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May-June 2020
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Impact of Long-Term Debt Maturity and Corporate Social Responsibility on Default Probability in Developing Countries

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Abstract:
This paper examines the impact of long-term debt maturity and corporate social responsibility on probability of default in 17 developing countries during 2010-2017. We find evidence that long-term debt maturity increases probability of default. Moreover, we establish that firms that invest more in corporate social responsibility activities decrease their probability of default. Similar results are obtained after excluding Africa and Middle Eastern regions from the full sample. Additional robustness analysis suggests that macroeconomic variables impact negatively on the probability of default. The findings suggest that policymakers should design policies that encourages firms to increase their investments towards CSR activities in order to establish good reputation with various stakeholders, and hence decrease probability of default.

Keywords*: long-term debt maturity, CSR, default probability, developing countries*
JEL classification: G30, G33, M14.

1. Introduction

There is no doubt that choice of debt and debt maturity structure are significant in determining the financial survival of corporate organizations. The choice of optimum debt maturity involves the trade-off between the costs and benefits of short-term and long-term debts. Longer maturity period is influenced by the tax related benefits but it exposes firms to default risk (Cathcart et al. 2020; Wang and Chiu, 2019). Theoretically, short-term debt maturity reduces firm financing costs, however it threatens firms with refinancing risk (He and Xiong 2012). Choosing an appropriate debt maturity may likely affect the firm default risk. Orman and Koksal (2017) argue that firms are exposed to possible inability to roll-over their short-term debts and fluctuations in interest rates thereby making it difficult for such firms to pursue available growth opportunities. The literature document that shortening the firms' debt maturity decreases information asymmetry (Diamond 1991; Kale and Noe 1990; Flannery 1986). Myers (1977) suggests that debt maturity reduces agency

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

related problems such as underinvestment and debt overhung. Myers also emphasize the monitoring role of short-term debt maturity in regulating the overinvestment behaviour by managers. Short-term debt maturity reduces the free cash flow and controls for inefficient use of firm resources. Additionally, Flannery (1986) also argues that where information asymmetry exists, debt maturity structure may serve as an indication of firm quality to outsiders. Empirical evidence on the effect of long-term debt maturity on probability of default are limited, and most of those studies focus on developed countries especially the United States market. A number of studies support the roll-over risk hypothesis (i.e. Cathcart et al., 2020; Jermann and Yue 2018; Crouzet et al., 2017) whose finding suggests that a firm faces higher risk of default when it is unable to roll-over its debts. Wang and Chiu (2019) find that firms that have higher amount of long-term debts are associated with higher risk of default. Awartani et al. (2016) document evidence in the MENA region that better quality institutions such as better regulatory institutions, strong rule of law, more developed capital markets and better creditor protection policies influence the firms' debt maturity. Most developing countries are characterized by inefficient capital markets and poor bankruptcy laws. World Bank Group (2017) also reports that firms in developing countries raise finance from the debt markets at maturity periods slightly higher than those issued by firms in developing countries (i.e. 7.3 years for developing and 6.2 years for developed countries); hence the need to explore how long-term debts exacerbates default probability in developing countries.

This study contributes to the literature in several ways: First, the study shows that long-term debt maturity contributes immensely to the firm probability of default. To arrive at this conclusion, the study employs a sample of 3,968 firm-year observations from 17 developing countries from 2010-2017. Our data source is Thomson Reuters DataStream, and we estimate probability of default using the Altman (1968) z-score model. Our findings reveal that firms with greater capacity borrow at longer maturity periods, but increase their probability to default.

Secondly, a growing number of studies have investigated the effect of corporate social responsibility (herein after referred to as CSR) on firm financial performance (Cho et al., 2019, Memon et al., 2019, Tran et al., 2019), firm idiosyncratic risk (Albuquerque et al., 2019, Metcalf et al., 2016) and default probability (Rizwan et al., 2017; Sun and Cui 2014; Jiraporn et al., 2014). In terms of default probability, a large number of the studies report that CSR might decrease probability of default. While most of those studies are carried out in the developed countries, this current study intends to expand the literature by analyzing the effect of CSR participation and probability of default using a sample of firms in developing countries. Our findings show that CSR participation lowers probability of default.

Third, the finance literature on predicting firm probability of default has mainly focus on examining the firm financial data to infer default. Numerous authors use firms' published financial statements to determine the likelihood of default probability and bankruptcy since the earlier works by Altman (1968). Though financial ratios are believed to be the cause of most business failures, however macroeconomic variables are also believed to contribute immensely towards default because those macroeconomic variables affects all the firms in the same way (Acosta-Gonzalez et al., 2019). Yet, limited studies focus on investigating the macroeconomic variables as determinants of probability of default, especially in developing countries. This study consider three macroeconomic variables namely; GDP growth rate, inflation, and interest rates to predict firm probability of default. Our findings reveal that GDP growth rate, inflation and interest rates are negatively related to probability of default.

Increase in GDP growth rate indicate increase in economic prospects such as sales growth (Filipe et al., 2016) that may likely decrease debt usage by firms thereby lowering probability of default. Similarly when the inflation rate is high, lenders are discouraged from supplying debt capital (Matemilola

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

et al., 2019), also when the interest rate is high, firms are discouraged from debt financing (Carvalho et al., 2020), these discourages debt financing and subsequently lower default probability. The reminder of the paper is organized as follows: section 2 reviews the relevant literature for the study, section 3 explain the methodology, section 4 presents and discusses the results and section 5 concludes the study.

