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# Analysis of Risk Factors Affecting Firms' Financial Performance—Support for Managerial Decision-Making

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**Abstract:** This paper aims to investigate how financial variables and exogenous crises influence firms' financial performance, and how these factors may help managers in decision-making to increase their firm's wealth. The dynamic interactions among variables were studied by applying a panel vector autoregressive model using annual data for a sample of non-financial firms from European countries. Results indicate that liquidity, leverage and productivity positively affect firm performance, while solvency and asset turnover are positive and statistically significant only in the case of return on equity. Labour productivity induces that firms tend to display larger efforts to keep financial performance in face of a crisis, considering that the crisis reveals a negative statistical impact over return on assets.

**Keywords:** financial performance; return; leverage; liquidity; labour productivity; asset turnover; large companies

## 1. Introduction

The high financial performance of firms is attractive for investors in their investment decisions, managers in their financial decisions and creditors in substantiating their funding decisions. Profits are the main goal of every company and shareholder's desire for wealth maximization. As such, the profit and the performance of businesses is a growing concern since their existence and survival are dependent on profits. Financial ratios end up helping investors, managers, financial institutions and other users of financial statements to better understand and gauge the performance of a company, in order to ensure the continuing performance of firms and aid in decision-making for investments or funding. Thus, these decisions are dependent on the quality of the financial statements [1]. Also, not only endogenous variables, like financial ratios calculated using accounting data, but also other relevant exogenous factors are able to explain firm performance or swaying financial ratios, usually indicative of a crisis.

Financial performance is usually measured through return on assets [2–5] and return on equity [6–8]. Financial performance has been stated in the literature as being affected by certain factors such as liquidity, ownership, age and size [9]. Also, other factors may affect financial performance, such as leverage, productivity, solvency and assets turnover, and these may change in the face of a crisis.

A financial crisis causes imbalance over the economy and affects the business environment. By spreading to other countries, companies' financial conditions and performance are affected at a micro level. Thus, this paper intends to analyse some factors that influence financial performance using two

different financial performance measures—return on assets (ROA) and return on equity (ROE)—and to reflect on different model specification effects, considering the financial crisis period of 2007–2009. Economists consider the financial crisis as the worst after Great Depression in the 1930s. A rise in unemployment rates, decline in capital markets and recession in the real estate market were observed in many countries of the world, and European countries were no exception. The mortgage loan crisis began in 2006 in the United States and quickly spread to banking networks of the US and European large-credit institutions [10].

In addition to accounting for different factors able to affect financial performance, this paper intends to observe which factors change influence in face of a financial crisis. For this, two financial measures were used, considering a set of companies acting in European countries. It is important to mention that most previous studies used only one country to highlight the financial performance impacts, even when the crisis period was analysed. Moreover, most of the previous studies did not analyse the dynamic interactions among variables that make them able to be analysed as both explanatory variables and explained variables. For example, while it is true that leverage and liquidity affect financial performance, it is also true that it works the other way around. For this issue we used panel vector autoregressive data estimation for the period 2006–2015. We ran two panel vector auto-regression models to examine empirically the interaction between company performance measures and both financial and non-financial factors related to crisis effects. The results are important for investors, managers and academics as knowledge about variables, factors and mutual influences that allow for better forecasts as well as short- and medium-term strategies applied by managers in order to increase firm performance.

The present article distinguishes from previous studies in the following ways:

(i) By dealing with a large financial data set large companies from European countries (28 countries) that work in a variety of sectors, except for financial sector, this study highlights the main trends at the level of a large amount of data and the results may be applied in any country included in the sample.

(ii) Reliable results were achieved by analysing financial variables selected and calculated based on standardized financial information provided by Amadeus database.

(iii) By using a complex economic, statistic and econometric analysis, this research can be applied everywhere in the world, for diverse sectors of activity, for different countries (developed or emerging), for various company sizes (large or small) and for diverse crisis periods specific to other countries or regions.

