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Market Risk and Financial Performance of Non-Financial Companies Listed on the Moroccan Stock Exchange

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Abstract: This study examines the effect of market risk on the financial performance of 31 non-financial companies listed on the Casablanca Stock Exchange (CSE) over the period 2000–2016. We utilized three alternative variables to assess financial performance, namely, the return on assets, the return on equity and the profit margin. We used the degree of financial leverage, the book-to-market ratio, and the gearing ratio as the indicators of market risk. Then, we employed the pooled OLS model, the fixed effects model, the random effects model, the difference-GMM and the system-GMM models. The results show that the different measures of market risk have significant negative influences on the companies' financial performance. The elasticities are greater following the degree of financial leverage compared with the book-to-market ratio and the gearing ratio. In most cases, the firm's age, the cash holdings ratio, the firm's size, the debt-to-assets ratio, and the tangibility ratio have positive effects on financial performance, whereas the debt-to-income ratio and the stock turnover hurt the performance of these non-financial companies. Therefore, decision-makers and managers should mitigate market risk through appropriate strategies of risk management, such as derivatives and insurance techniques.

Keywords: market risk; financial performance; non-financial firms; Morocco

1. Introduction

Financial risks are among the main problems faced by many companies, especially those listed on the stock exchange where the valuation of companies depends on market conditions. Several risks common to all businesses include liquidity risk, credit risk, market risk and other types of non-financial risks. In particular, market risk is one of the critical components of financial risk because it is a systematic risk that investors cannot eliminate through a diversified portfolio; Nevertheless, market risk can be reduced by using appropriate hedging strategies. Indeed, market risk is the likelihood that a company (or an investor) suffers losses due to factors that influence the global performance of the financial markets in which it is included. According to Koch and MacDonald (2006), market risk mainly includes foreign exchange risk, interest rate risk, commodity price risk and stock price risk, referring to adverse changes in exchange rate, interest rate, and stock prices. Some studies have used alternative measures of market risk, such as the book-to-market ratio (Fama and French 1993; Chen et al. 2005; Dempsey 2010; Cakici and Topyan 2014), the gearing ratio (Briston 1981; Akhtar et al. 2011; Siyanbola et al. 2015) and the degree of financial leverage (Abid and Mseddi 2004; Gatsi et al. 2013; Muriithi et al. 2016). These studies found that market risk had a significant effect on a firm's financial performance. Most empirical studies on financial risks and financial performance have focused on the banking sector to the detriment of non-financial firms (Nimalathasan and Puwanenthiren 2012; Muriithi et al. 2016; Badawi 2017; Abdellahi et al. 2017; among others). Few studies have investigated the effect of market risk on the performance of non-financial firms listed in Africa. Instead, these studies have analyzed the effect of capital structure on financial performance (Abor 2005; El-Sayed Ebaid 2009; Sakyi et al. 2014; Admassu 2016). Several studies on financial risks and financial performance in the Moroccan context have given considerable attention to financial institutions (Ferrouhi 2014; Eloitri 2017; Bayoud et al. 2018) rather than non-bank companies (Ibenrissoul and Maroua 2015).

The Casablanca Stock Exchange (CSE) was created in 1929 and included 74 listed companies, for a total market capitalization of MAD 627 billion as of 31 December 2017, making it one of the ten largest stock markets in Africa after the Johannesburg stock exchange and Nigerian stock exchange[1].

The CSE consists of a central market in which buyers and sellers are matched for each security, and a block-trade market allowing for the trading of over-the-counter securities continuously or by auction on the basis of the minimum block size obtained from the central market. The market is made up of several operators, including 17 brokerage firms, 18 asset management companies, the financial market authority (AMMC)[2], the central depository of securities (MAROCLEAR)[3], a professional association of stockbroking companies (APSB)[4] and the Ministry of Finance and Privatisation which is the regulator that oversees the CSE without participating in its management. Besides, the CSE is dominated by non-financial corporations that have played an essential role in the development of the Moroccan market. In Morocco, most publicly traded companies are exposed to financial risks, in particular to market risk, which has been neglected by previous studies on non-financial companies. Market risk is a constant threat that can affect the profitability of companies. Few studies have analyzed the impact of market risk on the profitability of non-financial companies listed in Morocco, by considering various indicators of financial performance and market risk, as well as using different econometric approaches.

The objective of this study is therefore to examine the effect of market risk on the financial performance of non-financial companies listed on the Moroccan stock exchange. We considered 31 non-financial publicly traded companies over the period 2000–2016 due to data availability. This study used three alternative measures of financial performance: return on assets, return on equity and profit margin. We also used the degree of financial leverage, the book-to-market ratio and the gearing ratio as market risk indicators, following the above studies and the availability of data for these non-financial firms. We then employed various econometric techniques such as the pooled OLS model, the fixed effects model, and the random effects model, as well as the difference-GMM and system-GMM models for additional analyses. We corrected the results using robust standard errors for autocorrelation and heteroscedasticity. Overall, we found that market risk indicators had significant adverse effects on the companies' financial performance, particularly on the return on their assets and their profit margins. The degree of financial leverage was the component of market risk that had a more significant effect on profitability than the book-to-market ratio and the gearing ratio. This study provided empirical evidence of the significant negative impact of market risk on financial performance in Morocco using alternative indicators of financial performance and market risk, as well as various econometric techniques.

Also, the study has several benefits for the supervisory board and the leading investors of the listed companies in Morocco. Indeed, it allows the directors of these listed companies to understand better the impact of market risk on the financial performance of non-financial companies listed on the Moroccan stock exchange. They can also benefit from this study by applying the main recommendations and

[1] 2017 Annual Report of the Casablanca Stock Exchange.
[2] AMMC: Autorite Marocaine du Marche des Capitaux.
[3] MAROCLEAR: Central Depository of securities in Morocco.
[4] APSB: Association Professionnelle des Societes de Bourse.

involving the stakeholders in defining appropriate risk management strategies to mitigate market risk and optimize the financial performance of their companies.

The remainder of this study is structured as follows: Section 2 presents a review of the empirical literature; Section 3 describes the data and methodology of this paper, while Section 4 shows the results and discussions. Finally, the last chapter summarises our findings and gives some policy recommendations.

2. Literature Review and Testable Hypotheses

Many empirical studies have analyzed the effect of financial risks on the financial performance of commercial banks. Notably, most studies of the impact of market risk on performance have focused on the banking sector using bank-specific variables as market risk indicators (Nimalathasan and Puwanenthiren 2012; Ngalawa and Ngare 2013; Muriithi et al. 2016). For instance, Nimalathasan and Puwanenthiren (2012) used a measure of the degree of financial leverage to examine the effect of market risk on the return of equity of listed financial institutions in Sri Lanka over the period 2007–2011. They found a significant positive association between market risk and the companies' financial performance. Muriithi et al. (2016) analyzed the impact of market risk on the financial performance of 43 commercial banks in Kenya using the fixed effects model, the random effects model and the generalized method of moments (GMM) from 2005 to 2014. They used three measures of market risk, namely, the degree of financial leverage, the foreign exchange exposure risk, and the net interest margin. The authors revealed that market risk indicators had significant adverse effects on return on equity. Other studies have used different measures of market risk and control variables to analyze the relationship between financial risks and financial performance (Dempsey 2010; Siyanbola et al. 2015; Wani and Dar 2015; Muriithi et al. 2016; among others).

2.1. Book-to-Market Ratio

The book-to-market ratio (BMR) is a measure used to compare the book value of a company to its market value. The accounting value of a company determines its book value while its market capitalization estimates the market value. A ratio of less than one denotes an overvalued company, while a rate of more than one indicates an undervalued company. Fama and French (1993) and Lakonishok et al. (1994) indicated a strong relationship between book-to-market ratio and financial performance. Fama and French (1993) have found that the book-to-market ratio was a market risk-factor predicting stocks returns. Chen et al. (2005) showed that the book-to-market ratio and the firm size are indicators of risk in investment decisions. They proved that firm size and book-to-market ratio had a strong relationship with the betas of the returns of different industries from 1981 to 2001. Besides, Dempsey (2010) used the book-to-market ratio as a proxy for risk in his study of Australian markets. He found a positive link between the firms' book-to-market ratio and stock returns. Cakici and Topyan (2014) found that the book-to-market ratio was a significant predictor of the future returns of companies in eight emerging Asian markets from January 1992 to December 2012.

2.2. Degree of Financial Leverage

The degree of financial leverage (DFL) measures the rate of changes in the earnings per share (EPS) for a unit change in the earnings before interest and taxes (EBIT). The DFL is also the ratio of the earnings before interest and taxes (EBIT) to the earnings before taxes (EBIT—Interest expenses). Bhatti et al. (2010) studied the relationship between financial leverage, systematic risk, and profitability of eight non-financial enterprises in Pakistan from January 2005 to December 2009. They showed a significant positive link between financial leverage and systematic risk. Likewise, Alaghi (2011) showed a positive association between financial leverage and market risk. Gatsi et al. (2013) found a significant and contrasting effect of the degree of financial leverage on the performance of 18 insurance companies in Ghana from 2002 to 2011. Dimisyqiyani et al. (2015) showed that the degree of financial leverage has a significant positive effect on return on equity. Moreover, Muriithi et al. (2016) examined the relationship between market risk and the financial performance of 43 commercial banks in Kenya over the period

2005–2014 using the fixed effects model, the random effects model and the generalized method of moments (GMM). The authors found that the degree of financial leverage had a significant opposite effect on return on equity.

2.3. Gearing Ratio

The gearing ratio (GEAR) is an indicator of financial leverage that shows how creditor financing or equity capital supports the company's activities. It indicates a financial ratio that compares borrowed funds to owner's equity. Linsley and Shrives (2006) pointed out the gearing ratio as a measure of financial risk. Briston (1981) revealed an inverted relationship between the gearing ratio and companies' profitability whereas Akhtar et al. (2011) and Siyanbola et al. (2015) found a positive effect of gearing ratio on financial performance from their study on Nigerian companies. However, Enekwe et al. (2014) showed a negative relationship between the gearing ratio (debt-to-equity ratio) and the return on assets in six pharmaceutical companies in Nigeria from 2001 to 2012.