2. Literature review:

This section describe the theoretical framework to highlight the link between log-term debt maturity, CSR, macroeconomic variables and probability of default. Furthermore, this section also reviews the empirical literature relevant to the factors under consideration.

2.1 Long-term debt maturity and probability of default

Some decades ago, Stiglitz (1974) propose that choice of short-term or long-term debt maturity is irrelevant in determining firm value where perfect capital market exists. However, numerous theoretical and empirical studies (i.e. Wang and Chiu 2019; Orman and Koksal 2017; Awartani et al., 2016; Stohs and Mauer 1996; Diamond 1991; Kale and Noe 1990; Flannery 1986; Brick and Ravid 1985; Myers 1977) have oppose Stiglitz's debt maturity irrelevance hypothesis because of the imperfection of the capital markets. Myers (1977) was among the first to make contributions to understanding debt maturity theory. Myers argue that debt maturity could be used by firms to decrease agency conflicts arising from debtholders and equity holders. This could happen by utilizing the short-term debt maturity structure because short-term debt maturity is more efficient in reducing agency conflicts than long-term debt maturity. Barnea et al. (1980) added that shortening the maturity of the debts allow for frequent monitoring of borrowers by the creditors and hence reduce conflicts within the firm. Furthermore, Brick and Ravid (1985) explain debt maturity choice in the concept of tax related theories. The authors argue that when a firm has differentiated structure of interest rates, long-term debt maturity structure will be more ideal in increasing the firm value. Choice of debt maturity may also be linked to the private information about the firm quality. Flannery (1986) and Kale and Noe (1990) are among the pioneer studies that investigate the role of signaling and information asymmetry in determining the firm debt maturity structure. The authors argue that in the presence of information asymmetry, choice of short-term or long-term debt maturity can be used to communicate the true quality of the firm to the outsiders. Flannery (1986) claim that high quality firms choose shorter debt maturity periods while lower quality firms opt for longer maturity periods. Choice of debt maturity is also influenced by the firm's liquidity risk. Diamond (1991) claim that choice of debt maturity is based on the trade-off by the borrowers on the private information about the preference for either long-term or short-term debt maturity. This choice is usually determined by the available information on firm's future liquidity risk and default probability. Diamond (1991) maintain that high quality firms usually issue short-term debts to minimize liquidity risk, lower quality firms issue short-term debts because of their inability to secure long-term debts due to their lower liquidation value, while the mid-rated firms may issue long-term debt maturity though at higher interest rates to reduce the roll-over and liquidity risks. Empirically, limited studies have investigated the impact of debt maturity structure on firm probability of default. Most of these studies relied on the theoretical frameworks of Myers (1977) and Diamond (1991) that explained clearly the advantages and disadvantages of debt maturity. Wang and Chiu (2019) empirically examined the impact of short-term debt on default probability in five Asia Pacific countries (namely Australia, Taiwan, Singapore, Malaysia and South Korea). Their findings show that firms have higher default probability when they have higher amount of debts with long-term debt maturity period. This finding is consistent with roll-over hypothesis that when

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

firms were unable to roll-over the short-term debts they are more likely to have higher default probability. Goplan et al. (2014) investigate the roll-over risk and credit ratings for U.S. firms, their findings show that firms that possess more long-term debt maturities are more anticipated to be downgraded. Another strand of finance literature argue that short-term debt maturity lead to more rapid decrease in firms' debt especially when firms begin to experience decline in their profitability. Some theoretical assumptions suggests that firms financed by short-term debts usually face the risk of inability to roll-over at maturity periods especially when the credit markets are tight or when the debts are expensive, hence decreasing firm value and increase in default probability (He and Xiong 2012). Additionally, He and Milbradt (2016) and He and Xiong (2012) empirically find that firms' default time is determined by its debt recovery value such that when a firms' future cash inflow deteriorate over time, early and inefficient default may likely occur. Firms issue long-term debt maturity to derive the benefits of interest tax shields, Leland and Toft (1996) claim that the tax advantage of the debt is maximized when firms issue debt with an infinite maturity structure. Thus, infinite debt maturity decreases transaction costs and mitigates early and inefficient default. On the other hand, the findings by D'Mello et al. (2018) discovered that longer maturity periods eliminate shareholders' incentive to pursue future debt reductions. Thus, the equity holders utilize the firms' equity to repay the debts in order to decrease the increasing effect of debts on the firm value amidst deteriorating cash inflows. However, when the firm's profitability continue to decline, the firm is left with no option than to continue issuing debts. Nevertheless, the authors argue that shot-term debt maturity serve to reduce firm's debts when the profitability is decreasing.

