CASH FLOW VOLATILITY AND DEBT MATURITY STRUCTURE: EVIDENCE FROM THE GULF COOPERATION COUNCIL COUNTRIES

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Abstract

This study aims to investigate the impact of cash flow volatility on the debt maturity structure choices of corporations in the Gulf Cooperation Council (GCC) countries, a region with large gross domestic products (GDPs), negligible corporate taxes, and bank-based economies. The study uses a four-year rolling standard deviation of cash flows as a proxy for volatility and examines its impact on the use of long-term debt by applying the two-stage least square estimator. In addition, the study constructs a categorical debt maturity variable and applies the ordered probit regression to analyze the impact of volatility on the probability of having long-term debt. The findings of this study show that both the proportion of long-term debt relative to total debt and the probability of having long-term debt decrease significantly with volatility. These findings suggest that volatility limits GCC firms' use of long-term borrowing which has implications for their private investments. Other findings indicate that firm size, asset tangibility, asset maturity, and leverage have a positive impact on debt maturity while growth opportunities have a negative impact, which suggests that GCC firms use short-term debt to reduce agency and liquidity costs.

Keywords: Debt Maturity, Cash Flow Volatility, Agency Costs, Information Asymmetry, Liquidity Risk, Categorical Dependent Variable, Emerging Markets, GCC Countries

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1. INTRODUCTION

The Gulf Cooperation Council (GCC) countries enjoy large gross domestic products (GDPs) as The World Bank reports a total of USD 1,660 billion in 2019. Further, the GCC region presents a unique context to examine corporate financial decisions given that their corporate taxes are negligible (Hertog, 2013; Mimouni et al., 2019). Notwithstanding the GCC countries' contribution to the world economy and their unique contexts, little is known about GCC firms' financial behaviour and the attributes of their debt financing. For example, long-term debt utilized by GCC firms is small which can affect their private investments but the limitations of using long-term borrowing in the GCC countries are not thoroughly

explored. For example, Awartani et al. (2016) explore corporate debt maturity in the Middle East and North Africa (MENA) region which encompasses the GCC countries. However, the GCC countries are different from the MENA countries in key aspects such as their negligible corporate tax environments (Hertog, 2013; Mimouni et al., 2019). Although Mimouni et al. (2019) investigate the debt maturity of GCC firms; their focus is on examining the impact of the financial crisis of 2007 and the subsequent liquidity shortages on debt maturity. Therefore, this study attempts to examine the debt maturity of firms operating in the GCC countries with a focus on the impact of cash flow volatility. This study proposes that volatility negatively affects the proportion and probability of having long-term debt in a firm's debt structure.

The existing literature regarding the influence of the volatility of cash flows on firm financing focuses on the impact of volatility on the capital structure decision (see Ghasemzadeh et al., 2021 for further discussion). This literature shows that there is a trade-off between tax advantages and higher costs of bankruptcy caused by the greater volatility which induces a negative relationship between volatility and debt financing (Ghasemzadeh et al., 2021; Keefe & Yaghoubi, 2016). However, the empirical results provide inconclusive findings regarding this relationship (Ahmed & Hla, 2019; Ghasemzadeh et al., 2021; Harris & Roark, 2019; Keefe & Yaghoubi, 2016). Some studies argue that the mixed findings can be attributed to the structure of debt in terms of its maturity. This is because firms with volatile cash flows have incentives to employ short-term debt because its value is less sensitive to firm volatility which results in a negative impact of volatility on long-term debt (Dangl & Zechner, 2021; Keefe & Yaghoubi, 2016). Indeed, the empirical evidence from the US documents a negative impact of volatility on debt maturity (Keefe & Yaghoubi, 2016). However, little is known about this relationship using emerging markets except for Memon et al. (2018) which utilizes the context of China.

Nonetheless, the ability to generalize the results of that research to other emerging countries can be limited. For example, one important aspect of the GCC region is that their countries impose almost no taxes (Hertog, 2013; Mimouni et al., 2019) while the US and China impose considerable taxes. The literature on debt maturity shows that tax considerations are important factors that influence the firm's choice of debt maturity (Brick & Ravid, 1985; Leland & Toft, 1996; Pour & Lasfer, 2019). Therefore, tax considerations play little role in influencing the debt maturities of GCC firms which makes the GCC region a unique context. On the other hand, GCC firms are subject to large agency and information asymmetry problems due to institutional weaknesses in their capital markets and hence GCC firms depend on debt financing that is largely sourced from banks (Awartani et al., 2016). Banks are efficient at screening and monitoring risky firms as they utilize lending technologies such as lending at short maturities and rolling the debt over at maturity (Diamond, 1991b). On the other hand, applying this lending technology in the capital markets is costly because of the higher transaction costs (Flannery, 1986) and the liquidity costs (Diamond, 1991a). Accordingly, the impact of volatility on deb maturity is likely to be stronger in bank-based economies such as the GCC countries as risky firms which are likely excluded from long-term borrowing can use short-term debt instead of disregarding debt financing.

Therefore, this study attempts to fill this gap in the literature by examining for the first time the impact of cash flow volatility on debt maturity using the context of the GCC countries, which represent the case of bank-based emerging markets with negligible corporate taxes. Specifically, this study poses the following research questions:

RQ1: Do GCC firms with greater cash flow volatility utilize less long-term debt?