2.4. Firm's Age

The firm's age (AGE) represents the number of years the company has been in existence since its creation. Many studies have shown that the age of companies has a mixed impact on their profitability (Loderer and Urs 2010; Ilaboya and Ohiokha 2016; Akben-Selcuk 2016; Adamade and Umar 2017; Pervan et al. 2017). For instance, Akben-Selcuk (2016) found a significant negative and convex nexus between a firm's age and its return of assets for 302 non-financial companies listed in Turkey from 2005 to 2014 by using the fixed effects model. Ilaboya and Ohiokha (2016) showed the significant positive effect of the firm's age on financial performance for 30 companies listed in Nigeria from 2006 to 2012. However, Pervan et al. (2017) showed that the firm's age had a significant adverse effect on the financial performance of 956 Croatian food companies over the period 2005–2014.

2.5. Cash Holding Ratio

The cash holding ratio (CASH) is the ratio of a company's cash and cash equivalent assets to its total liabilities. It indicates the degree to which available funds can repay current debts. Bhutto et al. (2015) found that the cash holding ratio has an opposite effect on return on equity. Aiyegbusi and Enisan (2016) showed that cash holdings have a significant positive effect on the financial performance of selected firms listed in Nigeria from 2001 to 2012 by using the GMM, following other studies (Akinyomi 2014; Abushammala and Sulaiman 2014). Nenu et al. (2018) analyzed the effect of capital structure on the performance of the firms listed on the Bucharest Stock Exchange from 2000 to 2016 using the fixed effects model and the system-GMM model. They found that the cash ratio had a significant positive effect on financial performance.

2.6. Debt-to-Income Ratio

The debt-to-income ratio (DIR) is a measure of a company's ability to repay its obligations. We calculate DIR by dividing the total debt of the corporation by its gross income, expressed as a percentage. Demyanyk et al. (2011) provided evidence that a great debt-to-income ratio increased the likelihood of default on mortgage repayments due to a high-interest rate and the income shocks. Lawes and Kingwell (2012) found an inverse relationship between economic performance and debt-to-income ratio from their study on 123 farms in Australia over the period 2005–2009. Brown et al. (2015) argued that a high proportion of debt relative to income constituted a high burden for the repayment of the loans. This constraint led to an increasing delinquency rate and may hurt financial performance. Fout et al. (2018) identified the debt-to-income ratio among a range of risk factors which can influence the firm's financial performance.

2.7. Debt-to-Assets Ratio

The debt-to-assets ratio (LEV) is an indicator of financial leverage, which reveals the percentage of total assets that were financed by debt. The debt-to-assets ratio is determined by dividing a firm's total debts by its total assets. Some studies revealed that the debt-to-assets ratio had a positive effect on companies' financial performance (Gill and Obradovich 2012; Davydov 2016; Detthamrong et al. 2017). However, other studies found a negative association between the debt-to-assets ratio and the firm's performance (Salim and Yadav 2012; Zelgalve and Berzkalne 2015; Le and Phan 2017). Likewise, Amraoui et al. (2018) found a significant negative relationship between debt-to-assets ratio and the financial performance of 52 firms listed in Morocco from 2009 to 2016 by using a simple pooled OLS model, with similar results in Amraoui et al. (2017).

2.8. Firm Size

Some studies have shown that the size of the firms (SIZE), measured by total assets, hurts financial performance (Ammar et al. 2003; Goddard et al. 2005; Amraoui et al. 2017; Amraoui et al. 2018). On the other hand, other studies have revealed that the size of a company had a positive and significant influence on its profitability (Jang and Park 2011; Akinyomi and Olagunju 2013; Al-Najjar 2014; Davydov 2016; Ilaboya and Ohiokha 2016). Bayoud et al. (2018) examined the relationship between the size of a company and the financial performance of six banks listed on the Moroccan stock exchange over the period 2004–2016 by using the fully modified ordinary least squares (FMOLS). They found that the firm's size positively and significantly affected its return on equity but had a significant opposite effect on its return on assets.

2.9. Tangibility Ratio

The tangibility ratio (TANG) represents the ratio of tangible fixed assets to total assets.

Randøy and Goel (2003) found a non-significant and positive effect of tangibility ratio on the return on assets of 68 small-and-medium-sized enterprises (SME) listed in Norway from 1996 to 1998. Margaritis and Psillaki (2010) examined the effect of tangible assets on financial performance in French industries from 2002 to 2005. They used a nonlinear approach and found a non-monotonic effect of tangibility ratio on financial performance. The effect was adverse at low tangibility ratio but positive at high tangibility ratio. Okwo et al. (2012) and Azadi (2013) showed the positive relationship between the tangibility ratio and financial performance while Razaq and Akinlo (2017) found that the tangibility ratio had a significant adverse effect on firms' profitability. Vătavu (2015) examined the impact of capital structure on the financial performance of 196 companies publicly traded in Romania during the period 2003–2010. He showed that tangible assets had a significant negative effect on the return on assets and the return on equity.

2.10. Stock Turnover

The stock turnover (TURN) is the frequency at which a company's inventory is "turned" or sold in a given period. The TURN is also known as the inventory turnover, an efficiency ratio that estimates how well the stock is overseen. Koumanakos (2008) analyzed the effect of inventory management on the performance of medium-to-large Greek firms from 2000 to 2002. He found a negative relationship between inventory turnover and financial performance. Choudhary and Tripathi (2012) investigated the effect of stock turnover on financial performance in the Indian retail industry from 2000 to 2010. They used a fixed effects model and found an inverse relationship between stock turnover and financial performance. Besides, Chandra and Arrawatia (2015) showed a negative relationship between stock turnover and financial performance of the firms listed in India during the period 2000–2013. Raheman and Nasr (2007) and Khan et al. (2016) revealed that stock turnover hurt firms' profitability. However, Eroglu et al. (2011), and Salawati (2012) found a positive relationship between stock turnover and profitability. Nawaz et al. (2016) found that stock turnover had a positive and significant effect on the return on equity of non-financial companies listed in Pakistan from 2010 to 2014. Therefore, as a result of these empirical studies, we assume that market risk has a significant effect on the financial performance of non-financial companies listed on the Moroccan stock exchange. In particular, we make the following assumptions:

Hypothesis 1 (H_1): *Market risk has significant negative effects on the return on assets of these firms.*

Hypothesis 2 (H_2): *Market risk has significant negative effects on the return on equity of these firms.*

Hypothesis 3 (H_3): *Market risk has significant negative effects on the companies' profit margin.*

3. Data and Methodology

3.1. Data and Sample

This study examines the effect of market risk on the performance of non-financial companies listed in Morocco (Casablanca Stock Exchange, CSE) over the period 2000–2016. Our sample is made up of 31 non-financial companies listed on the Moroccan stock exchange (see Appendix A, Table A2). We used the data from the financial statements of the companies. In particular, we used the database of Orbis and Osiris Bureau van Dijk (BvD) for these listed companies. We considered this sample and data period for several reasons. First, our study follows a series of previous studies on risk management and financial performance in non-financial corporations (Farooqi et al. 2014), as financial firms follow different supervisory rules than other types of companies. Secondly, we excluded financial companies because only six financial companies (banks) were listed on the Moroccan stock exchange during our sampling period, and most of their data covered the period 2011–2016. Third, we excluded other non-financial firms because of a large amount of missing data, to obtain more accurate data for our study. As a result, our study used unbalanced panel data from 31 non-financial listed companies over the period 2000–2016. We transformed the variables into US dollars based on the exchange rate of the study period for those expressed in Moroccan dirham (MAD).

3.2. Description of Variables

We alternatively employed three (03) measures of financial performance widely used in previous studies (Abdellahi et al. 2017; Badawi 2017), namely, return on assets, return on equity and profit margin. Then, this study utilized a measure of the degree of financial leverage (Dimisyqiyani et al. 2015; Muriithi et al. 2016), the book-to-market ratio (Fama and French 1993; Dempsey 2010; Cakici and Topyan 2014) and the gearing ratio (Briston 1981; Akhtar et al. 2011; Siyanbola et al. 2015) as indicators of market risk. Finally, we added seven control variables that influence firms' financial performance, including the firm age (Ilaboya and Ohiokha 2016; Akben-Selcuk 2016; Pervan et al. 2017), the cash holdings ratio (Akinyomi 2014; Bhutto et al. 2015), the debt-to-income ratio (Fout et al. 2018), the debt-to-assets ratio (Gill and Obradovich 2012; Zelgalve and Berzkalne 2015), firm size (Jang and Park 2011; Al-Najjar 2014), the tangibility ratio (Okwo et al. 2012; Azadi 2013) and stock turnover (Khan et al. 2016; Nawaz et al. 2016). Table A1 presents a detailed description of all the variables.

3.3. Model Specification and Empirical Procedures

3.3.1. Model Specification

In this section, we first employed a modified static model following previous empirical studies using three alternative measures of financial performance (Siyanbola et al. 2015; Zelgalve and Berzkalne 2015; Muriithi et al. 2016; Admassu 2016; Abdellahi et al. 2017; among others) and taking into account the issue of non-stationary variables:

$$\Delta lROA_{it} = \beta_0 + \beta_1 \Delta lDFL_{it} + \beta_2 \Delta lBMR_{it} + \beta_3 \Delta lGEAR_{it} + \beta_4 \Delta lAGE_{it} + \beta_5 \Delta lCASH_{it} + \beta_6 \Delta lDIR_{it} + \beta_7 \Delta lLEV_{it} + \beta_8 \Delta SIZE_{it} + \beta_9 \Delta lTANG_{it} + \beta_{10} \Delta lTURN_{it} + \alpha_{1i} + \varepsilon_{1it} \quad (1)$$

$$\Delta lROE_{it} = \delta_0 + \delta_1 \Delta lDFL_{it} + \delta_2 \Delta lBMR_{it} + \delta_3 \Delta lGEAR_{ii} + \delta_4 \Delta lAGE_{it} + \delta_5 \Delta lCASH_{it} + \delta_6 \Delta lDIR_{it} + \delta_7 \Delta lLEV_{it} + \delta_8 \Delta SIZE_{it} + \delta_9 \Delta lTANG_{it} + \delta_{10} \Delta lTURN_{it} + \alpha_{2i} + \varepsilon_{2it} \quad (2)$$

$$\Delta lPROF_{it} = \phi_0 + \phi_1 \Delta lDFL_{it} + \phi_2 \Delta lBMR_{it} + \phi_3 \Delta lGEAR_{ii} + \phi_4 \Delta lAGE_{it} + \phi_5 \Delta lCASH_{it} + \phi_6 \Delta lDIR_{it} + \phi_7 \Delta lLEV_{it} + \phi_8 \Delta SIZE_{it} + \phi_9 \Delta lTANG_{it} + \phi_{10} \Delta lTURN_{it} + \alpha_{3i} + \varepsilon_{3it} \quad (3)$$

where: Δ denotes the first-difference operator (for instance, $\Delta lROA_{it} = lROA_{it} - lROA_{it-1}$); *ROA*: return on assets; *ROE*: return on equity; *PROF*: net profit margin; *DFL:* degree of financial leverage; *BMR*: book-to-market ratio; *GEAR*: gearing ratio; *AGE*: firm age; *CASH*: cash holdings ratio; *DIR*: debt-to-income ratio; *LEV*: debt-to-total assets ratio; *SIZE*: firm size; *TANG*: tangibility ratio; *TURN:* stock turnover. All variables are expressed using the logarithmic operator (*l*) to obtain a normal distribution and interpretable results by dealing with outliers (see Muriithi et al. 2016; among others). The β_0, δ_0, and ϕ_0 are the constant terms whereas β_i, δ_i, and ϕ_i are the coefficients of the independent variables. α_i is the firm *i* specific effect and ε_{it} is the error term at time *t* in each model that is assumed to follow a normal distribution.