2.2 CSR and probability of default

The relationship between CSR performance and firm performance has been analyzed in the literature with findings based on different perspectives such as the stakeholder wealth maximization view and the risk mitigation viewpoint. Others view CSR as a source of conflict between shareholders and managers (Barnea and Rubin 2010), Hong (2019) also argue that corporate governance which is an aspect of CSR could decrease agency conflicts. From the stakeholder point of view, CSR is seen as a critical firm resource that connect the firm with its various stakeholders (Sun and Cui 2014). Additionally, the benefits of firm CSR participation is not only limited to the shareholders, but to the larger group of the society (Boubaker et al., 2019; Jiraporn et al., 2014). Firms that participate actively in CSR activities gain improved reputation which helps firms to penetrate international markets (Gardberg and Fombrun 2006). Benlemlih et al. (2018) also argue that high CSR participation creates goodwill for the firm through increasing firm-community relationship, employee dedication to duty, consumer loyalty, and supplier confidence towards the firm. Such goodwill increases the belief of all the stakeholders, impact their behaviour positively towards the firm and earn integrity for the firm (Luo and Bhattacharya 2009; McWilliams et al., 2006). Beside the wealth maximization view, CSR participation may also mitigate firm risk in multiple ways. Higher CSR activities signal firm long-term sustainability, intensify firm reputation and decrease the firms' likelihood of fines and lawsuits. This may be seen by the market as a risk mitigating factor (Rizwan et al., 2017). Moreover, firms that participate actively in CSR also enjoy stable cash inflows thereby reducing firm idiosyncratic risks. Brown and Kapada (2007) argued that firms that have higher level of financial risk are susceptible to greater uncertainty in their future cash inflows. The probability of default literature submit that a firm's likelihood to default its obligations is directly linked to its future cash inflows, firms that have stable cash inflows are less likely to fall into financial distress and bankruptcy (Sun and Cui 2014). Empirically, Truong and Kim

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

(2020) and Rizwan et al. (2017) have demonstrated that CSR activities may likely help to create intangible assets thereby increasing firms wealth and reducing default probability. CSR participation decreases idiosyncratic risk (Metcalf et al., 2016), enhances firm credit ratings (Jiraporn et al., 2014; Attig et al., 2013) and lower cost of equity (El-Ghoul et al., 2011). Therefore, firm CSR participation are likely to decrease the firms' financing costs, safeguard its future cash inflows, create intangible assets, decrease idiosyncratic risk and subsequently decrease probability of default.

2.3 Macroeconomic variables and probability of default

Forecasting probability of default and bankruptcy has been a recurring issue in the finance literature since the seminal works by Altman (1968) and Beaver (1966). Numerous studies make an attempt to classify firms based on financial health using the measures of financial data (Acosta-Gonzalez et al., 2019). Recently, another strand of literature focuses on macroeconomic determinants and country specific characteristics to predict firm probability of default (Kai and Xiaoguang 2020; Acosta-Gonzalez et al., 2019; Azizpour et al., 2018; Tinoco and Wilson 2013). These studies combine different macroeconomic variables and country characteristics to proxy for macroeconomic environment. For example, GDP growth rate, interest rate, inflation rate, stock returns, legal environment, creditor protection laws e.t.c. Nevertheless, as time changes, the forecast ability of these variables also changes. A study that combine firm level data and macroeconomic variables to predict default probability is necessary because it is argued that micro and macroeconomic factors are regarded as factors responsible for most firm failures. Similarly, Acosta-Gonzalez (2019) reported that macroeconomic variables affect all firms in the same way.

A number of empirical studies have examined the impact of macroeconomic variables on firm probability of default. Focusing on U.S. industrial economic sector, Kai and Xiaoguang (2020) find that macroeconomic indicators predict probability of default efficiently. Wang and Chiu (2019) also empirically show that stock return volatility is positively related to default probability. Acost-Gonzalez et al. (2019) analyze selected econometric models to forecast probability of default using both financial ratios and macroeconomic factors. The findings reveal that changes in interest rates, credit granted and sectors' share of GDP are more sensitive to predicting probability of default than the financial ratios for firms in the Spanish construction sector. Azizpour et al. (2018) provide evidence that macroeconomic factors account for about 71% of the variation and average probability to default for the sampled U.S. firms. In addition, their findings show that in times of economic depression, macroeconomic conditions lead to the sharp decline in corporate earnings; thus firms face decrease in the value of their assets and liabilities. Consequently, Giesecke et al. (2011) find that probability of default intensify during the periods of stock market crash and GDP contraction.

3. Empirical methodology:

3.1 Data and sample construction

The firm level data used in this study are collected from the Thomson Reuters DataStream database while the macroeconomic data such as GDP growth rates, inflation rates and interest rates are obtained from the World Bank Database. The sample for this study comprises listed firms from 17 developing countries that includes Turkey, South Africa, Colombia, Poland, Saudi Arabia, Thailand, Qatar, Philippines, Mexico, China, Kuwait, Malaysia, Egypt, Brazil, Indonesia, Chile and India. In line with the previous literature, financial firms are excluded from the sample due to their specific capital structure requirements. In addition, due to the non-disclosure of CSR data by firms, we make it mandatory for firms to have sufficient CSR data

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

during the period under consideration before they are included in the sample. The study finally arrives at a sample of 496 listed firms and 3,968 firm year observations from the 17 developing countries. As in Lemmon et al. (2008), this study remove outliers on the parameters by winsorizing the firm level variables.