RQ2: Does the probability of having long-term debt decrease with greater cash flow volatility?

To answer these questions, the extant study uses a sample of firms from the GCC countries, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE). This study examines the impact of cash flow volatility, measured as a four-year rolling standard deviation of cash flows, on debt maturity controlling for the endogeneity between leverage and debt maturity using the industry leverage in the random effects model and the two-stage least square random effects (2SLS) estimation method with leverage in the first stage. In addition, the study constructs a categorical debt maturity variable and applies the ordered probit regression to analyze the impact of volatility on the probability of having long-term debt. Also, building on the theoretical contributions of debt maturity, the study controls for well-documented determinants of debt maturity including growth opportunities, asset maturity, firm size, asset tangibility, earnings, risk of default, and leverage.

The findings of this paper indicate that cash flow volatility has a negative impact on firm debt maturity while other determinants' impact on debt maturity are in line with the theoretical predictions and the empirical evidence. These findings have interesting policy implications as the extant research shows that access to long-term debt reduces the liquidity and refinancing risks and improves the funding of private long-term investments (Diamond, 1991a; Jungherr & Schott, 2021). On the other hand, investments by the private sector in the GCC countries are lagging behind those of the state as the latter still has heavy direct involvement in economic activity (Abdallah & Ismail, 2017; Kaya & Tsai, 2016) with the wealth of the private sector concentrated among a handful of families (Martínez-García et al., 2021; Santos, 2015). Therefore, effective policy reforms in the GCC countries tackling the issue of strengthening and expanding the role of private investments by enhancing access to external finance must consider the limitations of firms' access to long-term borrowing.

This study contributes to the extant literature in several ways. It contributes to the literature on firm financial policies by exploring the impact of the volatility of cash flow on debt maturity (Keefe & Yaghoubi, 2016; Memon et al., 2018) by utilizing the context of the GCC emerging markets for the first time. The findings show that GCC firms' debt maturity choices are affected by cash flow

volatility. The study also contributes to the literature on corporate debt maturity structure in developing countries (Awartani et al., 2016; Mimouni et al., 2019; Orman & Köksal, 2017; Salehi & Sehat, 2019; Tayem, 2018). Surprisingly, this literature is limited as most studies outside the US tend to examine a large group of countries (Ağca et al., 2015; Álvarez-Botas & González-Méndez, 2019; El Ghoul et al., 2016; Feito-Ruiz & Menéndez-Requejo, 2022; Kirch & Terra, 2012; Pour & Lasfer, 2019; Zheng et al., 2012). However, as Awartani et al. (2016) note the study of specific cases of developing markets provides important insights into the constraints faced by firms from developing countries in raising external finance. Additionally, the extant study contributes to the growing empirical studies that focus on the financial behaviour of corporate GCC (Guizani & Ajmi, 2021; Mimouni et al., 2019; Tayem, 2023a).

The rest of the paper is structured as follows. Section 2 reviews the literature on debt maturity. Section 3 presents the research model, variables, and estimation methods. The sample and data are described in Section 4. The results and their discussions are presented in Section 5. The conclusion is presented in Section 6.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. Agency, information asymmetries and liquidity explanations of debt maturity

The theoretical literature on debt maturity suggests several explanations for the firm choice of debt maturity structure. At the core of these theories are arguments based on agency, information asymmetry, and liquidity risks. In his seminal work, Myers (1977) proposes that debt maturity can mitigate the underinvestment problem, i.e., passing value-adding investment opportunity because the added value of the opportunity accrues, partially or entirely, to creditors, not shareholders. Myers (1977) proposes that firms can reduce this problem by financing the project with short-term debt that matures before the investment cash flows are realized. Diamond and He (2014) support Myer's (1977) argument and show that short-term debt can indeed reduce the underinvestment problem but show that long-term debt can also reduce the underinvestment problem depending on the future volatility of the firm assets. Further, Barnea et al. (1980) show that short debt maturities can solve the asset substitution problem, i.e., taking sub-optimal risky projects that transfer wealth from creditors to shareholders. Firms issuing short-term debt become less sensitive to risk-shifting incentives because the value of short-term debt is less sensitive to asset volatility compared to the value of long-term debt (Leland & Toft, 1996).

Flannery (1986) proposes an explanation of debt maturity based on information asymmetry and signalling rationales and suggests that only good-quality firms can issue short-term debt (in capital markets). Flannery (1986) argues that short-term debt enjoys low-interest rates but exposes the firm to high future costs arising from the need to roll over (refinance) the short-term debt. Hence, when transaction costs are sufficiently high, good-quality firms with favourable private information issue short-term debt to signal their high quality and at the refinancing time, they roll the debt over at low future rates. However, bad-quality firms cannot mimic this signal and instead will issue long-term debt because their private information, i.e., their type or quality, will be revealed at the refinancing point hence they will be exposed to the risk of high future interest rates associated with the rollover strategy (Kale & Noe, 1990). However, the use of short-term debt subjects the firm to liquidity risk, i.e., the inability of solvent borrowers in need of liquidity to obtain new financing, which led to the emergence of theories that examine the impact of liquidity risks on the firm choice of debt maturity. For example, Diamond (1991a) argues that issuing short-term debt is motivated not only by the high(er) refinancing costs resulting from the reveal of new information about the quality of the firm but also by liquidity concerns. Therefore, firms subject to high liquidity and refinancing risks are better off choosing long-term debt (or saving cash) to reduce these costs (Diamond, 1991a; Harford et al., 2014). The next section motivates the choice of the variables of this study based on the predictions of the above-mentioned theories.