Next, we performed additional analyses by transforming the previous models into dynamic models. We added one lagged dependent variable following previous studies since the current level of the firm's financial performance could also be determined by its past value as follows:

$$\Delta lROA_{it} = \gamma_0 + \gamma_1 \Delta lROA_{it-1} + \gamma_2 \Delta lDFL_{it} + \gamma_3 \Delta lBMR_{it} + \gamma_4 \Delta lGEAR_{it} + \gamma_5 \Delta lAGE_{it} + \gamma_6 \Delta lCASH_{it} + \gamma_7 \Delta lDIR_{it} + \gamma_8 \Delta lLEV_{it} + \gamma_9 \Delta SIZE_{it} + \gamma_{10} \Delta lTANG_{it} + \gamma_{11} \Delta lTURN_{it} + \alpha_{4i} + \varepsilon_{4i} \quad (4)$$

$$\Delta lROE_{it} = \theta_0 + \theta_1 \Delta lROE_{it-1} + \theta_2 \Delta lDFL_{it} + \theta_3 \Delta lBMR_{it} + \theta_4 \Delta lGEAR_{it} + \theta_5 \Delta lAGE_{it} + \theta_6 \Delta lCASH_{it} + \theta_7 \Delta lDIR_{it} + \theta_8 \Delta lLEV_{it} + \theta_9 \Delta SIZE_{it} + \theta_{10} \Delta lTANG_{it} + \theta_{11} \Delta lTURN_{it} + \alpha_{5i} + \varepsilon_{5i} \quad (5)$$

$$\Delta lPROF_{it} = \lambda_0 + \lambda_1 \Delta lPROF_{it-1} + \lambda_2 \Delta lDFL_{it} + \lambda_3 \Delta lBMR_{it} + \lambda_4 \Delta lGEAR_{it} + \lambda_5 \Delta lAGE_{it} + \lambda_6 \Delta lCASH_{it} + \lambda_7 \Delta lDIR_{it} + \lambda_8 \Delta lLEV_{it} + \lambda_9 \Delta SIZE_{it} + \lambda_{10} \Delta lTANG_{it} + \lambda_{11} \Delta lTURN_{it} + \alpha_{6i} + \varepsilon_{6i} \quad (6)$$

where: ROA_{it-1}, ROE_{it-1}, and $PROF_{it-1}$ are the one period lagged dependent variables for firm *i* at year *t* − 1, and γ_1, θ_1 and λ_1 their coefficients, respectively; γ_0, θ_0, and λ_0 are the constant terms whereas γ_i, θ_i, and λ_i (for *i* different from 0 and 1) are the coefficients of the independent variables. α_i is the firm *i* specific effect and ε_{it} is the error term at time *t* in each model that is assumed to follow a normal distribution.

3.3.2. Empirical Procedures

First, our empirical analyses started with the descriptive statistics and correlation analysis to avoid problems of multicollinearity among the variables. As a result, we removed the highly correlated variables from the model before the regression analysis.

Second, this study carried out four unit root tests on all the variables in order to avoid spurious results and to validate our model's specification in first-difference. In particular, we employed the Im et al. (2003) test (IPS), the augmented Dickey and Fuller (1981) test (ADF), and the Phillips and Perron (1988) test (PP), all of which assume an individual unit root process, while the test by Levin et al. (2002) (LLC), follows a common unit root process. We performed these tests under the null hypothesis (H_0) of non-stationary variables against the alternative hypothesis of stationary variables.

Third, we estimated Equations (1)–(3) by considering various econometric techniques and selecting the most suitable from the ordinary least squares model (pooled OLS) ignoring the firms' specific effects, the fixed effects model (FE), and the random effects model (RE). The fixed effects model assumes that the specific characteristics of each firm are correlated with the independent variables. In the fixed effects model, the group averages are constant, unlike the random effects model. The random effects model supposes that there is no correlation between the firm's specific effects and the independent variables. Thus, the selection of the appropriate model was made following three different tests developed by Chow (1960), Hausman (1978), and Breusch and Pagan (1980). The Chow test determines the best model between the pooled OLS model and the fixed effect model. The null hypothesis of this test assumes that the individual effects (α_i) are equal to zero, i.e., the pooled OLS model (POLS) is the most convenient. The alternative hypothesis indicates that the fixed effects model is better. The Hausman test is used to select the appropriate and efficient model between the random effects model and the fixed effects model. The null hypothesis of this test assumes that the random effects model is the most efficient model, but the alternative hypothesis is that the fixed effects model is the most appropriate model. The Breusch and Pagan Lagrangian multiplier (LM test) examines whether random effects exist or not. The LM test is implemented under the null hypothesis that the variance of the specific effects ($\mathrm{Var}(\alpha_i)$) is equal to zero, i.e., the POLS is the most suitable model. The alternative hypothesis indicates that the random effects model is better. The selected model (the pooled OLS, fixed or random effects model) from these tests is then estimated and reported with robust standard errors for autocorrelation and heteroscedasticity within panel units. The interpretations of the results are based on the selected model.

Next, we investigated the robustness of the results from the static models (1), (2) and (3) by employing Driscoll and Kraay's (1998) standard errors on the selected model, as well as by using the indicator of market risk separately. This technique is robust to cross-sectional dependence between the panel units by employing a nonparametric approach to estimate the standard errors that are robust to autocorrelation and heteroscedasticity across firms. The cross-sectional dependence may arise from unseen common factors between the companies, such as social norms or psychological behavior. The robustness check with Driscoll and Kraay's (1998) standard errors is performed following the procedure developed by Hoechle (2007). This procedure can accommodate the pooled OLS, the fixed effects, and random effects models. We estimated the dynamic models (4), (5) and (6) for further analyses following the empirical literature. We used the generalized methods of moments (GMM) to solve the problem of endogeneity induced by the presence of the lagged dependent variable as a regressor. In particular, we used the Arellano and Bond (1991)' difference-GMM and the Arellano and Bover (1995) system-GMM to explore additional analyses. The difference-GMM transforms all independent variables using the first difference eliminating the time-invariant fixed effects. Also, the difference-GMM constructs instruments for endogenous independent variables that must be uncorrelated with the error term but strongly correlated with the primary independent variables. However, the system-GMM is an alternative estimator that eliminates the problem of potentially weak instruments from the difference-GMM by adding a new set of instruments. The system-GMM creates a system of equations by combining the level-equations with the difference-equations to create valid instruments to solve the problem of endogeneity.

4. Empirical Results and Discussion

4.1. Descriptive Statistics

Table 1 presents the descriptive statistics of all variables over the period 2000–2016. Panel A shows the results of the variables of financial performance. The number of observations is 341 for $\Delta lROA$, and $\Delta lROE$, but 340 for $\Delta lPROF$ from 2000 to 2016. The mean value of $\Delta lROA$ and $\Delta lROE$ is -0.045 and -0.030, respectively, showing that on average the return on assets and return on equity has declined by 4.5% and 3%, respectively, over the period 2000–2016. On average, the profit margin of the firms decreased by 5.3%. The results also show a significant variation in $\Delta lROE$ (58%) from its mean value compared to $\Delta lPROF$ (56.2%) and $\Delta lROA$ (57.9%), as described by the values of their standard deviations. $\Delta lROA$ ranges from -4.730 (a loss) to 3.367, whereas the maximum value of $\Delta lPROF$ was 3.082. Panel B results show that the mean values of $\Delta lDFL$, $\Delta lBMR$, and $\Delta lGEAR$ are 0.009, -0.018 and 0.082, respectively. For instance, the mean of the book-to-market ratio ($\Delta lBMR$) is less than 1, which means that the companies were overvalued from 2000 to 2016. The last panel C presents the descriptive statistics of the control variables. The mean values of $\Delta lDIR$, $\Delta SIZE$, $\Delta lTANG$ and $\Delta lCASH$ are 0.027, 0.010, -1.834 and 0.010, respectively.

The proportion of the firms' fixed assets was reduced by 183.4% compared to their total assets. The average of $\Delta lAGE$ is 0.044, for dispersion of 5.2% among the firms. On average, the level of leverage ($\Delta lLEV$) increased by 1.6% over the period, for dispersion of 18.3% from one company to another.

Table 1. Descriptive statistics.

Variables	Obs.	Mean	Std.Dev	Min	Max
Panel A: Performance variables					
$\Delta lROA$	341	−0.045	0.579	−4.730	3.367
$\Delta lROE$	341	−0.030	0.580	−4.579	3.338
$\Delta lPROF$	340	−0.053	0.562	−4.509	3.082
Panel B: Market risk variables					
$\Delta lDFL$	316	0.009	0.511	−3.258	3.010
$\Delta lBMR$	293	−0.018	0.363	−1.236	1.521
$\Delta lGEAR$	327	0.082	0.853	−4.600	4.019
Panel C: Control variables					
$\Delta lAGE$	496	0.044	0.052	0.010	0.693
$\Delta lCASH$	378	0.010	1.322	−4.772	8.975
$\Delta lDIR$	285	0.027	0.671	−2.343	3.759
$\Delta lLEV$	381	0.016	0.183	−0.781	1.116
$\Delta SIZE$	383	0.010	0.248	−1.166	1.894
$\Delta lTANG$	356	−1.834	1.461	−5.805	0.520
$\Delta lTURN$	375	0.000	0.327	−1.770	1.800

Note: *ROA* = return on assets, *ROE* = return on equity, *PROF* = profit margin, *DFL* = degree of financial leverage, *BMR*= book to market ratio, *GEAR* = gearing ratio, *AGE* = firm age, *CASH* = cash holdings ratio, *DIR* = debts to income ratio, *LEV* = debt-to-assets ratio, *SIZE* = firm size, *TANG* = tangibility ratio, *TURN* = stock turnover. *Obs* and *Std.Dev* denote the number of observations and standard deviation of the variables, respectively, whereas Min and Max indicate the minimum and maximum values of the variables. *Mean* represents the mean of the variables over the period 2000–2016 for the 31 non-financial firms.