3.2 Probability of default measure

To examine the impact of long-term debt maturity and CSR on probability of default, this study measure probability of default based on Altman (1968) z-score model. This model has been used by several authors to predict default probability and was found to be accurate. The model is suitable for this study because it capture the firms' accounting data which are always available, it also allows for the classification and comparison of firms into safe, grey zone and distress zone. Altman (1968) z-score is calculated as follows:

$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.64X_4 + 1.05X_5$……eq. 1

Where:

Z = Overall index

X_1 = Current assets-current liabilities / Total assets

X_2 = Retained earnings / Total assets

X_3 = Earnings before interest and tax / Total assets

X_4 = Market value of equity / Market value of total liabilities

X_5 = Sales / Total assets

3.3 Probability of default regression

The aim of this study is to investigate the impact of long-term debt maturity and CSR on probability of default in developing countries. The study control for firm level data, firm specific effects and year effects. The regression model is given as follows:

$$POD_{it} = \lambda POD_{it-1} + \beta_0 + \beta_1 LTDM_{it} + \beta_2 COSR_{it} + \beta_3 FLCV_{it} + \delta_i + \alpha_t + \mu_{it.} \ldots \text{eq. 2}$$

POD_{it} stands for current years' probability of default and it is the dependent variable for the study calculated using the Altman (1968) z-score model. λPOD_{it-1} denotes the previous years' probability of default. The main independent variables for the study are long-term debt maturity (LTDM) and corporate social responsibility ($COSR_{it}$). As in Orman and Koksal (2017) and Awartani et al. (2016), the LTDM represents the portion of firms' long-term debts that is due to mature in more than 1 year divided by the total debts. This study intends to investigate whether long-term debt maturity increases firm probability to default its obligations. We therefore expect the coefficient of LTDM to be positively related to probability of default. On the other hand, the other main variable of interest is COSR and it is collected from Thomson Reuters DataStream database. CSR participation enhances stakeholder-firm relationship and decreases firm risk, therefore high CSR activities are expected to lower firm probability of default. This study expects a negative relationship between CSR and probability of default.

$FLCV_{it}$ comprises a set of firm-level control variables that are presumed to affect firm probability of default. These control variables are variables commonly encountered in the finance literature that involve capital structure and probability of default studies (such as Cathcart et al., 2020; Wang and Chiu 2019; Matemilola et al., 2018). These variables are debt, size, profitability,

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

Tangibility, market-to-book, non-debt tax shield, asset maturity, firm quality and others. This study control for debt (TDTA) because the trade-off theory establishes that firms that have a higher debt ratio usually have a higher probability of default. Debt is measured as the ratio of total debts to total assets and positive relationship is expected between debts and probability of default. Size is also considered as a control variable because large firms are more diversified and are considered less risky hence are less likely to default than small firms. Size is measured as the natural logarithm of total assets and is expected to be negatively related to the probability of default. This study also controls for profitability (PRF) because the trade-off argues that profitable firms are unlikely to default their obligations. We measure profitability by the ratio of earnings before interests, taxes, depreciation and amortization to total assets, and anticipate a negative relationship between profitability and probability of default. We again control for asset tangibility (TANG) because firms that have more tangible fixed assets have more collateral value and are less likely to default. Tangibility is measured as the ratio of property, plant and equipment to total assets, and we expect tangibility to be negatively related to probability of default.

We also include market-to-book ratio (MTB) to proxy for growth opportunity because high growth firms face less default probability issues. We measure market-to-book as the ratio of market value of equities plus total debts to total assets, and we predict a negative relationship between market-to-book and probability of default. The study also control for non-debt tax shields (NONDTS) because higher non-debt tax shields indicate that firms incur more expenses that subsequently increase their probability of default. We measure non-debt tax shields as the ratio of depreciation to total assets and expect a positive relationship between non-debt tax shields and probability of default. Again, we control for asset maturity (AMAT) because default occurs when firms fail to match the maturity of their assets with the maturity of debts. Asset maturity is measured as the ratio of property, plant and equipment (net) to depreciation, and we expect asset maturity to be inversely related to probability of default. This study also control for firm quality (FIRMQ) because firms indicate their quality by choosing debt maturity period. Return on assets is used as proxy for firm quality, and an inverse relationship is expected between firm quality and probability of default.

4. Empirical results:

In this section, we present the descriptive statistics, the correlation results, full sample results and the robustness tests. Table 1 presents the descriptive statistics for the full sample. The statistics show that the average percentage of long-term debt maturity in the developing countries is 60% indicating that firms in developing countries utilize more long-term debts. This result is consistent with the findings by Benlemlih (2017), World Bank Group (2017) and Custudio et al. (2013). The result also shows that 49% of firms in developing countries engage in CSR activities. Table 2 reports the correlation results among the firm level variables and macroeconomic variables considered in the study. The correlation results show that the degree of correlation between the dependent and independent variables is weak and the coefficients are low, suggesting lower risk of multicollinearity among the control variables.