2.2. Debt maturity and firm-level determinants

2.2.1. Growth opportunities

Based on the agency's view, short-term debt maturity can mitigate the underinvestment problem because debt matures before the cash flow of the investment opportunity is realized hence the accrued value to creditors will be small which reduces the disinvestment motive (Myers, 1977). In addition, short-term debt maturity reduces or eliminates the asset substituting incentives (Barnea et al., 1980; Leland & Toft, 1996) because the value of short-term debt is less sensitive to changes to firm value hence shareholders will capture the added value of the project. The empirical implication of this view is that growth opportunities are negatively related to long-term debt maturity, a prediction that is supported by empirical evidence (Pan & Tan, 2019; Pour & Lasfer, 2019; Zheng et al., 2012).

2.2.2. Asset maturity

Myers (1977) suggests that matching asset and debt maturities reduces the firm disinvestment incentive. In practice, matching maturities entails scheduling debt repayments to correspond to the decline in future values of the firm's assets in place (Awartani et al., 2016). The empirical evidence shows that asset maturity is positively associated with debt maturity (Feito-Ruiz & Menéndez-Requejo, 2022; Pour & Lasfer, 2019; Tayem, 2018; Zheng et al., 2012). This study expects assets with longer maturity to be positively related to debt with longer maturities.

2.2.3. Firm size

The degree of agency conflicts and information asymmetries varies substantially according to the firm size. Small firms are expected to be subject

to severe agency conflicts compared to large firms and thus firm size is predicted to be positively related to long-term debt maturity (Wu et al., 2022). In addition, small firms are expected to face large information asymmetries which impede their ability to issue long-term debt (Custódio et al., 2013). Furthermore, transaction costs and economies of scale can induce small firms to obtain short-term debt. The issuance of long-term debt is associated with large transaction costs and small economies of scale which motivates small firms to use short-term debt (Wu et al., 2022). Overall, the empirical studies document a positive association between firm size and debt maturity (Ağca et al., 2015; Awartani et al., 2016; Feito-Ruiz & Menéndez-Requejo, 2022; Mimouni et al., 2019; Pour & Lasfer, 2019; Tayem, 2018; Zheng et al., 2012). This study predicts a positive association between firm size and maturity.

2.2.4. Asset tangibility

Tangible assets provide creditors with protection against firm defaults in two important ways. First, they reduce information asymmetries regarding the quality of the firm and second, they provide value that can be extracted for repayment in case of firm failure and subsequent liquidation which reduces possible agency conflicts (Myers & Rajan, 1998). Therefore, firms with more tangible assets are expected to use more long-term debt. Ağca et al. (2015), Awartani et al. (2016), Feito-Ruiz and Menéndez-Requejo (2022), Kirch and Terra (2012), and Mimouni et al. (2019) report a positive relationship between asset tangibility and the use of long-term debt.

2.2.5. Earnings

The asymmetric information explanation of debt maturity predicts that when the transaction costs are sufficiently high, good-quality firms issue short-term debt at relatively low interest rates and roll it over while bad-quality firms issue long-term debt at relatively high rates to avoid the expected costs of rolling over short-term debt in terms of the transactions costs and the high interest rate at the refinancing point when their quality is revealed (Flannery, 1986; Kale & Noe, 1990). Therefore, firms with favourable private information about their earnings signal their quality by issuing short-term debt and they obtain low rates on their issues while firms with unfavourable information find the issuance of long-term debt less costly. Consistent with this view, the evidence shows a negative relationship between earnings and debt maturity (Feito-Ruiz & Menéndez-Requejo, 2022; Pour & Lasfer, 2019).

2.2.6. Default risk

Firms with a higher probability of default are less likely to choose long-term debt because of the high bankruptcy costs (Goyal & Wang, 2013). In addition, Custódio et al. (2013) show that the long-term debt market excludes firms with a higher probability of default. The empirical evidence reports a negative relationship between default risk and the term-to-maturity of corporate debt (Awartani et al., 2016; Pour & Lasfer, 2019). This study expects that the probability of default is negatively associated with debt maturity.

2.2.7. Leverage

Based on the liquidation rationale, levered firms are subject to greater liquidity risk hence levered firms are expected to borrow with longer terms to maturity to mitigate this risk (Diamond, 1991a). This is supported by the evidence in Ağca et al. (2015), Awartani et al. (2016), Mimouni et al. (2019), Pour and Lasfer (2019), and Zheng et al. (2012). However, based on the agency costs explanations, firms with low leverage are subject to low agency costs hence they do not have incentives to use short debt maturities as a mechanism to reduce the agency costs of debt (Barclay et al., 2003; Johnson, 2003). Therefore, the impact of leverage is influenced by the liquidity risk which is expected to result in a positive relation between leverage and long-term debt and by the agency considerations which are expected to result in a negative relation between leverage and long-term debt. Therefore, the impact of leverage on debt maturity is expected to be resolved empirically.