4.2. Correlation Analysis

Table 2 presents the results of the correlation levels between the variables. We find that the market risk variables ($\Delta lDFL$, $\Delta lBMR$, and $\Delta lGEAR$) have negative and significant associations with the indicators of financial performance ($\Delta lROA$, $\Delta lROE$, and $\Delta lPROF$) at the 5% level in most cases. Besides, $\Delta lAGE$ is positively and significantly related to $\Delta lROA$ and $\Delta lPROF$ at the 10% level, but $\Delta lAGE$ has a non-significant positive relationship with $\Delta lROE$. $\Delta lCASH$ and $\Delta lTURN$ have non-significant positive relationships with $\Delta lROA$, $\Delta lPROF$ and $\Delta lROE$.

There is a significant negative relationship between the debt-to-income ratio ($\Delta lDIR$) and each variable of financial performance ($\Delta lROA$, $\Delta lROE$ and $\Delta lPROF$) at the 1% level, respectively. Likewise, $\Delta lLEV$ has a negative and significant association with $\Delta lROA$ and $\Delta lPROF$ at the 1% level, but a non-significant negative relationship with $\Delta lROE$. $\Delta SIZE$ and $\Delta lTANG$ have non-significant negative associations with the indicators of financial performance ($\Delta lROE$, and $\Delta lPROF$). The negative relationship between the size of the companies ($\Delta SIZE$) and their return on assets ($\Delta lROA$) is significant at the 10% level of significance.

4.3. Unit Root Analysis

Table 3 reports the results of the unit root tests developed by Im et al. (2003), Dickey and Fuller (1981), Phillips and Perron (1988), and Levin et al. (2002). We find that *SIZE* and *lTANG* are not stationary at the level following Im et al. (2003). The results of the tests by Dickey and Fuller (1981), and Phillips and Perron (1988) show that *lLEV*, *SIZE* and *lTANG* are not stationary at the level, contrary to the other variables. However, the tests of Im et al. (2003), Dickey and Fuller (1981), and Phillips and Perron (1988) indicate that all variables are stationary at the first difference at the 1% level of significance. Likewise, the test of Levin et al. (2002) corroborates that all variables are stationary at the first difference, except for *lAGE*. Thus, we conclude that all variables are stationary at the first difference at the 1% level of significance. Therefore, our models using the first difference operator are appropriate for avoiding spurious estimates.

Table 2. Correlation analysis.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Δ*IROA*	1.000												
(2) Δ*IROE*	0.938 ***	1.000											
(3) Δ*IPROF*	0.963 ***	0.918 ***	1.000										
(4) Δ*IDFL*	−0.540 ***	−0.490 ***	−0.499 ***	1.000									
(5) Δ*IBMR*	−0.212 **	−0.253 ***	−0.172 **	0.240 ***	1.000								
(6) Δ*IGEAR*	−0.203 **	−0.090	−0.195 **	0.093	−0.012	1.000							
(7) Δ*IAGE*	0.138 *	0.120	0.148 *	−0.006	0.059 *	−0.133	1.000						
(8) Δ*ICASH*	0.061	0.075	0.072	−0.025	−0.044	−0.021	0.006	1.000					
(9) Δ*IDIR*	−0.721 ***	−0.615 ***	−0.721 ***	0.398 ***	−0.016	0.127	−0.142 *	−0.039	1.000				
(10) Δ*ILEV*	−0.303 ***	−0.052	−0.282 ***	0.141 *	−0.069	0.399 ***	−0.109	0.098	0.477 ***	1.000			
(11) Δ*SIZE*	−0.151 *	−0.035	−0.084	0.096	0.068	0.116	−0.083	0.072	0.258 ***	0.456 ***	1.000		
(12) Δ*ITANG*	−0.105	−0.101	−0.119	−0.063	−0.003	0.101	−0.398 ***	0.025	0.090	0.083	0.065	1.000	
(13) Δ*ITURN*	0.030	0.006	0.015	−0.063	−0.053	0.027	0.017	0.179 **	−0.085	−0.033	−0.069	−0.110	1.000

Note: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

Table 3. Results of the unit root tests.

Variables	Im, Pesaran and Shin W-Stat, (IPS)		Augmented Dickey-Fuller Fisher Chi-Square, (ADF)		Phillips-Perron Fisher Chi-Square, (PP)		Levin, Lin and Chu *t*-Stat, (LLC)	
	H_0: I(0)	H_0: I(1)	H_0: I(0)	H_0: I(1)	H_0: I(0)	H_0: I(1)	H_0: I(0)	H_0: I(1)
Financial Performance								
lROA	−1.827 **	−6.678 ***	102.262 ***	169.017 ***	82.704 **	239.394 ***	−5.262 ***	−9.499 ***
lROE	−2.247 ***	−9.923 ***	100.922 ***	210.253 ***	100.273 ***	270.493 ***	−3.090 ***	−9.202 ***
lPROF	−2.438 **	−7.463 ***	111.423 ***	186.650 ***	86.348 ***	235.912 ***	−8.210 ***	−12.297 ***
Market risk								
lDFL	−4.444 ***	−7.550 ***	124.535 ***	207.259 ***	131.551 ***	246.652 ***	−19.981 ***	−12.416 ***
lBMR	−3.004 ***	−7.786 ***	91.901 ***	168.881 ***	97.482 ***	193.562 ***	−5.268 ***	−10.443 ***
lGEAR	−2.268 **	−11.186 ***	93.029 ***	236.791 ***	83.141 **	291.213 ***	−7.128 ***	−19.965 ***
Control variables								
lAGE	−15.601 ***	−43.526 ***	49.080 ***	134.968 ***	74.215 ***	140.577 ***	20.413	3.500
lCASH	−5.438 ***	−15.228 ***	136.913 ***	322.223 ***	137.263 ***	404.668 ***	−7.279 ***	−22.226 ***
lDIR	−1.825 **	−55.734 ***	89.926 ***	149.758 ***	73.014 **	195.840 ***	−9.368 ***	−135.944 ***
lLEV	−1.577 *	−10.945 ***	73.558	238.801 ***	63.273	274.749 ***	−3.827 ***	−21.733 ***
SIZE	0.924	−9.373 ***	71.595	205.034 ***	66.469	202.360 ***	−3.494 ***	−13.190 ***
lTANG	0.384	−8.484 ***	50.479	181.955 ***	44.906	222.370 ***	−2.969 ***	−14.412 ***
lTURN	−4.234 ***	−12.334 ***	124.004 ***	273.907 ***	125.525 ***	400.165 ***	−6.118 ***	−18.300 ***

Note: Im et al. (2003); ADF: Dickey and Fuller (1981); PP: Phillips and Perron (1988); LLC: Levin et al. (2002). The null hypothesis H_0: I(0) assumes a unit root process at the level, whereas H_0: I(1) supposes a unit root process at the first difference. *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

4.4. Results of the Regression Analysis

This section presents the results of the estimation using the different models described in the Methodology section. Table 4 shows the results of the effect of market risk on the financial performance of the non-financial firms listed in the Casablanca Stock Exchange from 2000 to 2016.

We considered the pooled OLS model, the fixed effects model, and the random effects model to estimate the models (1), (2) and (3). However, the different tests developed by Chow (1960), Hausman (1978), and Breusch and Pagan (1980) reveal that the results from the pooled OLS estimator are the most appropriate. The statistics of these tests are not significant. Our interpretations are based on the results of the pooled OLS using the robust standard errors corrected for autocorrelation and heteroscedasticity within the panel units. Thus, the results of the column (I) show that the degree of financial leverage ($\Delta lDFL$), the book-to-market ratio ($\Delta lBMR$), and the gearing ratio ($\Delta lGEAR$) have significant adverse effects (except for $\Delta lGEAR$) on the return on assets ($\Delta lROA$) of the firms at the 10% and 5% levels, respectively. The effect of market risk on firms' performance is higher using $\Delta lDFL$ compared with $\Delta lBMR$ and $\Delta lGEAR$.

Table 4. The effect of market risk on financial performance.

Variables	**(I) (Model 1: $\Delta lROA$) POLS (Robust)**	**(II) (Model 2: $\Delta lROE$) POLS (Robust)**	**(III) (Model 3: $\Delta lPROF$) POLS (Robust)**
$\Delta lDFL$	−0.383 * (0.198)	−0.308 (0.187)	−0.299 (0.246)
$\Delta lBMR$	−0.205 ** (0.085)	−0.236 *** (0.080)	−0.162 ** (0.075)
$\Delta lGEAR$	−0.064 (0.039)	−0.050 (0.039)	−0.059 * (0.033)
$\Delta lAGE$	0.619 (1.079)	0.828 (1.113)	0.721 (0.908)
$\Delta lCASH$	0.006 (0.018)	0.002 (0.017)	0.008 (0.015)
$\Delta lDIR$	−0.397 *** (0.059)	−0.386 *** (0.055)	−0.390 *** (0.062)
$\Delta lLEV$	0.211 (0.197)	0.806 *** (0.258)	0.197 (0.180)
$\Delta SIZE$	0.186 (0.165)	0.164 (0.196)	0.374 ** (0.153)
$\Delta lTANG$	0.116 (0.086)	0.064 (0.087)	0.120 * (0.066)
$\Delta lTURN$	−0.075 (0.084)	−0.093 (0.079)	−0.086 (0.077)
Constant	−0.064 (0.041)	−0.077 * (0.045)	−0.071 * (0.038)
R-squared	0.647	0.573	0.629
F-stat./Wald chi2(10)	15.310 ***	11.450 ***	12.300 ***
W_{MR}	5.590 ***	5.500 ***	4.220 ***
Diagnostics			
Chow test	1.35	1.39	1.18
LM test	0.61	0.78	0.00
Hausman test	11.30	12.92	13.08

Note: see Table A1 for the definition of the variables in the Appendix A. Model 1, 2 and 3 represent the equations in which return on asset ($\Delta lROA$), return on equity ($\Delta lROE$) and profit margin ($\Delta lPROF$) are the dependent variables respectively. POLS denotes pooled OLS whereas Robust indicates that we use the robust standard errors corrected for autocorrelation and heteroscedasticity. W_{MR} is the Wald test examining whether the proxies of market risk jointly influence the variables of financial performance significantly. The numbers in parentheses are the robust standard errors. *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$. The detailed descriptions of the Chow test, LM test, and Hausman test are presented in the Section 3.3.1.