(iv) This study uses a large number of observations from European countries, developed countries and emerging countries. The sample includes firms acting in all sectors of activity, except the financial sector, while the majority of studies related to company performance assessing were conducted to individual sectors such as: iron and steel industry [11], agriculture [12,13], transportation [12,14,15], manufacturing [16], retail [17], banking [18,19], insurance [20,21] and the hotel industry [22].

(v) We included as an exogenous dummy variable, the crisis, to assess the effects of the financial and economic crisis felt by European countries during 2007 and 2009 mostly and highlighted how the variables studied change during a crisis. By using the dummy variables for the crisis, we show that the results can be generalized and applied to any context. The results indicate that under a crisis, if we use ROA or ROE as performance measures, companies reduce assets turnover and labour productivity because of a reduced turnover. The reduction in turnover appears as a result of loss of customers which reduces the amount of markets shares as determined by: the period of trade credit offered, the activity or interruptions in activity, production costs, lack of liquidities to business partners, insolvency of business partners, etc.

(vi) Through economic analysis we present the results of econometric analysis into concrete actions and measures that managers can take to ensure future improvement of their economic and financial performance, and investors can make decisions to invest in such firms or sectors.

(vii) By using panel vector auto-regression (VAR) we identify and validate the main influence factors of performance and relations between them and the dependent variables. The model presented

allows a regression-type relation which can be also used for future forecasting of ROA and ROE. Using panel VAR models is useful and justified by increasing the number of panel data studies for three main reasons: growing data availability evidenced by Hsiao [23]; the higher capability for modelling the complex behaviour than usual cross-section or time-series models; and by being a challenging methodology that allows interactions. By using panel VAR specifications, the methodology may explicitly allow the endogenous variable to depend on lags of itself, of lags of other explanatory variables as well as relevant explanatory variables (in an endogenous and exogenous way), thus capturing all sorts of dynamic or static dependencies between observations or the existence of heterogeneity in coefficients on the variables of different observations. Also, the endogeneity concerns are eliminated whether panel VAR provides an autoregressive structure. Moreover, the methodology also allows exercises involving multiple-period projections in the future, through forecast error variance decompositions and/or impulse responses.

The rest of the paper is organised as follows: in Section 2, a literature review on factors influencing financial performance is presented and hypotheses are developed. The data and methodology are presented in Section 3. The paper then follows with analysis and results in Section 4. Concluding remarks pointing out some policy implications, future research suggestions and limitations of the study are discussed in Section 5.

## 2. Literature Review and Analysis of Interactions between Factors

The relationship between firms' financial performance and the factors influencing it is a widely studied topic in the literature, which uses diverse variables and research methods. For instance, Sena [24] used a sample of firms belonging to Italian manufacturing and found that restriction in the availability of financial resources can positively affect profitability. Hrovatin and Ursic [25] examined the influence of insider ownership, ownership by the state and municipalities, market share and the share of exports on company performance of Slovenian industrial companies after their ownership transformation, the main result being that insider ownership enhances performance. Karabag and Berggren [26] analysed the impact of firm strategy and industry structure as well as business group membership and state support on firm performance in Turkey, using a data set compiled from the largest manufacturing firms. Their results highlighted that industry structure and business group membership are the strongest determinants of firm performance. Ibhagui and Olokoyo [27] analysed whether an optimal firm size exists for which leverage is not negatively related to firm performance, by using a panel data of listed firms in Nigeria. Their results showed that the negative effect of leverage on firm performance is the most eminent and significant for small-sized firms and that the evidence of a negative effect diminishes as a firm grows.

In this article we analyse the factors able to influence financial performance (ROA and ROE) in firms among 28 countries in the European Union, considering the crisis period effect. We identified numerous risk factors able to affect asset values and firms' financial performance, but in this paper, we selected the following factors: leverage, liquidity, solvency, asset turnover, borrowed capital repayment and labour productivity, as representing indicators that usually are affected by a financial crisis.