2.3. Volatility and debt maturity

The literature on capital structure assumes that there is a trade-off between debt financing advantages and higher costs of bankruptcy caused by the greater volatility which induces a negative relationship between cash flow volatility and debt financing (Ghasemzadeh et al., 2021; Keefe & Yaghoubi, 2016). However, the empirical results are inconclusive (Ahmed & Hla, 2019; Ghasemzadeh et al., 2021; Harris & Roark, 2019; Keefe & Yaghoubi, 2016) which led some studies to argue that the structure of debt in terms of its maturity can influence the impact of volatility on debt financing (Dangl & Zechner, 2021; Keefe & Yaghoubi, 2016). This is because firms with volatile cash flows can employ short-term debt rather than disregard debt financing thereby causing a negative impact of volatility on long-term debt (Dangl & Zechner, 2021; Keefe & Yaghoubi, 2016). Hence, the literature on the impact of the volatility of cash flows on debt maturity assumes that risk and debt maturity are inversely related (Memon et al., 2018). Using an option valuation framework, Keefe and Yaghoubi (2016) show that higher cash flow volatility increases the value of equity while it decreases the value of debt. Furthermore, they show that with higher volatility, the value of debt decreases with long maturity thereby increasing its marginal cost. Consequently, firms subject to greater volatility have incentives to issue debt of shorter maturities to avoid higher costs. In addition, Dangl and Zechner (2021) show that firms with greater volatility are subject to a higher probability of financial distress which increases their credit risk and can affect their willingness to commit to costly long-term debt. Hence, volatile firms have incentives to issue short-term debt at a high credit spread rather than committing to that spread for the long term.

In addition, the supply side also predicts a negative impact of cash flow volatility on debt maturity. As shown by Keefe and Yaghoubi (2016), the value of short-term debt is less sensitive to

volatility than the value of long-term debt and hence firms with greater volatility are subject to greater credit risk. Therefore, the capital market of long-term debt screens out risky volatile firms (Johnson, 2003; Zheng et al., 2012). This argument is especially relevant in the case of bank-based economies such as the GCC markets. Banks are efficient monitors and screeners (Diamond, 1991b) and they widely use short-term debt as a monitoring mechanism as it allows them to monitor the performance and position of the firm at the debt renewing interval. Using this lending technology in the capital markets is costly because of the higher transaction costs (Flannery, 1986) and the liquidity costs (Diamond, 1991a). Hence, banks are likely to extend short-term debt to risky firms instead of excluding them from the loan market which induces a negative impact of volatility on long-term borrowing.

In terms of empirical evidence, Goyal and Wang (2013) employ new issuance of short and long-term debt in the US debt market and find that issuance of short-term debt reduces borrowers' asset volatility. In addition, Keefe and Yaghoubi (2016) utilize US firm-level balance sheet data and find that cash flow volatility is associated with a lower probability of using short-term debt and a high enough cash flow volatility is associated with a low probability of holding short- or long-term debt. Memon et al. (2018) utilize the context of China and find that volatility is negatively related to debt maturity in both state-owned and non-state-owned enterprises. Based on the theoretical motivation and the empirical evidence, this study expects earnings volatility to be negatively associated with the maturity of debt as stated in the hypothesis:

H1: Cash flow volatility is negatively associated with the proportion and probability of having long-term debt maturity.

3. RESEARCH METHODOLOGY

To empirically test the predictions of the study hypothesis, the study constructs two debt maturity variables. The first is a continuous variable (*Maturity*) defined as long-term debt divided by total debt (Awartani et al., 2016; Mimouni et al., 2019; Zheng et al., 2012), and is examined by the model specified in Eq. (1):

$$Maturity_{jit} = \alpha + \lambda Volatility_{jit} + \sum \beta_k X_{kjit} + \sum \delta_m Z_{mjt} + \varepsilon_{it} \quad (1)$$

where, *j* refers to the country, *i* firm, and *t* time. Eq. (1) is estimated using the random effects model augmented with country, year, and industry effects that enter as regressors (Awartani et al., 2016). Further, to control for the simultaneity between debt maturity and leverage (Barclay et al., 2003) the study uses industry leverage instead of firm-level leverage to control for the endogeneity issues between leverage and maturity (Keefe & Yaghoubi, 2016; Memon et al., 2018). As a further control for the endogeneity between leverage and maturity, the study uses the two-stage least square random-effects estimator for the panel data model (Mimouni et al., 2019). The first stage of the system specifies a leverage equation which includes the following explanatory variables: earnings, growth opportunities, tangibility, and firm size. The first stage equation also includes the year, industry, and country effects.

The second debt maturity variable (*Maturity-Categorical*) is a modified version of the categorical maturity variable introduced by Keefe and Yaghoubi (2016). *Maturity-Categorical* classifies debt maturity into three categories, no debt, only short-term debt, and long-term debt, and is examined by the model specified in Eq. (2):

$$\Pr(Maturity\text{–}Categorical > m|c, X, v) = \phi(\lambda Volatility_{jit} + \sum \beta_k X_{kjit} + \sum \delta_m Z_{mjt} + v - c_m) \quad (2)$$

where, *m* refers to the category number, and *c* the cut points. The model has two cut points as there are three categories. Table 1 describes the construction of the variable *Maturity-Categorical*. Equation (2) is estimated using the ordered probit regression model with the industry leverage to control for the simultaneity between debt maturity and leverage (Keefe & Yaghoubi, 2016; Memon et al., 2018). The model is augmented with country, year, and industry effects that enter as regressors.