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

Table 1 Descriptive statistics

VARIABLES	N	MEAN	STD. DEV.
POD	3,968	1.65	1.28
TDTA	3,968	0.27	0.25
SIZE	3,968	18.09	2.49
TANG	3,968	0.36	0.25
PRF	3,968	0.15	1.60
MTB	3,968	0.31	0.32
NONDTS	3,968	0.04	0.37
COSR	3,968	48.86	17.83
LTDM	3,968	0.60	0.31
AMAT	3,968	0.00	0.12
FIRMQ	3,968	14.04	17.71
INF	3,968	4.89	2.88
INTR	3,968	6.73	9.93
GDPG	3,968	4.54	2.98

Note: This table reports the summary statistics that contains the number of observations, mean and standard deviation for all the variables in the sample. POD is the probability of default calculated using the Altman (1968) z-score model. The number of sample firms is 468, and the period covered is 2010-2017.

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

Table 2 Pearson correlation

	POD	TDTA	LTDM	COSR	SIZE	AMAT	TANG	PRF	FIRMQ	MTB	NONDTS	INF	INTR	GDPG
POD	1													
TDTA	0.41***	1												
LTDM	0.23***	0.22***	1											
COSR	-0.09***	-0.03	0.12***	1										
SIZE	-0.00	0.001	0.04*	0.03*	1									
AMAT	-0.03*	0.42***	-0.01	-0.04*	-0.01	1								
TANG	-0.12***	0.11***	0.25***	0.11***	0.06***	0.00	1							
PRF	0.09***	-0.14***	0.01	0.09***	-0.00	-0.15***	-0.02	1						
FIRMQ	0.26***	-0.06***	-0.03	0.05**	0.17***	-0.04**	0.03*	0.06***	1					
MTB	-0.28***	0.45***	0.02	-0.04*	-0.02	0.32***	0.07***	-0.12***	-0.06***	1				
NONDTS	-0.02	0.41***	-0.04*	-0.02	0.00	0.82***	0.01	-0.14***	-0.02	0.41***	1			
INF	-0.04**	-0.02	-0.01	0.07***	-0.00	0.04*	-0.07***	0.05**	0.21***	-0.03*	0.02	1		
INTR	-0.15***	0.143**	0.10***	0.10***	-0.01	0.13***	-0.08***	-0.00	-0.09***	0.05**	0.06***	0.17***	1	
GDPG	-0.00*	-0.03*	-0.04*	-0.16***	0.04*	-0.07***	0.04**	0.05**	0.06***	-0.08***	-0.06***	-0.14***	-0.42***	1

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

4.1 Results for the impact of long-term debt maturity, CSR and probability of default

This section reports the results for the impact of long-term debt maturity, CSR and probability of default in developing countries after controlling for a number of firm level control variables. We employ the regression model in eq. 2 and the results are presented in Table 3. We estimate our regression model using the generalized method of moments (GMM) with system GMM two step vce robust as our main model. The results indicate the impact of long-term debt maturity, CSR and probability of default for a sample of 468 firms form 17 developing countries. The diagnostic checks reveal that the instruments are valid because the number of cross sectional observations is higher than the number of instruments. Moreover, the p-values are significant signifying that the models passed the AR2 tests. The empirical results indicate that long-term debt maturity is statistically significant and positively related to probability of default (see Table 3, model 3f), suggesting that firms that borrow at longer maturity period increases their probability to default. This result is consistent with Geelen (2016) theoretical prediction that longer debt maturity increases probability of default because the longer the debt maturity, the higher the volatility from the interest rate movement. Previous studies such as Wang and Chiu (2019) provide evidence that default is more prevalent when a firm issues debts with longer maturity periods. Moreover, the results of the other main variable of interest (CSR) shows that CSR is statistically significant and negatively related to probability of default. Implying that firms that engage in CSR activities establish good relationship with all the stakeholders and create goodwill that serve as insurance like protection to the firms that safeguard them against risk and probability of default. This result is consistent with Rizwan et al. (2017). With regards to the control variables, most of the results are consistent with our expectations, for example debt and non-debt tax shields are positively related to probability of default. Our results strongly support the trade-off that when firms borrow more, their probability to default also increases. This result is consistent with Zeitun and Al-Refai (2017). Likewise non-debt tax shield is also positively related to probability of default suggesting that firms in developing countries incur more expenses. Similarly, consistent with the trade-off theory, size is negatively related to probability to default indicating that large firms hardly default their obligations.

TEST Engineering & Management

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

Table 3 Full sample results for the impact of long-term debt maturity and CSR on probability of default