Liquidity is a factor which plays an important role in the valuation of financial performance. It may be interpreted as the degree to which an asset can be converted into cash, depending on the asset demand and supply. Liquidity risk is also one of the major causes of a financial crisis and should thus be considered as an important factor in financial performance. For example, using linear regression, Zygmunt [28] concluded that liquidity impacts profitability. Moreover, liquidity and profitability are closely linked with each other, since when one upturns the other declines [29]. Every company wants to sustain adequate liquidity as liquidity impressively affects profits of the firm out of which some portion is divided among shareholders. Liquidity affects not only profitability but also has an impact on solvency and leverage [7].

In the literature we found opposite results with respect to the impact of liquidity over financial performance. Eljelly [30] examined the relation between profitability and liquidity using correlation and

regression analysis and found a negative relationship between profitability and liquidity measured as a current ratio. Another significant negative relationship between companies' liquidity and profitability was found by Raheman and Nasr [31]. Saleem and Rehman [29] applied a linear regression model to examine the relationship between liquidity and profitability, and the empirical results confirmed that there is a significant control of liquid ratio on ROA whereas there is an insignificant effect on ROE. Also, Saluja and Kumar [32] claimed that there is a negative relationship between profitability and liquidity, explaining that there is a need to uphold equilibrium between these dimensions; when firm tries to maximize the profitability, its ability to meet obligations declines.

Otherwise, using multiple regression and Pearson correlations to explore the effect of liquidity on profitability, Bhunia et al. [33] indicated that a significantly positive relationship exists between liquidity variables and the profitability of a firm. Using a regression model to probe the impact of liquidity upon profitability, Holz [34] also found that liquidity has a positive impact upon profitability, claiming that endogenous factors are controlled. The study of Khidmat and Rehman [35] which was applied on Pakistani companies, found that liquidity had a positive and significant impact on profitability measured by ROA. Since Europe was first affected by the financial crisis we expect to see a significantly impactful relationship between liquidity and performance.

The asset turnover ratio is a measure of how efficiently a company's assets generate revenue. In general, a low asset turnover ratio suggests problems with excess production capacity, poor inventory management or weak collection methods of debtors. Increases in the asset turnover ratio over time may indicate that the company registers an increasing evolution and a high profitability, while a decreasing ratio may indicate the opposite. The asset turnover ratio has a strongly significant and positive impact on the ROE [7]. Also, firms with high labour productivity are more performant. Thus, we are expecting a positive relationship between profitability and both asset turnover and labour productivity.

According to Aminu [36], stable growth and survival of a firm are linked with maintenance of an appropriate balance between liquidity and profitability in compliance with a firm's strategies and core objectives. Solvency and liquidity are two concepts that are closely related and reflect upon the actions of a company's working capital policy [37]. A low liquidity level may lead to increasing financial costs and result in the business being incapable of paying its obligations [38]. Thus, the optimal level for liquidity would be obtained by a trade-off between the low return of current assets and the benefit of minimizing the need for external finance [39].

Leary and Roberts [40] claimed that peers' capital structure is highly relevant for firm financial decisions, especially for small and less successful firms. A positive relationship exists between both leverage and firm performance [41], since the higher the leverage the more in-depth the control undertaken by lenders [42,43]. This means that a lower equity ratio is associated with high profit efficiency [44]. Using a sample of US firms, Roden and Lewellen [45] found a positive relationship between profitability and leverage, as well as Nunkoo and Boateng [46] for Canadian listed firms, while Gill and Mathur [47] found the same relation only for Canadian service firms.

Myers and Majluf [48] presented the pecking order theory which states that companies prefer to use their internal sources of financing for equity financing. If internal financing does not meet the needs of the company, the firm uses external financing; first companies apply for a bank loan, then for public debts, and as a last resort, equity financing. The profitable firms are less likely to opt for debt for new projects because they have the available funds in the form of retained earnings [49]. It means that firms with low financial leverage should have a high performance [50]. This means that equity improves the performance, especially during crises [51] and is in line with Demirguc-Kunt and Huizinga [52] who found a positive relationship between equity and profitability, explained mainly by the reduction in the cost of funding.