Table 1. Construction and description of *Maturity-Categorical*

Description	*Short-term debt*	*Long-term debt*	*Frequency*	*%*	*Cumulative*
1. Firms holding zero debt	No	No	274	15.05	15.05
2. Firms using short-term debt only	Yes	No	396	21.76	36.81
3. Firms using long-term debt	Maybe	Yes	1,150	63.19	100

Note: Table 1 describes the classification criteria of the three categories in Maturity-Categorical and shows the frequency, percentage and cumulative percentage of firm-year observations in each category of debt maturity.

Volatility (*Volatility*) is measured as the standard deviation of the ratio of earnings before interest, taxes and depreciation divided by total assets over a four-year period (Keefe & Yaghoubi, 2016; Memon et al., 2018). *X* is a matrix of *k* firm-level characteristics identified in the literature as determinants of debt maturity. The choice of these variables is discussed in the previous section and their measurements are presented below. Growth opportunities (*Growth*) are measured by the market-to-book ratio which is equal to the market value of equity plus the book value of liabilities divided by the book value of assets (Ağca et al., 2015; Awartani et al., 2016; Kirch & Terra, 2012; Zheng et al., 2012). Asset maturity (*AssetMaturity*) is measured by net property, plant, and equipment divided by the depreciation expense (Pour & Lasfer, 2019). Firm size (*Size*) is measured as the natural logarithm of total assets (Ağca et al., 2015; Awartani et al., 2016; Mimouni et al., 2019; Zheng et al., 2012). Asset tangibility (*Tangibility*) is measured as net property, plant, and equipment divided by total assets (Ağca et al., 2015; Awartani et al., 2016; Kirch & Terra, 2012; Mimouni et al., 2019; Zheng et al., 2012). Earnings are equal to earnings before interest and taxes divided by total assets (Kirch & Terra, 2012). Default risk (*ReverseZ-score*) is the modified reverse Altman's

Z-score. The higher Z-score the lower the probability of default hence this study takes the reverse of the Z-score. Z-score is calculated as 3.3 (EBIT/total assets) + 1.0 (sales/total assets) + 1.4 (retained earnings/total assets) + 1.2 (working capital/total assets) (Awartani et al., 2016). Leverage (*Leverage*) is measured by total debt divided by total assets (Ağca et al., 2015; Awartani et al., 2016; Mimouni et al., 2019; Zheng et al., 2012). *Z* is a matrix of *m* macro-level variables, namely GDP growth (*GDP*) (Ağca et al., 2015; Awartani et al., 2016; Mimouni et al., 2019) and private credit to GDP ratio (*Credit*) (Awartani et al., 2016; Zheng et al., 2012) to control for country-wide variations. The operational definitions of the variables and their expected signs are presented in Table 2.

Table 2. Summary of variable definitions

Variables	*Proxy*	*Predicted Sign*
Earnings volatility (*Volatility*)	The standard deviation of cash flows over a four-year period.	– (Bankruptcy and credit risk)
Growth opportunities (*Growth*)	The market-to-book ratio (MTB) defined as the market value of equity plus the book value of assets minus the book value of equity divided by total assets	– (Agency)
Asset maturity (*AssetMaturity*)	The net property, plant, and equipment divided by the depreciation expense	+ (Agency)
Firm size (*Size*)	The natural logarithm of total assets	– (Agency, information and transaction costs)
Asset tangibility (*Tangibility*)	The ratio of fixed assets divided by total assets	+ (Source of repayment in case of liquidation)
Earnings (*Earnings*)	Earnings before interest, tax, and depreciation divided by total assets	– (Signalling)
Default risk (*Defualt*)	The reverse modified Altman's Z-score. Z-score is calculated as 3.3 (EBIT/total assets) + 1.0 (sales/total assets) + 1.4 (retained earnings/total assets) + 1.2 (working capital/total assets)	– (Credit risk)
Leverage (*Leverage*)	Total debt divided by total assets	+ (Liquidity risk) – (Agency)

Note: Table 2 summarizes variable operational definitions and their expected sign.

4. SAMPLE AND DESCRIPTIVE STATISTICS

The sample consists of nonfinancial publicly traded companies from the GCC countries over the period 2007–2019. The GCC countries include (in alphabetical order): Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the UAE. The stock exchanges where the sample companies are listed are Bahrain Bourse, Boursa Kuwait (formerly the Kuwait Stock Exchange), Muscat Securities Market, Qatar Stock Exchange, Saudi Stock Exchange (Tadawul), Dubai Financial Market and Abu Dhabi Securities Exchange. Financial companies are excluded because of their different asset structure and because their liquidity is partially regulated (Awartani et al., 2016). Firm-level financial data is obtained from DataStream and firm annual reports. Firm-year entries with missing data items are dropped. The study sample period starts based on the consistent coverage of the DataStream database and ends before the coronavirus pandemic. Country-level macroeconomic data is obtained from The World Bank data bank.