For instance, a 1% increase in the degree of financial leverage ($\Delta lDFL$) and in the gearing ratio ($\Delta lGEAR$) significantly reduced $\Delta lROA$ by approximately 0.38% and by 0.06%, respectively, whereas a similar increase in the book-to-market ratio (an undervaluation) significantly decreased the firms' return on assets by around 0.20%. The variables $\Delta lAGE$, $\Delta lCASH$, $\Delta lLEV$, $\Delta SIZE$ and $\Delta lTANG$ have positive but non-significant influences on $\Delta lROA$, whereas $\Delta lDIR$ and $\Delta lTURN$ hurt $\Delta lROA$. The negative effect of $\Delta lDIR$ on $\Delta lROA$ is significant at the 1% level. The relatively high value of R-squared indicates that all the independent variables are accounted for by 64.70% of the variation in $\Delta lROA$. Besides, the significance of the Wald statistic at the 1% level shows that the proxies of market risk ($\Delta lDFL$, $\Delta lBMR$ and $\Delta lGEAR$) jointly have a negative and significant effect on the firms' return on assets ($\Delta lROA$). Table A3 reports the results of the fixed and random effects models (see Appendix A).

The columns (II) and (III) of Table 4 summarise the analysis of the relationship between market risk and financial performance measured by return on equity ($\Delta lROE$) and profit margin ($\Delta lPROF$), respectively. The results are similar to the previous findings with $\Delta lROA$, $\Delta lDFL$, $\Delta lBMR$, and $\Delta lGEAR$ reduced the return on equity and the profit margin of the companies. Also, the significance of the Wald tests reveals that these indicators of market risk jointly exert a negative influence on $\Delta lROE$ and $\Delta lPROF$ at the 1% level. The results of the effects on the control variables on $\Delta lROE$ and $\Delta lPROF$ are similar to those in the case of $\Delta lROA$. However, $\Delta lLEV$ has a significant positive effect only on $\Delta lROE$ at the 1% level, but $\Delta SIZE$ and $\Delta lTANG$ have a positive and significant effect only on $\Delta lPROF$ at the 5% and 10% levels, respectively. The non-significance of the diagnostics test indicates that these results from the pooled OLS are better than those from the fixed effects (FE) and random effects (RE) models reported in Tables A4 and A5 in Appendix A.

Next, we further examined the previous results of Table 4 using the robust standard errors developed by Driscoll and Kraay (1998), as described above in the experimental procedures. This technique removes the cross-sectional dependence between the non-financial companies. Table 5 shows the results of the effect of a single proxy of market risk on financial performance separately. The non-significance of the Chow test, LM test and Hausman test in the columns (A), (B), (D), (E) and (H) indicates that the pooled OLS with the robust standard errors by Driscoll and Kraay (1998) is the best estimator in the corresponding models. However, the Chow and Hausman statistics are significant in the corresponding models of columns (C), (F), (G) and (I). These tests conclude that the fixed effects model with the robust standard errors in Driscoll and Kraay (1998) is the most suitable model besides the pooled OLS and random effects models. Thus, the results from columns (A) to (I) show that each proxy of market risk has a negative and significant effect on each variable of financial performance at the 1% level. The degree of financial leverage ($\Delta lDFL$) has a more significant effect on the financial performance of the companies, following by the book-to-market ration and the gearing ratio. For instance, a 1% increase in $\Delta lDFL$, $\Delta lBMR$ and $\Delta lPROF$ reduces $\Delta lROA$ significantly by 0.69%, 0.29% and 0.09%, respectively, whereas a 1% increase in $\Delta lDFL$, $\Delta lBMR$ and $\Delta lPROF$ leads to a significant decrease in $\Delta lPROF$ by 0.59%, 0.24% and 0.08%, respectively. The detailed results leading to the selection of the suitable estimator are presented in the Tables A6–A8 (see Appendix B).

Furthermore, Table 6 presents the results of the robustness analysis using the three proxies of market risk along with the framework in Driscoll and Kraay (1998). The statistics from the different tests by Chow (1960), Breusch and Pagan (1980), and Hausman (1978) are not significant. Thus, columns (I), (II) and (III) show the results of the pooled OLS models 1, 2 and 3, respectively. The significance of the Wald tests validates our previous findings that the three proxies of market risk ($\Delta lDFL$, $\Delta lBMR$ and $\Delta lGEAR$) jointly have a negative and significant effect on each variable of financial performance at the 1% level.

Table 5. Robustness using a single measure of market risk with Driscoll and Kraay's standard errors.

Variables	(A) (Model 1: Δ*IROA*) POLS	(B) (Model 1: Δ*IROA*) POLS	(C) (Model 1: Δ*IROA*) FE	(D) (Model 2: Δ*IROE*) POLS	(E) (Model 2: Δ*IROE*) POLS	(F) (Model 2: Δ*IROE*) FE	(G) (Model 3: Δ*IPROF*) FE	(H) (Model 3: Δ*IPROF*) POLS	(I) (Model 3: Δ*IPROF*) FE
Δ*IDFL*	−0.694 *** (0.158)			−0.659 *** (0.165)			−0.592 *** (0.131)		
Δ*IBMR*		−0.298 *** (0.049)			−0.322 *** (0.051)			−0.247 *** (0.060)	
Δ*IGEAR*			−0.099 *** (0.029)			−0.088 *** (0.028)			−0.085 *** (0.023)
Δ*IAGE*	0.453 (0.321)	1.166 (0.687)	0.104 (0.387)	0.392 (0.304)	1.168 * (0.598)	−0.090 (0.339)	0.380 (0.468)	1.401 * (0.668)	0.030 (0.460)
Δ*ICASH*	−0.025 *** (0.007)	0.017 (0.013)	−0.039 *** (0.011)	−0.013 (0.012)	0.016 * (0.009)	−0.032 ** (0.011)	−0.016 * (0.008)	0.030 ** (0.010)	−0.012 (0.010)
Δ*IDIR*	−0.338 *** (0.101)	−0.485 *** (0.114)	−0.526 *** (0.111)	−0.334 *** (0.099)	−0.473 *** (0.109)	−0.512 *** (0.113)	−0.355 *** (0.099)	−0.460 *** (0.100)	−0.511 *** (0.097)
Δ*ILEV*	0.109 (0.135)	0.015 (0.082)	0.722 *** (0.221)	0.736 ** (0.266)	0.540 ** (0.188)	1.313 *** (0.355)	0.109 (0.193)	0.048 (0.122)	0.642 ** (0.217)
Δ*SIZE*	0.334 ** (0.138)	0.319 (0.196)	0.535 *** (0.146)	0.306 * (0.159)	0.340 ** (0.136)	0.567 *** (0.146)	0.487 *** (0.073)	0.387 ** (0.161)	0.653 *** (0.114)
Δ*ITANG*	0.048 (0.086)	−0.037 (0.041)	0.286 (0.201)	0.047 (0.092)	−0.079 ** (0.035)	0.262 (0.214)	0.040 (0.053)	−0.045 (0.048)	0.283 (0.171)
Δ*ITURN*	0.154 * (0.087)	−0.052 (0.031)	0.098 ** (0.037)	0.136 * (0.077)	−0.057 * (0.032)	0.071 * (0.035)	−0.003 (0.077)	−0.330 *** (0.094)	−0.172 * (0.084)
Constant	−0.061 *** (0.013)	−0.058 * (0.028)	−0.107 *** (0.035)	−0.060 *** (0.014)	−0.060 * (0.027)	−0.094 ** (0.032)	−0.064 *** (0.016)	−0.079 * (0.039)	−0.112 ** (0.040)
R-squared	0.534	0.561	0.503	0.491	0.524	0.464	0.573	0.523	0.471
F-stat.	165.630 ***	350.600 ***	98.930 ***	67.650 ***	475.610 ***	46.200 ***	353.420 ***	124.620 ***	135.400 ***
Chow test	1.26	0.94	2.13 ***	1.36	0.85	1.65 **	1.74 **	0.78	2.38 ***
LM test	0.47	0.00	0.00	0.23	0.00	0.17	0.14	0.00	0.05
Hausman test	9.71	8.50	358.670 ***	7.85	7.66	16.59 **	14.32 *	6.21	31.10 ***

Note: POLS and FE represent the pooled OLS model and the fixed effects model, respectively. *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

Table 6. Robustness using three measures of market risk with Driscoll and Kraay's standard errors.

Variables	(I): POLS (Model 1: $\Delta lROA$) DK (Robust Std.)	(II): POLS (Model 2: $\Delta lROE$) DK (Robust Std.)	(III): POLS (Model 3: $\Delta lPROF$) DK (Robust Std.)
$\Delta lDFL$	−0.383 * (0.193)	−0.308 (0.187)	−0.299 (0.240)
$\Delta lBMR$	−0.205 *** (0.028)	−0.236 *** (0.027)	−0.162 ** (0.030)
$\Delta lGEAR$	−0.064 *** (0.015)	−0.050 *** (0.013)	−0.059 *** (0.012)
$\Delta lAGE$	0.619 (0.693)	0.828 (0.757)	0.721 (0.530)
$\Delta lCASH$	0.006 (0.015)	0.002 (0.010)	0.008 (0.005)
$\Delta lDIR$	−0.397 *** (0.119)	−0.386 *** (0.113)	−0.390 *** (0.124)
$\Delta lLEV$	0.211 (0.210)	0.806 ** (0.350)	0.197 (0.219)
$\Delta SIZE$	0.186 * (0.088)	0.164 * (0.080)	0.374 *** (0.108)
$\Delta lTANG$	0.116 (0.082)	0.064 (0.073)	0.120 * (0.079)
$\Delta lTURN$	−0.075 * (0.038)	−0.093 ** (0.037)	−0.086 (0.065)
Constant	−0.064 * (0.035)	−0.077 * (0.036)	−0.071 * (0.037)
R-squared	0.647	0.573	0.629
F-stat./Wald chi2(10)	768.420 ***	1031.840 ***	204.030 ***
W_{MR}	36.090 ***	50.230 ***	18.640 ***
Chow test	1.35	1.39	1.18
LM test	0.61	0.78	0.00
Hausman test	11.30	12.92	13.08