By multiple regression analysis, Thippayana [53] highlighted that debt ratio has a significant negative relationship with the level of profitability, after controlling for industry, showing that companies with high profitability issue less debt; this is in agreement with Agrawal and Knoeber [43]. Through correlation analysis, Biger et al. [54] found that financial leverage in Vietnamese firms

decreases with profitability. Similar results were found: in a study by Al-Qaisi [55] which collected data from United Arab Emirates; Majumdar and Chhibber [56] who used data from Indian firms; Nguyen and Neelakantan [57] who used data collected by the International Finance Corporation (IFC) from 10 developing countries; Huang and Song [58] and Chen [59] who used Chinese companies; Gill and Mathur [47] for manufacturing firms; Nguyen et al. [60] for Vietnamese listed firms; and Nawaz et al. [5] for Pakistani firms.

Using the panel vector auto-regression with generalized method of moment (GMM) framework, based on impulse response factors (IRF) and forecast error variance decomposition (FEVD) applied on 412 French financial institutions, Jouida [61] found an inverse bidirectional causal relationship between profitability and debt level and a shock to leverage decreased the profitability of the financial sector. We used in our paper the same methodology but applied it to over 10,000 large companies across all sectors of activity, except the financial sector, from 28 European countries.

Hirigoyen [62] assured that both profitability and solvency are necessary conditions for the healthy existence of a company and both are conditioned by the strategy adopted in the medium and long-term. Also, the study of Khidmat and Rehman [35] found that solvency had a negative significant impact on ROA and ROE.

Finally, related to the relationship between crisis and financial performance ratios and using the analytical hierarchy process, Seilsepoor and Ahmadi [10] showed that profitability ratio, leverage ratio, liquidity ratio and activity ratio are the main indexes with respect to the impact of the financial crisis in 2007. They found that return on asset, return on equity, current ratio, the leverage ratio and asset turnover ratio were more affected by the financial crisis. So, we are expecting that the crisis will change the effects of variables on financial performance.

## 3. Data Description and Methodology

### *3.1. Data and Variables Description*

The source of the data is the Amadeus database, provided by Bureau van Dijk Electronics. There we selected large non-financial companies from 28 European countries and from various sectors for the period 2006–2015. In this paper, the selection criteria for large companies were proposed starting from the classification of the small and medium enterprises (SMEs) that is published in the Commission Recommendation of 6 May 2003 [63] concerning the definition of micro, small and medium-sized enterprises. Thus, the criteria used for selection of large companies were: number of employees greater than 250, total assets greater than €43 million and turnover greater than €50 million. These criteria were applied simultaneously for the data available for the year 2015. We found 22,581 active companies. We did not consider small and medium enterprises (SMEs) due to the fluctuations over time in foundation and closing of these firms compared to large companies.

Even in the case of large companies, because of some data missing, we deleted data for years and companies that did not have available information used for the calculation of selected variables. Also, inconclusive values and outliers were eliminated from the database. Thus, 106,510 valid year-observations remained in the study. We organized the data as a panel and we have an unbalanced panel. Variables selected for study are described in Table 1.

The data descriptive statistical analysis and correlation values are presented in Tables 2 and 3. As reported in Table 2, the average ROE (13.9%) is higher than average ROA (7.4%), which shows the positive effect of leverage on ROE (ROE increases when leverage increases) due to a higher ROA than average interest rate. Firms are on average performant and registered with a high solvency (2.07) which means that firms use on average 50% equity and 50% debts for funding, a high liquidity of assets (1.27) with favourable values showing some difficulties in cashing receivables, and a reasonable asset turnover (1.55) which show that firms have the capacity to pay debts.