Table 3 presents summary statistics by country. The figures indicate that Saudi Arabia has the largest corporate assets expressed in dollar value. In addition, Saudi Arabia has the largest amount of total debt and long-term debt. The figures also indicate that *Maturity* is the highest in Qatar, indicating that Qatari firms in the Gulf region use more long-term debt as a proportion of total debt in their financing. Table 4 presents GCC firm characteristics while their correlation coefficients are presented in Table 5. Table 4 shows that the mean value of *Maturity* is 41.2%, which indicates that the average corporation in the GCC countries issues 41.2% of its total debt in the form of long-term debt. The sample statistics are comparable to Mimouni et al. (2019) and Tayem (2023b). Table 5 shows that the correlation coefficients between debt maturity and its expected determinants carry their expected signs. *Volatility* and *Growth* are negatively and significantly correlated with *Maturity*, while *AssetMaturity*, *Size*, *Tangibility* and *Leverage* are all positively and significantly correlated with *Maturity*.

Table 3. Summary statistics by country

Variables	*Bahrain*	*Kuwait*	*Oman*	*Qatar*	*Saudi*	*UAE*
GDP Growth	3.153	1.395	3.314	5.502	3.550	3.243
Private Credit to GDP	69.782	76.804	56.551	62.677	46.276	71.371
Avg. assets (USD thousands)	359,168	929,984	140,931	3,449,005	4,522,667	3,354,295
Avg. total debt (USD thousands)	59,191	235,558	28,150	1,179,849	1,314,480	1,184,618
Avg. long-term debt (USD thousands)	40,219	143,497	15,653	968,552	1,045,650	1,000,983
Maturity	0.180	0.333	0.374	0.615	0.462	0.454
Volatility	0.037	0.050	0.038	0.021	0.034	0.036
Growth	1.015	1.165	1.368	1.429	1.813	1.039
AssetMaturity	13.064	10.499	13.346	21.070	15.786	16.558
Size	11.762	12.467	10.554	14.112	13.636	13.615
Tangibility	0.208	0.266	0.439	0.382	0.494	0.413
Earnings	0.069	0.043	0.076	0.084	0.077	0.052
Default	−1.764	−1.292	−1.872	−1.369	−1.305	−1.173
Leverage	0.069	0.198	0.211	0.249	0.257	0.214
Observations (number)	70	476	345	158	464	307
Companies (number)	12	70	66	20	74	40

Note: Table 3 reports summary statistics by country along with the mean value of the study variables. The variable under investigation is Maturity defined as long-term debt divided by total debt. Variables are defined in Table 2.

Table 4. Summary statistics

Variables	*Mean*	*SD*	*25% percentile*	*Median*	*75% percentile*
Maturity	0.412	0.350	0	0.395	0.755
Volatility	0.038	0.044	0.012	0.024	0.047
Growth	1.365	0.787	0.906	1.149	1.603
AssetMaturity	14.425	15.837	6.713	10.955	16.799
Size	12.712	1.981	11.579	12.760	13.859
Tangibility	0.390	0.233	0.202	0.375	0.579
Earnings	0.064	0.091	0.029	0.063	0.108
Default	−1.410	1.068	−1.932	−1.361	−0.877
Leverage	0.218	0.191	0.055	0.174	0.353

Note: Table 4 reports firm-level descriptive statistics for a sample of non-financial firms operating in the GCC countries over the period 2007–2019. The variable under investigation is Maturity defined as long-term debt divided by total debt. Variables are defined in Table 2.

Table 5. Correlation matrix

Variables	*Maturity*	*Volatility*	*Growth*	*AssetMaturity*	*Size*	*Tangibility*	*Earnings*	*Default*
Volatility	−0.2049 (0.000)							
Growth	−0.0567 (0.016)	−0.0377 (0.108)						
AssetMaturity	0.3202 (0.000)	−0.1225 (0.000)	0.0161 (0.492)					
Size	0.4224 (0.000)	−0.2432 (0.000)	−0.0087 (0.710)	0.1886 (0.000)				
Tangibility	0.3955 (0.000)	−0.1124 (0.000)	0.1147 (0.000)	0.5582 (0.000)	0.1231 (0.000)			
Earnings	0.0452 (0.054)	−0.2949 (0.000)	0.4245 (0.000)	0.0568 (0.015)	0.1275 (0.000)	0.0503 (0.032)		
Default	0.157 (0.000)	0.2723 (0.000)	−0.2927 (0.000)	0.091 (0.000)	0.0555 (0.018)	0.168 (0.000)	−0.6533 (0.000)	
Leverage	0.41 (0.000)	−0.0714 (0.002)	−0.1577 (0.000)	0.2163 (0.000)	0.2886 (0.000)	0.2594 (0.000)	−0.2515 (0.000)	0.4486 (0.000)

Note: Table 5 shows the correlation between the variables used in the study for a sample of non-financial firms operating in the GCC countries over the period 2007–2019. The variable under investigation is Maturity defined as long-term debt divided by total debt. Variables are defined in Table 2. p-values are in parentheses.

5. RESULTS AND DISCUSSION

Table 6 presents the cross-country results of estimating Eq. (1). Columns 1 and 2 present the results using the random effects model (Awartani et al., 2016) with firm leverage and industry leverage, respectively. Column 3 reports the estimation results of the two-stage least square random-effects estimator for panel data to control for the simultaneity between debt maturity and leverage as a robustness check (Mimouni et al., 2019). In terms of the main variable of interest *Maturity*, the results reported in Table 6 show that cash flow volatility is negatively and significantly related to debt maturity at the 5% level or better in all specifications, which suggests that volatile firms choose to employ more short-term debt relative to long-term debt. This result supports *H1* and is consistent with the view that the value of long-term debt is more sensitive to volatility than short-term debt which increases the firm's default and credit risks thereby increasing the marginal costs of long-term borrowing (Dangl & Zechner, 2021; Keefe & Yaghoubi, 2016).