VARIABLES	Model 3a DGMM One step	Model 3b DGMM Two step	Model 3c DGMM Two step vce robust	Model 3d SGMM One step	Model 3e SGMM Two step	Model 3f SGMM Two step vce robust
L.POD	0.257***	0.281***	0.281***	0.467***	0.457***	0.457***
	(0.036)	(0.036)	(0.082)	(0.029)	(0.031)	(0.085)
LTDM	0.206***	0.100*	0.100	0.561***	0.380***	0.380***
	(0.067)	(0.059)	(0.065)	(0.052)	(0.060)	(0.101)
MTB	-0.488	0.033	0.033	-0.441***	-0.433***	-0.433
	(0.361)	(0.463)	(0.545)	(0.113)	(0.083)	(0.317)
LSIZE	-0.017	-0.138	-0.138	-0.316***	-0.423***	-0.423***
	(0.099)	(0.106)	(0.143)	(0.045)	(0.054)	(0.136)
TDTA	-0.329***	-0.310***	-0.310***	0.051***	0.031***	0.031**
	(0.045)	(0.054)	(0.083)	(0.008)	(0.009)	(0.015)
COSR	0.000	0.002	0.002	-0.001	-0.003**	-0.003**
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
PRF	0.293***	0.473***	0.473	0.286***	0.115	0.115
	(0.039)	(0.172)	(0.354)	(0.045)	(0.174)	(0.310)
FIRMQ	0.005***	0.005***	0.005**	0.006***	0.007***	0.007***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
AMAT	0.109	0.103**	0.103**	0.116	0.022	0.022
	(0.161)	(0.045)	(0.050)	(0.203)	(0.081)	(0.054)
NONDTS	1.987*	1.813	1.813	2.414***	6.038***	6.038***
	(1.053)	(1.659)	(2.665)	(0.543)	(1.433)	(2.062)
TANG	-0.578***	-0.566**	-0.566*	0.163	0.062	0.062
	(0.180)	(0.225)	(0.290)	(0.192)	(0.213)	(0.378)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,968	3,968	3,968	3,968	3,968	3,968
Number of firm	496	496	496	496	496	496
Number of instruments	46	46	46	70	70	70
AR2	0.392	0.729	0.773	-	0.040	0.045
Sargan/Difference Sargan test	0.000	0.165	-	0.000	0.113	-

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

Note: The table reports the regression results on the impact of long-term debt maturity and CSR on probability of default in 17 developing countries. The dependent variable is the POD calculated using the Altman (1968) z-score model and the main independent variables are long-term debt maturity and CSR. The firm level variables are size, debts, market-to-book, non-debt tax shields, tangibility, firm quality, asset maturity and profitability. The table reports the coefficient of those variables. All regressions comprise firms and year effects. The standard errors are reported in parenthesis, except AR2 which are p-values. AR2 tests for the second order serial correlation. If the p-value >0.05, it indicates absence of serial correlation, indicating that the model is correctly specified. ***, **, and * indicates the significance levels at 1%, 5%, and 10% respectively. The number of sampled firms is 468, and the period covered is 2010-2017.

4.2 Robustness tests

We conduct two robustness tests. First of all, we employ the macroeconomic variables and expand our regression model in eq. 2 by adding GDP growth rate, inflation rate, and the interest rate as below:

$POD_{it} = \lambda POD_{it-1} + \beta_0 + \beta_1 LTDM_{it} + \beta_2 COSR_{it} + \beta_3 FLCV_{it} + \beta_4 MACROVar_{ij} + \delta_i + \alpha_t + \mu_{it}$ (Eq. 3)

Equation 3 is the new model for the robustness test. $MACROVar_{it}$ contains a group of three macroeconomic variables (i.e. GDP growth rate, inflation rate and interest rate) that are generally established to measure macroeconomic conditions. These variables are likely to give early warning changes in the macroeconomic environment. This study control for GDP growth rate because a country's GDP growth rate is very sensitive and has a significant influence on the business growth and economic environment. Giesecke et al. (2011) establish that a strong economic growth rate decreases the firms' probability to default. This study expects GDP growth rate to be negatively related to probability of default. We also control for inflation rate because inflation serve as proxy for government's proper management of the economy. Larger inflation rates decrease creditors' ability to provide debt capital (Awartani et al., 2016), hence decreasing default probability. This study anticipates a negative relationship between inflation rate and probability of default. This study also considers interest rate as one of the control variables because higher interest rates reduce the firms' willingness to utilize debt capital (Matemilola et al., 2019). We therefore expect a negative relationship between interest rate and probability of default. As in eq. 2, we also control for firm fixed effects and year effects in eq.3.

Secondly, we also apply the model in eq. 4 to estimate the impact of long-term debt maturity, CSR and macroeconomic variables on probability of default for firms in developing countries excluding Africa and Middle East. Thus, the model is estimated for 383 firms from Asia, Europe and Latin America.

4.2.1 Impact of macroeconomic variables on probability of default (Robustness tests 1)

Table 4 reports the regression results for the impact of macroeconomic variables on probability of default. The study considers three macroeconomic variables; GDP growth rate, inflation rate and interest rate. The results show that the lagged dependent variable is significant in all the models (Table 4, models 4a-4f), similarly, the p-values are insignificant suggesting that the dynamic model is valid. The results show that the relationship between macroeconomic variables and probability of default is negative as predicted (Table 4, model 4f). The coefficient of GDP growth rate, inflation rate and interest rate are statistically significant and negatively related to probability of default. This result is consistent with Cathcart et al. (2020), Carvalho et al. (2020) and Parrado-Mertinez et al. (2019) findings that macroeconomic variables significantly affect probability of default. For the impact of the firm level determinants, long-term debt maturity, debt and non-debt tax shields are positively related to probability of default. This result conforms

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

to the theoretical proposition that higher debts and debts with longer maturity periods increase probability of default. Similarly, firms have higher default when they incur more expenses through higher non-debt tax shields. The results of the other control variables show that size and CSR are negatively related to probability of default suggesting that large firms hardly default; also, when firms invest more in CSR activities they create goodwill that serve as insurance like and protect the firms against probability of default.