Note: The models 1, 2 and 3 represent the equations in which $\Delta lROA$, $\Delta lROE$ and $\Delta lPROF$ are the dependent variables, respectively. POLS denotes the pooled OLS model whereas *DK* indicates that we use the robust standard errors (Robust Std.) in Driscoll and Driscoll and Kraay (1998). W_{MR} is the Wald test examining whether the proxies of market risk, i.e., $\Delta lDFL$, $\Delta lBMR$ and $\Delta lGEAR$ jointly influence $\Delta lROA$, $\Delta lROE$ and $\Delta lPROF$ significantly. The numbers in parentheses are the robust standard errors. *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

4.5. Results of the Dynamic Panel Models

This section presents the results of the dynamic approach of the effect of market risk on financial performance following Muriithi et al. (2016), among others. Table 7 shows the results of the effect of $\Delta lDFL$, $\Delta lBMR$ and $\Delta lGEAR$ on financial performance using the difference-GMM developed by Arellano and Bond (1991). Thus, a 1% increase in $\Delta lDFL$ decreases $\Delta lROA$ significantly and $\Delta lROE$ by 0.44% and 0.41%, respectively. $\Delta lBMR$ has a significant and negative effect on $\Delta lROA$, $\Delta lROE$ and $\Delta lPROF$ at the 1% level, whereas the effect of $\Delta lGEAR$ on financial performance is negative but non-significant. However, $\Delta lDFL$, $\Delta lBMR$ and $\Delta lGEAR$ simultaneously have an adverse and significant effect on financial performance at the 1% level. $\Delta lAGE$ and $\Delta lTANG$ have a positive effect on $\Delta lROA$, $\Delta lROE$ and $\Delta lPROF$ $\Delta lCASH$ and $\Delta SIZE$ hurt $\Delta lROA$, but have a positive effect on $\Delta lROE$ and $\Delta lPROF$. $\Delta lLEV$ exerts a positive and significant effect on financial performance at the 10% level, whereas $\Delta lDIR$ negatively and significantly affects financial performance at the 1% level. The Hansen test and AR(2) test are not significant denoting that the instruments used in the difference-GMM are exogenous and valid, and there is no autocorrelation in the models.

Table 7. Results of the difference-generalized method of moments (GMM).

Variables	(IV) (Model 4) Coeff. (Robust Std. Err.)	(V) (Model 5) Coeff. (Robust Std. Err.)	(VI) (Model 6) Coeff. (Robust Std. Err.)
$L.\Delta lROA$	−0.153 *** (0.036)		
$L.\Delta lROE$		−0.235 *** (0.058)	
$L.\Delta lPROF$			−0.146 *** (0.043)
$\Delta lDFL$	−0.443 * (0.241)	−0.417 ** (0.217)	−0.450 (0.286)
$\Delta lBMR$	−0.372 *** (0.109)	−0.340 *** (0.094)	−0.342 *** (0.115)
$\Delta lGEAR$	−0.061 (0.055)	−0.045 (0.048)	−0.071 (0.048)
$\Delta lAGE$	10.410 (7.739)	2.370 (4.977)	9.046 (6.890)
$\Delta lCASH$	−0.000 (0.016)	0.001 (0.017)	0.021 (0.013)
$\Delta lDIR$	−0.473 *** (0.133)	−0.440 *** (0.122)	−0.454 *** (0.135)
$\Delta lLEV$	0.585 * (0.330)	0.983 *** (0.315)	0.535 * (0.294)
$\Delta SIZE$	−0.091 (0.238)	0.090 (0.208)	0.171 (0.194)
$\Delta lTANG$	0.057 (0.105)	0.055 (0.089)	0.071 (0.125)
$\Delta lTURN$	0.017 (0.075)	−0.027 (0.059)	−0.012 (0.061)
Constant	–	–	–
F-stat.	50.220 ***	142.770 ***	34.210 ***
Hansen test	10.750	13.120	12.030
AR(2)	0.760	−0.200	−0.570
W_{MR}	5.960 ***	6.410 ***	6.310 ***

Note: GMM denotes the generalized method of moments whereas Robust indicates that we use robust standard errors corrected for autocorrelation and heteroscedasticity problems. We employed the one-step difference-GMM. W_{MR} is the Wald test examining whether the market risk proxies, i.e., $\Delta lDFL$, $\Delta lBMR$, and $\Delta lGEAR$ jointly influence $\Delta lROA$, $\Delta lROE$ and $\Delta lPROF$ significantly. The numbers in parentheses are the robust standard errors. $L.\Delta lROA = \Delta lROA_{it-1}$; $L.\Delta lROE = \Delta lROE_{it-1}$ and $L.\Delta lPROF = \Delta lPROF_{it-1}$ *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

Finally, Table 8 reveals the results of the effect of market risk on financial performance using the one-step system-GMM in Arellano and Arellano and Bover (1995). The results are similar to those in the difference-GMM in most cases. $\Delta lDFL$, $\Delta lBMR$, and $\Delta lGEAR$ simultaneously exert a negative and significant effect on $\Delta lROA$, $\Delta lROE$ and $\Delta lPROF$ at the 1% level. However, $\Delta lAGE$ and $\Delta lTURN$ harm $\Delta lROA$, but $\Delta lLEV$ only has a significant positive effect on $\Delta lROE$.

Overall, the results showed that the degree of financial leverage, the book-to-market ratio, and the gearing ratio had a significant opposite effect on the performance of the non-financial firms listed on the Casablanca Stock Exchange (CSE) during the period 2000–2016. The results of a significant adverse effect of the degree of financial leverage on financial performance are in accordance with those of Gatsi et al. (2013) and Muriithi et al. (2016), while the results of the book-to-market ratio and the gearing ratio are similar to previous studies by Cakici and Topyan (2014) and Enekwe et al. (2014), respectively. These results reveal that the non-financial firms listed in the CSE were heavily indebted and their increasing use of debt financing strategies reduced their profitability because of the burden of interest payments, thus crowding out productive investments. Therefore, the managers of these companies must be attentive to the optimal level of debt to finance productive investments. Besides, the overvaluation of these firms during the period 2000–2016 also led to a decline in their financial performance. The results show that the shares of these companies were very expensive in the market compared to their book value. Companies are growth stocks with certain expectations of future capital gains that may not be possible in adverse market conditions.

Table 8. Results of the system-GMM.

Variables	(IV) (Model 4: Δ*lROA*) Coeff. (Robust Std. Err.)	(V) (Model 5: Δ*lROE*) Coeff. (Robust Std. Err.)	(VI) (Model 6: Δ*lPROF*) Coeff. (Robust Std. Err.)
L.ΔlROA	−0.065 (0.051)		
L.ΔlROE		−0.155 * (0.075)	
L.ΔlPROF			−0.055 (0.048)
Δ*lDFL*	−0.461 * (0.267)	−0.417 (0.251)	−0.385 (0.340)
Δ*lBMR*	−0.246 ** (0.090)	−0.296 *** (0.081)	−0.186 ** (0.077)
Δ*lGEAR*	−0.020 (0.036)	−0.007 (0.036)	−0.033 (0.036)
Δ*lAGE*	−0.031 (1.362)	0.289 (1.388)	0.472 (1.062)
Δ*lCASH*	−0.001 (0.016)	−0.005 (0.016)	0.002 (0.014)
Δ*lDIR*	−0.397 *** (0.085)	−0.389 *** (0.077)	−0.395 *** (0.086)
Δ*lLEV*	0.145 (0.236)	0.737 ** (0.271)	0.172 (0.226)
Δ*SIZE*	0.156 (0.168)	0.148 (0.176)	0.324 ** (0.152)
Δ*lTANG*	0.050 (0.074)	−0.003 (0.068)	0.072 (0.077)
Δ*lTURN*	−0.077 (0.070)	−0.092 (0.063)	−0.085 (0.069)
Constant	−0.052 (0.046)	−0.065 (0.046)	−0.066 (0.038)
F-stat.	14.330 ***	39.230 ***	10.130 ***
Hansen test	8.910	8.250	9.060
AR(2)	0.160	−0.610	−0.610
W_{MR}	3.810 **	6.280 ***	2.630 *

Note: see Table 7. *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

The significance of the Wald tests indicates that market risk has significant negative effects on the return on assets, the return on equity and the profit margin of these companies, respectively. Thus, these findings give support to hypotheses (H_1), (H_2) and (H_3), and the results are in line with those of Gatsi et al. (2013) and Muriithi et al. (2016), among others.

On average, the results of the various models suggest that the firm's size, the age of the company, the debt-to-assets ratio, the tangibility ratio, and the cash holdings ratio have a positive effect on the performance of the company in conformity with Al-Najjar (2014), Ilaboya and Ohiokha (2016), Detthamrong et al. (2017), Azadi (2013), Aiyegbusi and Enisan (2016). However, the debt-to-income ratio and the stock turnover hurt the performance of these non-financial firms, similarly to some previous studies (Fout et al. 2018; Raheman and Nasr 2007; Khan et al. 2016).

Our study contributes to the empirical literature by providing new insights into the effects of market risk on the performance of the non-financial firms listed in the Moroccan stock exchange. Few studies have considered such a survey in Morocco or elsewhere. Also, we utilized three alternative proxies of financial performance as well as three market risk indicators that have been used in previous studies. Finally, we employed several econometric techniques to validate our results: the pooled OLS model, the fixed effects model, the random effects model, the difference-GMM and the system-GMM models. Our findings suggest that market risk has significant adverse effects on a company's financial performance.

5. Conclusions and Recommendations

This study examined the effect of market risk on the performance of 31 non-financial companies listed on the Casablanca Stock Exchange (CSE) over the period 2000–2016. We utilized three alternative variables widely used in previous studies to assess financial performance, namely, return on assets, return on equity and profit margin. We also used the degree of financial leverage, the book-to-market ratio, and the gearing ratio as variables of market risk following earlier empirical studies. We then added seven control variables, including the firm age, the cash holdings ratio, the debt-to-income ratio, the debt-to-assets ratio, the firm size, the tangibility ratio, and the stock turnover.