Table 7 reports the estimation results of Eq. (2) with *Maturity-Categorical* as the dependent variable. This variable has the advantage of differentiating between firms with no debt (the value of the *Maturity* variable for those firms is zero) and firms with short-term debt but with no long-term debt (the value of the *Maturity* variable for those firms is also zero). The results are estimated using the ordered probit model (Keefe & Yaghoubi, 2016; Memon et al., 2018). Following Keefe and Yaghoubi (2016), and Memon et al. (2018) leverage is computed at the industry level (for each country and year) to control for the endogeneity between leverage and maturity choices. Table 7 reports that the volatility coefficient is statistically significant at less than a five per cent significance level. The negative volatility coefficient indicates that the higher the cash flow volatility, the lower the category of debt maturity. In other words, as volatility increases (decreases) the likelihood that a firm will hold debt of longer maturity will decrease (increase), a result that supports *H1*.

Other results are consistent across the various specifications and hence the discussion will focus on results reported in Table 6, Column 3. The results show that *Growth* is significantly and negatively related to *Maturity* at a 5% level, which indicates that firms with a large set of growth opportunities use more short-term debt relative to long-term debt. It is also consistent with the view that firms subject to large agency costs of debt resolve these costs by choosing debt maturities that expire before the growth opportunity to reduce the underinvestment problem (Myers, 1977) and asset substitution (Barnea et al., 1980; Leland & Toft, 1996). Further, this finding is consistent with empirical evidence (Pan & Tan, 2019; Pour & Lasfer, 2019; Zheng et al., 2012). In terms of the variable *AssetMaurity*, the results show that it is significantly and positively related to *Maturity* at the 5% level, which indicates that firms with longer asset maturities use longer debt maturities. This finding supports the prediction that firms subject to large agency costs of debt resolve these costs by choosing debt maturities (Myers, 1977) and the empirical evidence (Feito-Ruiz & Menéndez-Requejo, 2022; Pour & Lasfer, 2019; Zheng et al., 2012).

Table 6. The results of estimating Eq. (1) with *Maturity* as the dependent variable

Variables	*Random effects*		*2SLS*
Volatility	−0.383**	−0.385**	−0.351**
	(−2.27)	(−2.24)	(−2.13)
Growth	−0.021*	−0.026**	−0.024**
	(−1.69)	(−2.07)	(−2.09)
AssetMaturity	0.036***	0.034***	0.026**
	(3.02)	(2.76)	(2.30)
Size	0.050***	0.067***	0.059***
	(5.26)	(7.00)	(8.55)
Tangibility	0.315***	0.356***	0.369***
	(5.38)	(5.98)	(6.82)
Earnings	−0.022	0.099	0.096
	(−0.200)	(0.86)	(0.88)
Default	−0.034**	0.012	−0.006
	(−2.17)	(0.80)	(−0.35)
Leverage	0.535***	–	0.332**
	(8.69)	–	(2.51)
Industry leverage	–	0.320***	–
	–	(4.37)	–
GDP	0.000	0.0003	0.001
	(0.00)	(0.14)	(0.25)
Credit	−0.0002	0.0001	0.00002
	(−0.22)	(0.07)	(0.02)
Observations	1820	1820	1820
Groups	282	282	282
Year effects	Yes	Yes	First and second stage
Industry effects	Yes	Yes	First stage
Country effects	Yes	Yes	First stage
Overall R^2	0.452	0.423	0.369

*Note: Table 6 reports the results of estimating Eq. (1) with Maturity as the dependent variable. The sample consists of non-financial firms operating in the GCC countries over the period 2007–2019. The variable under investigation is Maturity defined as long-term debt divided by total debt. Variables are defined in Table 2. z-statistics are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10%, respectively.*

Table 7. The results of estimating Eq. (2) with *Maturity-Categorical* as the dependent variable

Variables	*Ordered probit*
Volatility	−2.046**
	(−2.42)
Growth	−0.256***
	(−4.92)
AssetMaturity	0.193***
	(3.25)
Size	0.328***
	(9.71)
Tangibility	0.663***
	(2.96)
Earnings	0.247
	(0.47)
Default	0.269***
	(4.87)
Industry leverage	2.620***
	(6.92)
GDP	0.024*
	(1.68)
Credit	0.010
	(1.64)
Observations	1820
Groups	282
Year effects	Yes
Industry effects	Yes
Country effects	Yes
Pseudo R^2	0.305

*Note: Table 7 reports the results of estimating Eq. (2) with Maturity-Categorical as the dependent variable. The sample consists of non-financial firms operating in the GCC countries over the period 2007–2019. The variable under investigation is Maturity-Categorical which classifies debt maturity into three categories, no debt, only short-term debt, and long-term debt. Variables are defined in Table 2. z-statistics are in parentheses. ***, **, * indicate significance at the 1%, 5%, and 10%, respectively.*

