regression results of the lagged independent variables. In this setting, one-year prior profitability has a positive but insignificant effect on short debt maturity for overall and post CPEC period. Last period risk has a negative influence on the current short term debt maturity at a 1% level of significance, and the results are similar for both the samples. Lagged firm growth is a positive predictor of short term debt for overall and the post-CPEC data at a 1% level of significance. Prior period taxes have a positive but insignificant impact on the current short maturity of debt in the overall data period, i.e., 2013 to 2017. It influenced negatively but yet insignificant for the post CPEC period. Lagged firm liquidity is a negative but insignificant predictor of current short debt maturity for both the samples. Results for lagged asset tangibility are consistent as at level, and there is a significant and negative impact on short debt maturity at a 1% level of significance in both samples. The role of lagged government external debt is estimated to be consistent with previous analysis at the level as it has a positive impact on current short term debt maturity for both the samples. It confirms the fill the gap behavior of corporate entities in this sample of firms during the study period. Heterskedacity test once again confirms the non-homoskedacitic behavior of data that leads us to employ robust standard errors while analyzing the data through regression.

Table 7: Generalized Method of Moments (System-GMM) Regression Results

Variable	Overall (2013-2017)	Post CPEC (2015-2017)
Constant	-0.13856 (0.3294)	-0.14014 (0.3299)
STMR _(t-1)	0.58603*** (0.0797)	0.58665*** (0.0800)
PROF	0.00004 (0.0000)	0.00004 (0.0000)
SDPROF	-0.00074*** (0.0002)	-0.00074*** (0.0002)
FG	-0.00000 (0.0000)	-0.00000 (0.0000)
lnTAX	0.00086 (0.0092)	0.00085 (0.0092)
LIQ	-0.00027 (0.0004)	-0.00027 (0.0004)
AT	-0.24912*** (0.0503)	-0.24896*** (0.0503)
lnGED	0.06034** (0.0263)	0.06039** (0.0262)
No of Groups	331	331
No of Instruments	17	17
Sargan Test	5.819	5.809

Note: The notations SMTR_(t-1) represents lagged short term debt maturity, PROF stands for firm profitability. SDPROF is a measure of firm risk. Similarly, LIQ represents liquidity, FG for firm growth, lnTAX is for the logarithmic value of taxes, AT for asset tangibility, and lnGED represents the natural log of external government debt. The standard errors presented within parenthesis. The signs *, ** and *** show level of significance at 0.1, 0.5 and 0.01, respectively.

Table 7 constructed to report the role of selected predictors using the system GMM approach. It proves that profitability, firm growth, taxes, and liquidity are weak predictors of short term debt maturity in overall data period and post CPEC period being highly insignificant. However, profitability and taxes are negative predictors of short term debt maturity, and firm growth and liquidity are negative predictors of short term debt maturity. Firm-level risks once again confirm the previous results for the complete sample and post CPEC sample, respectively. They have a significant negative impact on short term debt maturity of the listed non-financial firms in Pakistan. The same is the case for external debt as our results reaffirm the positive role of defining firm-level short term debt maturity. Results are consistent as per the significance level for both periods, i.e., overall (2013-2017) and post CPEC (2015-2017). The lagged value of short term debt maturity is also a positive and significant predictor of current short term debt maturity. The estimated value of the Sargan test is insignificant, confirming that instruments are valid.

Conclusion and Policy Implications

In this paper, we examine the determinants of short debt maturity in listed non-financial firms of an underdeveloped economy. More specifically, we used certain firm-specific attributes and government external debt as predictors of short maturity in corporate debt of Pakistani firms over 2013-2017 and also in a post-CPEC scenario over 2015-2017. We find that risk, asset tangibility, and external government debt are strong predictors of short term debt maturity. Risk and asset tangibility influenced short term debt negatively, and results were significant for both samples using varied statistical approaches, a similar proposition was made by Hall (2012) who found a positive relationship between asset tangibility and long term debt. The negative association of risk proves that firms at higher risk levels try to avoid short term debt as it proves riskier currently and in the future as well Hussain et al. (2021). Tangible assets are regarded as collateral in acquiring finance, and our results demonstrate that Pakistani firms do not exploit them for short term debt acquisition, as shown by the significant negative link between them. More risk mitigation approaches may render the use of tangible assets as collateral in long term loan acquisition (Xuezhou et al., 2022). We employed the random effect model with robust standard errors at the level and first difference. The endogeneity concerns were settled by applying the one-step system GMM model that also confirmed our results. The government external debt influenced short term debt maturity positively as also evidenced by (Gelpert, Hagan & Mazarei, 2020). A significant role of foreign government debt in defining the short term debt has implications for policymakers at the government level. Like Dangel & Zechner (2021), the profitability, firm growth, and liquidity proved to be weak determinants of short corporate debt maturity in our analysis, and their impact was