First, we performed the panel unit root tests, we then employed the tests developed by Chow (1960), Hausman (1978) and Breusch and Pagan (1980) to select the best model among the pooled ordinary least squares model (POLS), the fixed effects (FE) model and the random effects (RE) model. The tests suggested that POLS was the most suitable model after correcting for autocorrelation and heteroscedasticity within firms with robust standard errors. Overall, the results showed that the indicators of market risk jointly had a significant adverse effect on the companies' financial performance, namely, the return on assets, the return on equity and the profit margin. The degree of financial leverage was the proxy for market risk that had the greatest and most significant effect on the profitability of the companies, followed by the book-to-market ratio and the gearing ratio.

Second, we performed additional robustness analyses by using the robust standards errors in Driscoll and Kraay (1998) which dealt with any cross-sectional dependence between firms. The results from the robustness analysis supported our previous findings.

Third, we further examined the relationship between market risk and financial performance with a dynamic framework. The results from the difference-GMM and the system-GMM models corroborated our findings, although the elasticities differed slightly from the previous results. These findings validated our three hypotheses that market risk had significant adverse effects on the return on assets (Hypothesis 1, H_1), the return on equity (Hypothesis 2, H_2) and the profit margin (Hypothesis 3, H_3) of the non-financial firms listed in the CSE. These findings are consistent with previous empirical studies by Gatsi et al. (2013) and Muriithi et al. (2016), among others. Most of the results of the different models suggested that the firm's age, the cash holdings ratio, the firm's size, the debt-to-assets ratio, and the tangibility ratio had a positive effect on financial performance, whereas the debt-to-income ratio and the stock turnover hurt the performance of these non-financial firms. Therefore, decision-makers and managers of these companies should mitigate market risk by using appropriate risk management strategies through derivatives, forwards, futures, swaps, options, and insurance as well as securitization techniques. The relatively small size of the sample and the priority given to non-financial firms due to the availability of data are the main limitations of this study. Future research could investigate the effects of other types of risks on financial performance by using several countries and an extended sample period. Finally, various econometric procedures such as cointegration and causality analysis could be used to assess the relationship between risk management and financial performance better.

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Appendix A

Table A1. Description of variables.

Variables	Symbol	Definition	Formula	Expected Sign	Empirical Studies
Dependent variable					
Return on assets	*ROA*	The ratio of a company's net income to the average of its total assets.	$ROA = \frac{Net\ income}{average\ of\ total\ assets}$	+	Yao et al. (2018)
Return on Equity	*ROE*	It is the ratio of the firm's net income to the average of its shareholders' equity.	$ROE = \frac{Net\ income}{average\ of\ total\ equity}$	+	(Muriithi et al. 2016)
Profit margin	*PROF*	The amount of net income (profits) earned with each dollar of sales realized.	$PROF = \frac{Net\ income}{Net\ sales}$	+	Yao et al. (2018)
Independent variables					
Market risk					
The degree of financial leverage	*DFL*	The ratio of earnings before interest and taxes (EBIT) to earnings before taxes	$DFL = \frac{EBIT}{(EBIT - Interest\ \exp enses)}$	-	Gatsi et al. (2013) Muriithi et al. (2016)
Book to market ratio	*BMR*	The book-to-market ratio is used to find the value of a company by comparing the book value of a firm to its market value.	$BMR = \frac{Book\ value}{Market\ value}$	-	Chen et al. (2005)
Gearing ratio	*GEAR*	It indicates a financial ratio that compares the borrowed funds to the owner's equity.	$GEAR = \frac{Total\ debts}{Equity}$	-	Linsley and Shrives (2006) Enekwe et al. (2014)

Table A1. *Cont.*

Variables	Symbol	Definition	Formula	Expected Sign	Empirical Studies
Control variables					
Firm Age	*AGE*	Difference between the last year of the study period and the firm's year of establishment	$AGE = Year_t - Establishment\ date$	+	Ilaboya and Ohiokha (2016)
Cash holdings ratio	*CASH*	Cash and Cash equivalents divided by total assets	$CASH = (\frac{Cash\ and\ cash\ equivalents}{Total\ assets})$	+	Akinyomi (2014) Aiyegbusi and Enisan (2016)
Debt to income ratio	*DIR*	The ratio of debt to income	$DIR = \frac{Debts}{Income}$	-	Demyanyk et al. (2011) Brown et al. (2015)
Debt-to-assets ratio	*LEV*	Total debts divided by total assets	$LEV = (\frac{Total\ debts}{Total\ assets})$	-	Le and Phan (2017) Amraoui et al. (2018)
Firm size	*SIZE*	The natural logarithm of total assets	$SIZE = Ln(Total\ assets)$	-	Goddard et al. (2005) Amraoui et al. (2018)
Tangibility ratio	*TANG*	Tangible fixed assets divided by total assets	$TANG = (\frac{Fixed\ assets}{Total\ assets})$	-	Vătavu (2015) Razaq and Akinlo (2017)
Turnover	*TURN*	Stock turnover	$TURN = \frac{Cost\ of\ sales}{Average\ stock}$	+	Salawati (2012) Nawaz et al. (2016)

Note: Data of *ROA*, *ROE*, *PROF*, *GEAR*, and *TURN* were readily available from Orbis and Osiris databases. The expected signs are based on the literature review and the correlation analysis between variables (see Table 2).

Table A2. List of selected non-financial companies listed in Morocco.

Number	Company Name	Establishment (Year)	Listing (Year)
01	DOUJA PROMOTION GROUPE ADDOHA SA	1988	2006
02	LYONNAISE DES EAUX DE CASABLANCA SA	1995	2005
03	CENTRALE DANONE SA	1959	1974
04	LABEL VIE SA	1985	2008
05	SOCIETE ALUMINIUM DU MAROC SA	1976	1998
06	CARTIER SAADA SA	1947	2006
07	IB MAROC.COM SA	1994	2001
08	SOCIETE MAGHREBINE DE MONETIQUE SA	1983	2011
09	STOKVIS NORD-AFRIQUE SA	1950	2007
10	MICRODATA SA	1991	2007
11	HIGH TECH PAYMENT SYSTEMS SA	1995	2006
12	FENIE BROSSETTE SA	1962	2006
13	DARI COUSPATE SA	1994	2005
14	COLORADO SA	1957	2006
15	COMPAGNIE DE TRANSPORTS AU MAROC SA	1919	1993
16	DELATTRE LEVIVIER MAROC SA	1959	2008
17	SOCIETE DE REALISATIONS MECANIQUES SA	1949	2006
18	MAGHREB OXYGENE SA	1977	1999
19	INVOLYS SA	1986	2006
20	STROC INDUSTRIE SA	1989	2008
21	SOCIETE NATIONALE D ELECTROLYSE ET DE PETROCHIMIE SA	1973	2007
22	SOCIETE DES BRASSERIES DU MAROC SA	1919	2002
23	DELTA HOLDING SA	1999	2008
24	SOCIETE NATIONALE DE SIDERURGIE SA	1984	1996
25	SOCIETE LESIEUR CRISTAL SA	1940	1972
26	SOCIETE AUTO-HALL SA	1920	1941
27	MANAGEM SA	1930	2007
28	LAFARGEHOLCIM MAROC SA	1981	1997
29	SOCIETE LES CIMENTS DU MAROC SA	1957	1969
30	SOCIETE ANONYME MAROCAINE DE L'INDUSTRIE DU RAFFINAGE SA	1959	1996
31	MAROC TELECOM SA	1998	2004

Note: By the authors using the financial statement databases of the companies from Orbis and Osiris.

Table A3. Hausman test between the fixed effects model and the random effects model (Model 1).

Variables	(b) FE	(B) RE	(b − B) Difference	Sqrt (diag(V_b − V_B)) S.E
Δ*lDFL*	−0.448 *** (0.108)	−0.381 *** (0.091)	−0.067	0.060
Δ*lBMR*	−0.246 *** (0.081)	−0.212 *** (0.070)	−0.034	0.041
Δ*lGEAR*	−0.062 ** (0.029)	−0.064 ** (0.027)	0.002	0.011
Δ*lAGE*	2.878 (3.193) −0.001	0.602 (1.021)	2.276	3.068
Δ*lCASH*	(0.021)	0.005 (0.019)	−0.006	0.009
Δ*lDIR*	−0.436 *** (0.047)	−0.404 *** (0.040)	−0.032	0.025
Δ*lLEV*	0.368 * (0.211)	0.231 (0.192)	0.137	0.092
Δ*SIZE*	0.076 (0.203)	0.184 (0.182)	−0.108	0.096
Δ*lTANG*	0.112 (0.090)	0.120 (0.083)	−0.008	0.037
Δ*lTURN*	−0.106 (0.084)	−0.078 (0.083)	−0.028	0.018
Constant	−0.138 (0.109)	−0.067 (0.042)		
R-squared	0.632	0.647		
F-stat./Wald chi2(10)	21.940 ***	245.590 ***		
Hausman test chi2(10)				[11.300]
Prob > chi2	-	-	-	0.334

Note: FE and RE represent the fixed effect model and the random effect model, respectively. The Hausman (1978) test helps to select the best model between the fixed effect model and the random effect model. The null hypothesis is that the random effect model is the most efficient and more appropriate than the fixed effect model. The numbers in parentheses and brackets are the standard errors and the statistics of Hausman tests, respectively. *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

Table A4. Hausman test between the fixed effects model and the random effects model (Model 2).

Variables	(b) FE	(B) RE	(b−B) Difference	Sqrt (diag(V_b−V_B)) S.E
Δ*lDFL*	−0.426 *** (0.109)	−0.308 *** (0.092)	−0.118	0.062
Δ*lBMR*	−0.231 *** (0.082)	−0.236 *** (0.071)	0.005	0.043
Δ*lGEAR*	−0.048 (0.029)	−0.050 * (0.027)	0.002	0.012
Δ*lAGE*	2.324 (3.247)	0.777 (1.011)	1.547	3.158
Δ*lCASH*	−0.003 (0.021)	0.002 (0.019)	−0.005	0.009
Δ*lDIR*	−0.396 *** (0.047)	−0.389 *** (0.041)	−0.007	0.026
Δ*lLEV*	0.895 *** (0.214)	0.812 *** (0.196)	0.082	0.097
Δ*SIZE*	0.093 (0.206)	0.167 (0.185)	−0.073	0.101
Δ*lTANG*	0.055 (0.092)	0.067 (0.085)	−0.012	0.040
Δ*lTURN*	−0.139 (0.086)	−0.097 (0.085)	−0.042	0.019
Constant	−0.124 (0.111)	−0.077 (0.042)		
R-squared	0.563	0.573		
F-stat./Wald chi2(10)	15.690 ***	177.750 ***		
Hausman test chi2(10)				[12.920]
Prob > chi2	-	-	-	0.228

Note: See Table A3.