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

Table 4 Full sample results for the impact of long-term debt maturity, CSR and macroeconomic variables on probability of default

VARIABLES	Model 4a DGMM One step	Model 4b DGMM Two step	Model 4c DGMM Two step vce robust	Model 4d SGMM One step	Model 4e SGMM Two step	Model 4f SGMM Two step vce robust
L.POD	0.163***	0.193***	0.193*	0.464***	0.432***	0.432***
	(0.038)	(0.050)	(0.099)	(0.027)	(0.031)	(0.092)
LTDM	0.217***	0.143***	0.143***	0.558***	0.365***	0.365***
	(0.063)	(0.055)	(0.051)	(0.049)	(0.059)	(0.089)
MTB	-0.975***	-0.014	-0.014	-0.390***	-0.416***	-0.416
	(0.343)	(0.517)	(0.595)	(0.110)	(0.106)	(0.354)
LSIZE	0.055	-0.139	-0.139	-0.356***	-0.448***	-0.448***
	(0.097)	(0.118)	(0.171)	(0.045)	(0.057)	(0.139)
TDTA	-0.315***	-0.306***	-0.306***	0.065***	0.039***	0.039**
	(0.049)	(0.061)	(0.084)	(0.008)	(0.011)	(0.016)
COSR	0.000	0.001	0.001	-0.000	-0.003**	-0.003**
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
PRF	0.215***	0.255**	0.255	0.193***	0.022	0.022
	(0.037)	(0.127)	(0.235)	(0.043)	(0.131)	(0.166)
FIRMQ	0.003**	0.003*	0.003	0.004***	0.005***	0.0053***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
AMAT	0.079	0.098**	0.098	0.220	0.041	0.041
	(0.164)	(0.044)	(0.064)	(0.210)	(0.062)	(0.070)
NONDTS	0.031	0.018	0.018	0.069***	0.044**	0.044*
	(0.021)	(0.016)	(0.018)	(0.024)	(0.018)	(0.024)
TANG	-0.003	0.000	0.000	0.151***	0.011	0.011
	(0.034)	(0.034)	(0.042)	(0.039)	(0.042)	(0.052)
INF	-0.251***	-0.191***	-0.191***	-0.103***	-0.065***	-0.065*
	(0.046)	(0.046)	(0.073)	(0.019)	(0.017)	(0.035)
INTR	-0.004	-0.007***	-0.007***	-0.002	-0.008***	-0.008***
	(0.004)	(0.002)	(0.003)	(0.004)	(0.003)	(0.003)
GDPg	-0.138**	-0.180***	-0.180*	-0.404***	-0.351***	-0.351**
	(0.066)	(0.063)	(0.099)	(0.039)	(0.043)	(0.139)

TEST Engineering & Management

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,968	3,968	3,968	3,968	3,968	3,968
Number of firm	496	496	496	496	496	496
Number of instruments	49	49	49	73	73	73
AR2	0.265	0.964	0.967	-	0.068	0.075
Sargan/Difference Sargan Test	0.000	0.056	-	0.000	0.009	-

Note: The table reports the regression results on the impact of long-term debt maturity and CSR on probability of default in 17 developing countries. The dependent variable is the POD calculated using the Altman (1968) z-score model and the main independent variables are long-term debt maturity and CSR. The firm level variables are size, debts, market-to-book, non-debt tax shields, tangibility, firm quality, asset maturity and profitability. While the macro variables comprise GDP growth rate, inflation rate and interest rate. The table reports the coefficient of those variables. All regressions comprise firms and year effects. The standard errors are reported in parenthesis, except AR2 which are p-values. AR2 tests for the second order serial correlation. If the p-value >0.05, it indicates absence of serial correlation, indicating that the model is correctly specified. ***, **, and * indicates the significance levels at 1%, 5%, and 10% respectively. The number of sampled firms is 468, and the period covered is 2010-2017.

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

4.2.2 Impact of long-term debt maturity, CSR and macroeconomic variables on probability of default in developing countries excluding Africa and Middle East (Robustness test 2)

As a robustness test to our earlier findings, we exclude Africa and Middle Eastern regions and focus on 383 firms from Asia, Europe and Latin American regions. We decide to exclude Africa and Middle Eastern regions because these regions are classified by poor bankruptcy laws and inefficient capital markets (Awartani et al., 2016). The study focus on the three regions because firms have access to debt capital in those regions due to efficient capital markets. We also intend to validate whether our earlier results hold even when some regions (as potential outliers) are excluded from the full sample. The empirical results in Table 5 confirm the validity of the instruments because the p-values are insignificant and the number of instruments are also lower than the number of cross sectional observations. The empirical results indicate that the coefficient of long-term debt maturity is statistically significant and positively related to probability of default. Also, the coefficient of CSR is statistically significant and negatively related to probability of default. For the three measures of macroeconomic environment, the results of GDP growth rate, inflation rate, and interest rate are very much similar to those results obtained in Table 4, model 4f. Our results for these variables indicate that GDP growth rate, inflation and interest rates are significant and negatively related to probability of default (see Table 5, model 5f).