**Table 1.** Variables' description.

| Description | Abbreviation | Calculation |
|---|---|---|
| Return on equity (%) | ROE | Net income/shareholder funds |
| Rate on assets (%) | ROA | EBIT (Earnings before Interest and Taxes)/total assets |
| Financial leverage (%) | Fin. Lev. | Total liabilities/shareholder funds |
| Liquidity ratio | Liquidity | (Current assets—inventories)/current liabilities |
| Total solvency ratio | Solvency | Total assets/total liabilities |
| Asset turnover ratio | Ass. Turn. | Turnover/total assets |
| Borrowed capital repayment ratio | Cap. Repay. | Financial long-term debts/self-financing capacity [1] |
| Labour productivity (ThEur/employee) | Labour Prod. | (Turnover/1000)/number of employees |
| Crisis | Crisis | Dummy: 2006 and 2010–2015 = 0 and 2007–2009 = 1 |

Note: [1] self-financing capacity = net income + depreciation and amortization. Source: Amadeus database (Bureau van Dijk Electronics); some calculations were done by the authors.

**Table 2.** Descriptive statistics.

| Variable | Obs. | Mean | Std. Dev | Min | Max |
|---|---|---|---|---|---|
| ROE | 106510 | 0.139 | 0.216 | −1.000 | 1.000 |
| ROA | 106510 | 0.074 | 0.094 | −0.901 | 0.975 |
| Fin. Lev. | 106510 | 2.068 | 1.838 | −2.998 | 9.999 |
| Liquidity | 106510 | 1.272 | 0.853 | 0.000 | 4.998 |
| Solvency | 106510 | 2.067 | 1.139 | 0.660 | 9.970 |
| Ass. Turn. | 106510 | 1.549 | 1.013 | 0.010 | 9.924 |
| Cap. Repay. | 106510 | 0.734 | 1.254 | −5.000 | 5.000 |
| Labour Prod. | 106510 | 0.398 | 0.635 | 0.000 | 9.986 |
| Crisis | 106510 | 0.268 | 0.443 | 0.000 | 1.000 |

Source: authors' elaboration based on data from Amadeus database.

**Table 3.** Pearson correlation coefficients for all firms.

| | ROE | ROA | Fin. Lev. | Liquidity | Solvency | Ass. Turn. | Cap. Repay. | Labour Prod. | Crisis |
|---|---|---|---|---|---|---|---|---|---|
| ROE | 1 | | | | | | | | |
| ROA | 0.701 | 1 | | | | | | | |
| Fin. Lev. | 0.091 | −0.136 | 1 | | | | | | |
| Liquidity | 0.044 | 0.154 | −0.335 | 1 | | | | | |
| Solvency | −0.091 | 0.071 | −0.576 | 0.492 | 1 | | | | |
| Ass. Turn. | 0.163 | 0.158 | 0.212 | −0.112 | −0.247 | 1 | | | |
| Cap. Repay. | 0.005 | −0.076 | 0.096 | −0.092 | −0.167 | −0.126 | 1 | | |
| Labour Prod. | 0.036 | 0.017 | 0.079 | −0.046 | −0.074 | 0.239 | −0.021 | 1 | |
| Crisis | 0.014 | 0.007 | 0.029 | −0.015 | −0.034 | 0.026 | 0.002 | −0.004 | 1 |

Source: authors' elaboration based on data from Amadeus database.

Also, a high correlation between the two financial performance measures as well as a negative correlation between solvency and all other variables except ROA and liquidity, were observed in Table 3. ROE was only negatively correlated with solvency while ROA was with financial leverage (Fin. Lev.) and borrowed capital repayment ratio (Cap. Repay.). The correlation between crisis and liquidity, and solvency and labour productivity (Labour Prod.) is negative, but positive with respect to ROA and ROE.

### *3.2. The Model*

We started analysing our dependent variables, respectively ROA and ROE, regressed using: Fin. Lev.—financial leverage; liquidity—liquidity ratio; solvency—solvency ratio; Ass. Turn.—assets turnover ratio; Cap. Repay.—capital repayment ratio; Labour Prod.—labour productivity; and exogenous crisis—dummy crisis. Our goal was to find the effects each of them exerted, such as whether crises influenced ROA and ROE, and if the crisis changes the factors effect over financial performance.