inconsistent under various econometric approaches applied. The tax expenses turned out to be a negative predictor of short maturity in the post-CPEC scenario (Pour & Lasfer, 2019). The overall results are pretty much unchanged in a post-CPEC scenario, referring that the behavior of short term debt maturity is stable. It may be due to lesser contribution of CPEC financing in the shape of external borrowing but more of an investment as joint ventures at the firm level as claimed by Chinese officials and their Pakistani counterparts.

Declarations

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest/Competing interests

There is no conflict of interest/Competing interests.

Availability of data and material

The data that support the findings of this study are openly available in the website of State Bank of Pakistan and Ministry of finance (www.sbp.org.pk/publications; www.finance.gov.pk).

Code Availability

The computer program results are shared through the tables in the manuscript.

Authors' Contributions

RYH wrote the main draft, WX supervised the research, HH did the main analysis, IA collected the data and handled software related issues, HI conceived the idea and helped in preparing main draft, MYHM wrote the revisions and proof read the document.

REFERENCES

- Akkoyun, H. C. (2018). How Does Government Debt Impact Corporate Financing? Evidence From War Finance. Available online at https://cpbe1.wpmucdn.com/sites.northwestern.edu/dist/7/2582/files/2018/09/JMP_20181110-1csxq95.pdf [Accessed March, 24, 2020].
- Antoniou, A., Guney, Y., and Paudyal, K. (2006). The determinants of debt maturity structure: evidence from France, Germany and the UK. *European Financial Management*, 12(2), 161-194.
- Arellano, M. and Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58 (2), 277-297.
- Arellano, M. and Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29-51
- Atique, Z., Khan, M.H., and Azhar, U. (2004). The impact of FDI on economic growth under foreign trade regimes: A case study of Pakistan. *The Pakistan Development Review*, 43(4), 707-718.
- Badoer, D. C., and James, C. M. (2016). The determinants of long-term corporate debt issuances. *The Journal of Finance*, 71(1), 457-492.
- Bei, Z., and Wijewardana, W. P. (2012). Financial leverage, firm growth and financial strength in the listed companies in Sri Lanka. *Procedia - Social and Behavioral Sciences*, 40, 709-715.
- Blundell, R., and Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics*, 87(1), 115-143.
- Breusch, T.S. and A.R. Pagan, (1979). A simple test for heteroscedasticity and random coefficient variation. *Econometrica* 47, 1287- 1294.
- Chattha, M. K., and Sayed, M. (2019). China-Pakistan Economic Corridor: Where is the money going?. *Journal of Infrastructure, Policy and Development*, 3(1), 100-114.
- Cook, R. D., and Weisberg, S. (1983). Diagnostics for heteroscedasticity in regression. *Biometrika* 70, 1-10.
- Cüneyt Orman and Bülent Köksal (2017), Debt maturity across firm types: Evidence from a major developing economy. *Emerging Markets Review*, 30, 169-199.
- Custódio, C., Ferreira, M. A., and Laureano, L. (2013). Why are US firms using more short-term debt?. *Journal of Financial Economics*, 108(1), 182-212.
- Dangl, T., & Zechner, J. (2021). Debt maturity and the dynamics of leverage. *The Review of Financial Studies*, 34(12), 5796-5840.
- Demirci, I., Huang, J., and Sialm, C. (2019). Government debt and corporate leverage: International evidence. *Journal of financial economics*, 133(2), 337-356.
- Díaz-Díaz, N. L., García-Teruel, P. J., and Martínez-Solano, P. (2016). Debt maturity structure in private firms: Does the family control matter?. *Journal of Corporate Finance*, 37, 393-411.
- Erasmus, P. (2009). Capital structure and debt maturity choices for South African firms: Evidence from a highly variable economic environment. In *12th international conference on finance & banking: Structural & regional impacts of financial crises (Vol. 1, No. 1, pp. 134-147)*.
- Ezeoha, A. E. (2008). Firm size and corporate financial-leverage choice in a developing economy: Evidence from Nigeria. *The Journal of Risk Finance*, 9, 351-364.
- Fan, J. P., Titman, S., and Twite, G. (2012). An international comparison of capital structure and debt maturity choices. *Journal of Financial and quantitative Analysis*, 47(1), 23-56.
- Garlick, J. (2018). Deconstructing the China–Pakistan economic corridor: pipe dreams versus geopolitical realities. *Journal of Contemporary China*, 27(112), 519-533.
- Gelpern, A., Hagan, S., & Mazarei, A. (2020). Debt standstills can help vulnerable governments manage the COVID-19 crisis. *Peterson Institute for International Economics*, 7.
- Graham, J., Leary, M. T., and Roberts, M. R. (2014). How does government borrowing affect corporate financing and investment? (No. w20581). National Bureau of Economic Research.