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

Table 5 Results for the impact of long-term debt maturity, CSR and macroeconomic variables on probability of default in developing countries (Excluding Africa and Middle East

VARIABLES	Model 5a DGMM One step	Model 5b DGMM Two step	Model 5c DGMM Two step vce robust	Model 5d SGMM One step	Model 5e SGMM Two step	Model 5f SGMM Two step vce robust
L.POD	0.098**	0.084***	0.084	0.506***	0.498***	0.498***
	(0.040)	(0.027)	(0.182)	(0.024)	(0.015)	(0.131)
INF	-0.193*	-0.198**	-0.198	-0.289***	-0.347***	-0.347**
	(0.099)	(0.085)	(0.242)	(0.042)	(0.030)	(0.162)
INTR	-0.001	-0.001	-0.001	-0.016***	-0.011***	-0.011**
	(0.004)	(0.003)	(0.005)	(0.003)	(0.002)	(0.005)
GDPg	0.002	-0.001	-0.001	-0.003**	-0.004***	-0.004*
	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.002)
TDTA	0.054	0.059**	0.059	0.148***	0.106***	0.106**
	(0.046)	(0.024)	(0.046)	(0.042)	(0.014)	(0.053)
MTB	0.479**	0.484***	0.484	-0.137***	-0.176***	-0.176
	(0.212)	(0.167)	(0.375)	(0.053)	(0.051)	(0.252)
LTDM	0.238***	0.119***	0.119**	0.481***	0.371***	0.371**
	(0.056)	(0.046)	(0.058)	(0.035)	(0.035)	(0.174)
LSIZE	-0.299***	-0.242***	-0.242***	-0.056***	-0.030**	-0.030
	(0.055)	(0.045)	(0.067)	(0.017)	(0.013)	(0.027)
COSR	0.105	0.260	0.260	-0.685***	-0.680***	-0.680*
	(0.230)	(0.183)	(0.260)	(0.069)	(0.048)	(0.368)
TANG	-0.002	-0.007	-0.007	0.207***	0.137***	0.137*
	(0.038)	(0.026)	(0.041)	(0.033)	(0.035)	(0.079)
PRF	0.156***	0.220***	0.220	0.077**	0.049	0.049
	(0.037)	(0.071)	(0.172)	(0.030)	(0.042)	(0.102)
NONDTS	0.354	0.273	0.273	1.216**	1.205***	1.205
	(0.452)	(0.323)	(0.527)	(0.503)	(0.455)	(1.055)
AMAT	0.126	0.110***	0.110**	0.329*	0.242***	0.242***
	(0.162)	(0.032)	(0.051)	(0.186)	(0.041)	(0.092)
FIRMQ	-0.222***	-0.079**	-0.079	-0.019*	-0.012*	-0.012

TEST Engineering & Management

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

	(0.064)	(0.039)	(0.076)	(0.012)	(0.006)	(0.029)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,064	3,064	3,064	3,064	3,064	3,064
Number of firm	383	383	383	383	383	383
Number of instruments	64	64	64	106	106	106
AR2	0.141	0.476	0.483	-	0.988	0.988
Sargan/Difference Sargan Test	0.000	0.000	-	0.000	0.004	-

Note: The table reports the regression results on the impact of long-term debt maturity and CSR on probability of default in 12 developing countries (Africa and Middle East excluded). The dependent variable is the POD calculated using the Altman (1968) z-score model and the main independent variables are long-term debt maturity and CSR. The firm level variables are size, debts, market-to-book, non-debt tax shields, tangibility, firm quality, asset maturity and profitability. While the macro variables comprise GDP growth rate, inflation rate and interest rate. The table reports the coefficient of those variables. All regressions comprise firms and year effects. The standard errors are reported in parenthesis, except AR2 which are p-values. AR2 tests for the second order serial correlation. If the p-value >0.05, it indicates absence of serial correlation, indicating that the model is correctly specified. ***, **, and * indicates the significance levels at 1%, 5%, and 10% respectively. The number of sampled firms is 383, and the period covered is 2010-2017.

May-June 2020
ISSN: 0193-4120 Page No. 499 - 519

5. Conclusion

This paper aims to investigate the impact of long-term debt maturity and CSR on probability of default in developing countries. Our findings reveal that long-term debt maturity increases probability of default in developing countries. Our results suggests that although long-term debt maturity may increase firm value due to debt interest tax-shield benefits, but it threatens the survival of firms due to higher probability to default. The longer the maturity period, the higher the volatility from interest rate fluctuations that increases default probability. The study also find that firms that invest more in CSR activities establish good relationships with various stakeholders that help to sustain the firms and increase their future cash inflows; thus decreasing their probability to default. Furthermore, in additional robustness tests, we find that macroeconomic conditions affect firm probability to default. Specifically, GDP growth rate, inflation rate, and interest rate are found to decrease probability of default in developing countries. The findings from this study has some implications for developing countries. First, as long- term debt maturity increases probability of default, policymakers in developing countries should come up with policies that will make it easier for firms to access short-term debts and be able to roll-over such debts at maturity. This will reduce firms' dependence on long-term debt financing and subsequently decrease probability of default. Second, policymakers should also design policies that will encourage firms to increase their investments towards CSR activities in order to establish good reputation with various stakeholders, and hence decrease probability of default. Third, policy makers in developing countries should note that default probability does not only depend on firm financial performance, but also on macroeconomic environment. Therefore, they should come up with policies that will help promote macroeconomic stability and save businesses from failure. Lastly, firm managers should actively involve in CSR activities because it enables them to retain customers' loyalty and build reputation which may help lower the probability of default.

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