Panel vector auto-regression (VAR) models have been increasingly used in applied research [64,65]. All variables in a VAR system can be treated as endogenous. To present the model, we considered a k-variate homogeneous panel VAR of p order with panel-specific fixed effects represented by the following system of linear equations:

$$Y_{it} = Y_{it-1}A_1 + Y_{it-2}A_2 + \ldots + Y_{it-p+1}A_{p-1} + Y_{it-p}A_p + X_{it}B + u_i + e_{it} \quad i \in (1,2,\ldots,N),\ t \in (1,2,\ldots,T_i) \tag{1}$$

where $Y_{it}$ is a $(1 \times k)$ vector of dependent variables; $X_{it}$ is a $(1 \times l)$ vector of exogenous covariates; $u_i$ and $e_{it}$ are $(1 \times k)$ vectors of dependent variable-specific panel fixed-effects, respectively of idiosyncratic errors. The $(k \times k)$ matrices $A_1$, $A_2$, … $A_{p-1}$, $A_p$ and the $(l \times k)$ matrix B are parameters to be estimated. The same as Abrigo and Love [64], we assumed that the innovations have the following characteristics: $E[e_{it}] = 0$, $E[e'_{it}e_{it}] = \Sigma$ and $E[e'_{it}e_{is}] = 0$ for all $t > s$.

In the first model, the variables accounted for were: ROA, Fin. Lev., liquidity, solvency, Ass. Turn., Cap. Repay., Labour Prod. and a dummy exogenous crisis. For robustness check and to see whether results remain basically the same with different measurements, using a different company performances' typical measure, we ran a second panel VAR model with all the previous variables, except for ROA, which has been substituted by ROE. As such, four panel VAR models have been estimated using those seven and eight variables in their presented order. The first two models account only for the first seven variables and exclude the crisis. The last two models account for crisis exogenous effect in terms of robustness check.

Panel VAR analysis (PVAR) was predicated upon choosing the optimal lag order in both panel VAR specification and moment condition, which in this case revealed to be one. Without loss of generality, the exogenous variables were dropped in our notation and were focused on the autoregressive structure of the panel VAR in Equation (1). This paper followed and used the codes provided by Abrigo and Love [64]. PVAR estimated panel vector auto-regression models fitting a multivariate panel regression of each dependent variable on lags of itself, lags of all other dependent variables and exogenous variables, if any. The estimation was done using the generalized method of moments (GMM).

## 4. Analysis and Results Discussion

In this section, the results obtained by PVAR estimations for both financial performance measures are presented and analysed. Table 4 presents the data coefficients and statistical significance attained considering all firms in the sample and excluding the exogenous crisis effect.

**Table 4.** Panel vector auto-regression (VAR) estimations using ROA excluding crisis.

| | | Dependent | ROA | Fin. Lev. | Liquidity | Solvency | Ass. Turn. | Cap. Repay. | Labour Prod. |
|---|---|---|---|---|---|---|---|---|---|
| Indep.-lagged 1 | ROA | coef. | 0.519 | −0.575 | −0.333 | −0.263 | 0.119 | −0.294 | 0.020 |
| | | z | 35.19 *** | −4.27 *** | −2.92 *** | −2.20 ** | 1.96 * | −2.90 *** | 0.54 |
| | Fin. Lev. | coef. | 0.004 | 0.578 | −0.027 | −0.032 | 0.024 | 0.024 | −0.011 |
| | | z | 4.78 *** | 35.73 *** | −3.51 *** | −4.00 *** | 4.90 *** | 2.02 ** | −3.69 *** |
| | Liquidity | coef. | 0.006 | −0.018 | 0.555 | −0.002 | 0.008 | 0.001 | 0.007 |
| | | z | 3.10 *** | −0.86 | 24.98 *** | −0.08 | 0.98 | 0.03 | 1.07 |
| | Solvency | coef. | −0.004 | −0.005 | 0.028 | 0.646 | −0.050 | −0.068 | −0.031 |
| | | z | −1.47 | −0.17 | 1.01 | 18.52 *** | −4.24 *** | −1.95 * | −3.00 *** |
| | Ass. Turn. | coef. | 0.005 | 0.007 | −0.020 | −0.046 | 0.504 | −0.015 | −0.091 |
| | | z | 1.56 | 0.15 | −0.73 | −1.73 * | 18.98 *** | −0.40 | −6.63 *** |
| | Cap. Repay. | coef. | −0.001 | 0.037 | −0.022 | −0.028 | −0.008 | 0.355 | −0.007 |
| | | z | −1.04 | 4.54 *** | −4.46 *** | −5.78 *** | −2.76 *** | 25.92 *** | −3.48 *** |
| | Labour Prod. | coef. | 0.009 | 0.352 | 0.211 | 0.098 | 0.063 | 0.052 | 0.738 |
| | | z | 2.41 ** | 5.43 *** | 5.29 *** | 2.60 *** | 2.04 ** | 0.98 | 20.60 *** |