- Greenwood, R., Hanson, S., and Stein, J. C. (2010). A gap-filling theory of corporate debt maturity choice. *The Journal of Finance*, 65(3), 993-1028.
- Goel, U., Chadha, S., and Sharma, A. K. (2015). Operating liquidity and financial leverage: Evidences from Indian machinery industry. *Procedia-Social and Behavioral Sciences*, 189(14), 344-350.
- Fraisse, H., & Laporte, M. (2022). Return on investment on artificial intelligence: The case of bank capital requirement. *Journal of Banking & Finance*, 138, 106401.
- Habib, S. M., Hussain, H., Al-Faryan, M. A. S., & Hussain, R. Y. (2022). Impact of firm characteristics and ownership structure on firm efficiency: evidence from non-financial firms of Pakistan. *Cogent Economics & Finance*, 10(1), 2106628.
- Hall, T. W. (2012). The collateral channel: Evidence on leverage and asset tangibility. *Journal of Corporate Finance*, 18(3), 570-583.
- Hausman, J.A., 1978, Specification tests in econometrics, *Econometrica* 46, 1251-1272.
- Hussain, R. Y., Irshad, H., Akhtar, S., & Ismail, H. (2018). Analyzing the Factors of Firm Liquidity in Chemical Products and Pharmaceuticals Sector of Pakistan. *Review of Applied Management and Social Sciences*, 1(1), 1-7.
- Hussain, R. Y., Wen, X., Butt, R. S., Hussain, H., Ali Qalati, S., & Abbas, I. (2020). Are growth led financing decisions causing insolvency in listed firms of Pakistan?. *Zagreb International Review of Economics & Business*, 23(2), 89-115.
- Hussain, R. Y., Xuezhou, W., Hussain, H., Saad, M., & Qalati, S. A. (2021). Corporate board vigilance and insolvency risk: a mediated moderation model of debt maturity and fixed collaterals. *International Journal of Management and Economics*, 57(1), 14-33.
- Hussain, R. Y., Wen, X., Hussain, H., Saad, M., & Zafar, Z. (2022). Do leverage decisions mediate the relationship between board structure and insolvency risk? A comparative mediating role of capital structure and debt maturity. *South Asian Journal of Business Studies*, 11(1), 104-125.
- Judson, R. A., and Owen, A. L. (1999). Estimating dynamic panel data models: a guide for macroeconomists. *Economics letters*, 65(1), 9-15.
- Keefe, M. O. C., and Yaghoubi, M. (2016). The influence of cash flow volatility on capital structure and the use of debt of different maturities. *Journal of Corporate Finance*, 38, 18-36.
- Khetran, M. S. B., and Khalid, M. H. (2019). The China-Pakistan Economic Corridor Gateway to Central Asia. *China Quarterly of International Strategic Studies*, 5(3), 1-15
- Kubick, T. R., and Lockhart, G. B. (2017). Corporate tax aggressiveness and the maturity structure of debt. *Advances in accounting*, 36, 50-57.
- López-Gracia, J., and Mestre-Barberá, R. (2011). Tax effect on Spanish SME optimum debt maturity structure. *Journal of Business Research*, 64(6), 649-655.
- Luo, W. (2023). Demography and economic growth: the effect of tax composition. In *Inequality, Demography and Fiscal Policy* (pp. 161-177). Singapore: Springer Nature Singapore.
- Lugo, S., and Piccillo, G. (2019). The Relation between Corporate and Government Debt Maturity in Europe. *Journal of Financial and Quantitative Analysis*, 54(5), 2119-2140.
- Mehar, A. (2017). Infrastructure development, CPEC and FDI in Pakistan: is there any connection?. *Transnational corporations review*, 9(3), 232-241.
- Mei-Sheng, D., Hong, G. X., Hussain, R. Y., & Tajeddini, K. (2023). Is state-owned enterprise merging private enterprise “market choice” or “space crowding”?—Based on the motives of equity transfer of mixed-ownership enterprises. *Heliyon*, 9(8).
- Morlin, G. S. (2022). Growth led by government expenditure and exports: public and external debt stability in a supermultiplier model. *Structural Change and Economic Dynamics*, 62, 586-598.
- Mota, J. H., and Moreira, A. C. (2017). Determinants of the capital structure of Portuguese firms with investments in Angola. *South African Journal of Economic and Management Sciences*, 20(1), 1-11. doi:<https://doi.org/10.4102/sajems.v20i1.885>.