In addition, the results reported in Table 6 show that *Size* and *Tangibility* are significantly and positively related to *Maturity* at the 1% level. These results indicate that large firms and firms with more asset tangibility secure more long-term debt financing which is consistent with the view that large firms are subject to less transaction, information, and agency costs (Wu et al., 2022) while firms with large base of tangible assets provide the necessary source of payment in case of bankruptcy ex-post thereby reducing information and agency costs ex-ante (Myers & Rajan, 1998). Further, these results are consistent with empirical evidence (Ağca et al., 2015; Awartani et al., 2016; Feito-Ruiz & Menéndez-Requejo, 2022; Mimouni et al., 2019). However, the results reported in Table 5 do not support the predictions of the signalling model as the variables *Earnings* and *Default* are not

statistically significantly related to *Maturity*. Hence, the results of this study do not find evidence supporting the signalling argument (Flannery, 1986) which is discussed further in the next section. In terms of leverage, the results show that *Leverage* is significantly positively related to *Maturity* at the 1% level in the random effects and is robust to controlling the endogeneity between the leverage and maturity decisions as shown in the 2SLS estimations. This finding is consistent with the liquidity argument that predicts that as leverage increases liquidity risk increases hence the firm is better off issuing long-term debt (Diamond, 1991a) and the empirical evidence (Ağca et al., 2015; Mimouni et al., 2019; Pour and Lasfer, 2019; Zheng et al., 2012).

6. CONCLUSION

This paper investigates the determinants of the debt maturity structure of nonfinancial corporate GCC firms over the period 2007–2019 with a focus on the impact of the volatility of cash flows. The article documents that cash flow volatility is negatively related to the proportion of long-term debt in a firm's capital and the probability that a firm has long-term debt, which is the first evidence using the context of the GCC countries. The GCC countries have negligible corporate taxes (Hertog, 2013; Mimouni et al., 2019), are bank-based systems (Awartani et al., 2016), and their private sector contribution to economic growth lags behind state-led initiatives (Abdallah & Ismail, 2017; Kaya & Tsai, 2016). Hence, this study explores the determinants of debt maturity in an attempt to understand the limitations of the use of long-term borrowing that can affect private investments. The findings of this study show that 1) the proportion of long-term debt relative to total debt decreases significantly with greater volatility, and 2) the probability of having long-term debt also decreases significantly with greater volatility. Theoretically, these results are best interpreted from the view that the value of long-term debt is more sensitive to volatility because of the higher costs of default and credit risk hence the marginal costs of long-term debt are larger for volatile firms (Keefe & Yaghoubi, 2016; Memon et al., 2018). Therefore, volatile firms have incentives to use short-term debt rather than committing to long-term debt with higher marginal costs (Dangl & Zechner, 2021; Keefe & Yaghoubi, 2016). Further, these results can be interpreted from the supply side as the main source of debt in the GCC countries are banks. Short-term debt sourced from banks can be used efficiently as a lending technology (as short-term debt obtained from capital markets is comparatively subject to larger transaction and refinancing costs) instead of excluding risky firms from the loan market.

Other results documented in this article are consistent with the extant theoretical and empirical findings. They show that mature GCC firms with low growth opportunities and firms with long asset maturity employ long-term maturities. In terms of firm size, the evidence in this article shows that large firms use more long-term debt in their debt structures. Taken together, these results indicate that GCC firms subject to large agency costs such as small, growth firms use short-term debt as a mechanism to resolve some of the agency costs of debt. Further, the results show that GCC firms with a larger base of tangible assets use long-term debt. Because tangible assets are heavily used in asset-based lending, this evidence indicates the important role of collateralized loans in the provision of long-term loans in the GCC region. This result also suggests that collateralized debt can be used as an alternative mechanism to solve the agency problem. Further, the results indicate that liquidity risk also influences GCC firms' debt maturity decisions, evident by the negative impacts of leverage on debt maturity. This finding is consistent with the liquidity argument that predicts that as leverage increases liquidity risk increases hence the firm is better off issuing long-term debt (Diamond, 1991a).

Nonetheless, the findings presented in this article show that private information and signalling do not affect GCC firm debt maturity evidenced by the insignificant impact of earnings on debt maturity. According to the findings of this study, firms with favourable private information do not signal their quality through the issuance of short-term debt. This finding is not surprising considering the context of the GCC countries, as the source of finance matters. GCC firms source their short-term debt from banks, not financial markets. Hence, the choice of bank short-term debt is unlikely to signal the quality of the firm, especially given that banks are efficient monitors and bank loans are private (Diamond, 1984, 1991b).

In terms of policy implications, policymakers concerned with reforms tackling the issue of strengthening and expanding the role of private investments must consider firm access to external finance, especially, long-term borrowing. Previous research shows that access to long-term debt reduces liquidity and refinancing risks and improves the funding of private long-term investments (Harford et al., 2014; Jungherr & Schott, 2021). The evidence on the negative impact of firm volatility the proportion and likelihood of having long-term debt indicate that the financial system can develop screening and monitoring mechanisms to accommodate risky firms' long-term borrowing needs. Finally, the results of this study direct attention to questions that can be answered by future research. Debt maturity is one of many mechanisms employed by firms to reduce agency and information asymmetry problems. Another important mechanism heavily utilized in bank-based economies is collateral, hence, future research can explore the issue of the joint determination of maturity and collateral.

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