Table A5. Hausman test between the fixed effects model and the random effects model (Model 3).

Variables	(b) FE	(B) RE	(b−B) Difference	Sqrt (diag(V_b−V_B)) S.E
Δ*lDFL*	−0.399 *** (0.105)	−0.299 *** (0.087)	−0.100	0.061
Δ*lBMR*	−0.195 ** (0.078)	−0.162 ** (0.067)	−0.032	0.043
Δ*lGEAR*	−0.070 ** (0.028)	−0.059 ** (0.026)	−0.011	0.012
Δ*lAGE*	−0.109 (3.108)	0.721 (0.873)	−0.830	3.032
Δ*lCASH*	0.012 (0.020)	0.008 (0.018)	0.004	0.009
Δ*lDIR*	−0.418 *** (0.045)	−0.390 *** (0.038)	−0.028	0.026
Δ*lLEV*	0.326 (0.205)	0.197 (0.183)	0.128	0.099
Δ*SIZE*	0.315 (0.198)	0.374 ** (0.172)	−0.058	0.103
Δ*lTANG*	0.148 * (0.088)	0.120 (0.079)	0.027	0.041
Δ*lTURN*	−0.110 (0.082)	−0.086 (0.081)	−0.024	0.020
Constant	−0.042 (0.106)	−0.071 ** (0.036)		
R-squared	0.623	0.629		
F-stat./Wald chi2(10)	20.710 ***	228.050 ***		
Hausman test chi2(10)				[13.080]
Prob > chi2	-	-	-	0.219

Note: See Table A3.

Appendix B

Table A6. Selection of the most appropriate estimator for the robustness analysis (Model 1).

Variables	Model 1: Δ*lROA*	Model 1: Δ*lROA*	Model 1: Δ*lROA*	Model 1: Δ*lROA*	Model 1: Δ*lROA*	Model 1: Δ*lROA*
	FE	RE	FE	RE	POLS	RE
Δ*lDFL*	−0.666 *** (0.088)	−0.691 *** (0.083)				
Δ*lBMR*			−0.307 *** (0.077)	−0.298 *** (0.070)		
Δ*lGEAR*					−0.054 (0.033)	−0.057 * (0.033)
Δ*lAGE*	0.575 (0.928)	0.476 (0.607)	4.988 (3.448)	1.166 (0.961)	0.357 (0.583)	0.349 (0.658)
Δ*lCASH*	−0.031 * (0.017)	−0.027 (0.016)	0.007 (0.020)	0.017 (0.019)	−0.036 * (0.019)	−0.037 * (0.019)
Δ*lDIR*	−0.376 *** (0.042)	−0.342 *** (0.039)	−0.509 *** (0.039)	−0.485 *** (0.037)	−0.462 *** (0.042)	−0.467 *** (0.042)
Δ*lLEV*	0.241 * (0.140)	0.123 (0.132)	0.085 (0.168)	0.015 (0.160)	0.355 ** (0.163)	0.385 ** (0.162)
Δ*SIZE*	0.294 ** (0.126)	0.331 *** (0.119)	0.208 (0.202)	0.319 * (0.176)	0.597 *** (0.125)	0.590 *** (0.124)
Δ*lTANG*	0.029 (0.072)	0.037 (0.066)	−0.103 (0.085)	−0.037 (0.077)	0.202 ** (0.077)	0.205 *** (0.077)
Δ*lTURN*	0.142 * (0.083)	0.156 * (0.081)	−0.053 (0.085)	−0.052 (0.083)	0.153 * (0.083)	0.148 * (0.082)
Constant	−0.065 (0.042)	−0.063 * (0.036)	−0.173 (0.109)	−0.058 (0.038)	−0.112 *** (0.034)	−0.119 *** (0.039)
R-squared	0.530	0.534	0.526	0.561	0.401	0.423

Table A6. *Cont.*

Variables	Model 1: Δ*lROA* FE	Model 1: Δ*lROA* RE	Model 1: Δ*lROA* FE	Model 1: Δ*lROA* RE	Model 1: Δ*lROA* POLS	Model 1: Δ*lROA* RE
F-stat./Wald	31.770 ***	262.740 ***	27.870 ***	245.360 ***	19.350 ***	159.920 ***
Chow test	1.26		0.94		2.13 ***	
LM test		0.47		0.00		0.00
Hausman test		9.71		8.50		[358.67 ***]
Conclusion		POLS		POLS		FE

Note: FE, RE, and POLS denote the fixed effects model, the random effects model and the pooled ordinary least squares, respectively. The Chow (1960) test determines the best model to choose between the pooled OLS model and the fixed effect model. The null hypothesis (H_0) assumes that the individual effect u_i is equal to zero, i.e., the pooled OLS model (POLS) is preferred, whereas the alternative hypothesis indicates that the fixed effects model is better. The LM test is the Breusch and Pagan (1980) Lagrangian multiplier examining whether random effects exist or not. The null hypothesis (H_0) assumes that the individual-specific error variance (Var(u)) is zero, i.e., the pooled OLS model (POLS) is preferred, whereas the alternative hypothesis indicates that the random effect model is the most suitable model to be chosen. The Hausman (1978) test helps to select the best model between the fixed effect model and the random effect model. The null hypothesis is that the random effect model is the most efficient and appropriate than the fixed effect model. The numbers in parentheses and brackets are the standard errors and the statistics of Hausman tests. *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

Table A7. Selection of the most appropriate estimator for the robustness analysis (Model 2).

Variables	Model 2: Δ*lROE* FE	Model 2: Δ*lROE* RE	Model 2: Δ*lROE* FE	Model 2: Δ*lROE* RE	Model 2: Δ*lROE* POLS	Model 2: Δ*lROE* RE
Δ*lDFL*	−0.670 *** (0.090)	−0.662 *** (0.085)				
Δ*lBMR*			−0.331 *** (0.077)	−0.322 *** (0.069)		
Δ*lGEAR*					−0.049 (0.034)	−0.053 (0.034)
Δ*lAGE*	0.260 (0.948)	0.348 (0.661)	3.355 (3.437)	1.168 (0.952)	0.290 (0.293)	0.227 (0.682)
Δ*lCASH*	−0.024 (0.017)	−0.017 (0.017)	0.008 (0.020)	0.016 (0.019)	−0.026 (0.019)	−0.027 (0.019)
Δ*lDIR*	−0.346 *** (0.043)	−0.337 *** (0.040)	−0.491 *** (0.039)	−0.473 *** (0.037)	−0.464 *** (0.043)	−0.470 *** (0.042)
Δ*lLEV*	0.781 *** (0.143)	0.744 *** (0.135)	0.581 *** (0.168)	0.540 *** (0.159)	1.037 *** (0.166)	1.065 *** (0.165)
Δ*SIZE*	0.309 ** (0.128)	0.309 ** (0.122)	0.255 (0.202)	0.340 * (0.175)	0.593 *** (0.127)	0.592 *** (0.126)
Δ*lTANG*	0.014 (0.073)	0.033 (0.068)	−0.154 * (0.084)	−0.079 (0.076)	0.204 ** (0.079)	0.208 *** (0.079)
Δ*lTURN*	0.135 (0.085)	0.138 * (0.083)	−0.064 (0.085)	−0.057 (0.082)	0.123 (0.084)	0.115 (0.084)
Constant	−0.052 (0.043)	−0.060 (0.040)	−0.123 (0.109)	−0.060 (0.037)	−0.105 *** (0.034)	−0.110 *** (0.041)
R-squared	0.490	0.491	0.509	0.524	0.412	0.412
F-stat./Wald	26.730 ***	224.160 ***	23.650 ***	211.320 ***	18.510 ***	152.290 ***
Chow test	1.36		0.85		1.65 **	
LM test		0.23		0.00		0.17
Hausman test		7.85		7.66		16.59 **
Conclusion		POLS		POLS		FE

Note: See Table A6.

Table A8. Selection of the most appropriate estimator for the robustness analysis (Model 3).

Variables	**Model 3: Δ*lPROF***	**Model 3: Δ*lPROF***	**Model 3: Δ*lPROF***	**Model 3: Δ*lPROF***	**Model 3: Δ*lPROF***	**Model 3: Δ*lPROF***
	POLS	**RE**	**FE**	**RE**	**POLS**	**RE**
Δ*lDFL*	−0.611 *** (0.077)	−0.614 *** (0.077)				
Δ*lBMR*			−0.288 *** (0.079)	−0.247 *** (0.071)		
Δ*lGEAR*					−0.032 (0.034)	−0.036 (0.033)
Δ*lAGE*	0.495 (0.506)	0.455 (0.616)	3.525 (3.541)	1.401 (0.976)	0.591 (0.590)	0.524 (0.668)
Δ*lCASH*	−0.012 (0.015)	−0.015 (0.015)	0.023 (0.020)	0.030 (0.020)	−0.012 (0.019)	−0.013 (0.019)
Δ*lDIR*	−0.314 *** (0.036)	−0.319 *** (0.036)	−0.474 *** (0.040)	−0.460 *** (0.038)	−0.438 *** (0.042)	−0.442 *** (0.042)
Δ*lLEV*	−0.052 (0.123)	−0.020 (0.121)	0.109 (0.173)	0.048 (0.163)	0.206 (0.165)	0.238 (0.164)
Δ*SIZE*	0.533 *** (0.110)	0.531 *** (0.110)	0.319 (0.208)	0.387 ** (0.179)	0.712 *** (0.126)	0.707 *** (0.126)
Δ*lTANG*	0.031 (0.061)	0.017 (0.061)	−0.082 (0.087)	−0.045 (0.078)	0.156 ** (0.078)	0.162 ** (0.079)
Δ*lTURN*	0.021 (0.029)	0.023 (0.074)	−0.320 *** (0.088)	−0.330 *** (0.084)	−0.128 (0.084)	−0.127 (0.083)
Constant	−0067 ** (0.029)	−0.069 * (0.038)	−0.144 (0.112)	−0.079 ** (0.038)	−0.124 *** (0.034)	−0.130 *** (0.040)
R-squared	0.529	0.529	0.511	0.523	0.378	0.378
F-stat./Wald	31.830 ***	264.480 ***	23.170 ***	211.070 ***	16.060 ***	131.130 ***
Chow test	1.74 **		0.78		2.38 ***	
LM test		0.14		0.00		0.05
Hausman test		14.32 *		6.21		31.10 ***
Conclusion		FE		POLS		FE

Note: see Table A6.

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