- Palich, L. E., Carini, G. R., and Seaman, S. L. (2000). The Impact of Internationalization on the Diversification–Performance Relationship. *Journal of Business Research*, 48(1), 43–54. doi:10.1016/s0148-2963(98)00074-5.
- Pour, E. K., & Lasfer, M. (2019). Taxes, governance, and debt maturity structure: International evidence. *Journal of International Financial Markets, Institutions and Money*, 58, 136-161.
- Qiuyan, Z., Qian, Z., and Jingjing, G. (2012). On Debt Maturity Structure of Listed Companies in Financial Engineering. *Systems Engineering Procedia*, 4, 61-67.
- Sadiq, M., Shinwari, R., Usman, M., Ozturk, I., & Maghyereh, A. I. (2022). Linking nuclear energy, human development and carbon emission in BRICS region: do external debt and financial globalization protect the environment?. *Nuclear Engineering and Technology*, 54(9), 3299-3309.
- Saeed, A., and Sameer, M. (2017). Impact of board gender diversity on dividend payments: Evidence from some emerging economies. *International Business Review*, 26(6), 1100-1113.
- Sargan, J.D. (1958). The estimation of economic relationships using instrumental variables. *Econometrica: Journal of the Econometric Society*, 393-415.
- Stephan, A., Talavera, O., and Tsapin, A. (2011). Corporate debt maturity choice in emerging financial markets. *The Quarterly Review of Economics and Finance*, 51(2), 141-151.
- Tan, Y. (2016). The impacts of risk and competition on bank profitability in China. *Journal of International Financial Markets, Institutions and Money*, 40, 85-110.
- Terra, P. R. S. (2011), “Determinants of corporate debt maturity in Latin America”, *European Business Review*, 23(1), 45-70.
- Valev, N. T. (2007). Uncertainty and international debt maturity. *Journal of International Financial Markets, Institutions and Money*, 17(4), 372-386.
- van Bakkum, S., Grundy, B. D., and Verwijmeren, P. (2019). The Importance of Sovereign Reference Rates for Corporate Debt Issuance: Mind the Gap. Available at SSRN 3330391.
- Xuezhou, W., Hussain, R. Y., Hussain, H., Saad, M., & BUTT, R. S. (2020). Interaction of Asset Tangibility on the Relationship between Leverage Structure and Financial Distress in Agriculture–Linked Non-Financial Firms. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, 20(3).
- Xuezhou, W., Hussain, R. Y., Hussain, H., Saad, M., & Qalati, S. A. (2022). Analyzing the impact of board vigilance on financial distress through the intervention of leverage structure and interaction of asset tangibility in the non-financial sector of Pakistan. *International Journal of Financial Engineering*, 9(2), 2150004.