Source: authors' elaboration based on data from Amadeus database; Level of significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The results show that ROA is positively and significantly influenced by lagged ROA, Fin. Lev., liquidity and Labour Prod. The positive relationship between ROA and Fin. Lev. is also sustained by Chang and Dasgupta [66], who explained that more profitable firms should have more reason to take advantage of the interest tax shield and increase leverage. The explanation is that more profitable firms are also likely to have greater debt capacity, according to the agency theory that states since agency costs increase with free cash flow [49], profitable firms should be more levered to alleviate these costs. More than that, when ROA is higher than interest rate, the company may increase banking loans, that are easy to get when the company has a low insolvency risk, thus explaining the low interest rate. Also, Berger and diPatti [44] showed that higher leverage is significantly associated with higher profit efficiency.

When crisis is included (Table 5), Ass. Turn. gains significance, whereas Labour Prod. loses significance and crisis exerts a negative statistical influence. Liquidity also has a negative significant influence over Fin. Lev. when accounting for crisis and is lost when we do not include the crisis into estimations. This relation between liquidity and Fin. Lev. is similar to that of Khan et al. [7] and highlights that when crisis is present, a high degree of debts reduces firms' liquidities, because of interest payments and loans repayments, considering that loans are more expensive in the crisis periods. The inverse influence is explained by the lack of liquidities that may lead to the increase in debts needed for developing operating activities by firms.

**Table 5.** Panel VAR estimations using ROA including crisis.

| | | Dependent | ROA | Fin. Lev. | Liquidity | Solvency | Ass. Turn. | Cap. Repay. | Labour Prod. |
|---|---|---|---|---|---|---|---|---|---|
| Indep.-lagged 1 | ROA | coef. | 0.536 | −0.484 | −0.345 | −0.273 | 0.238 | −0.332 | 0.112 |
| | | z | 31.75 *** | −3.82 *** | −2.86 *** | −2.18 ** | 3.31 *** | −2.99 *** | 3.07 *** |
| | Fin. Lev. | coef. | 0.006 | 0.571 | −0.036 | −0.031 | 0.039 | 0.025 | 0.008 |
| | | z | 7.25 *** | 37.88 *** | −5.87 *** | −4.85 *** | 7.90 *** | 2.42 ** | 3.16 *** |
| | Liquidity | coef. | 0.006 | −0.040 | 0.548 | 0.005 | 0.011 | 0.006 | 0.010 |
| | | z | 3.04 *** | −1.98 ** | 25.13 *** | 0.23 | 1.27 | 0.27 | 1.53 |
| | Solvency | coef. | 0.000 | −0.031 | −0.008 | 0.620 | −0.015 | −0.067 | 0.012 |
| | | z | −0.05 | −1.35 | −0.36 | 19.86 *** | −1.32 | −2.38 ** | 1.46 |
| | Ass. Turn. | coef. | 0.010 | −0.013 | −0.042 | −0.030 | 0.551 | −0.007 | −0.020 |
| | | z | 2.84 *** | −0.27 | −1.60 | −1.16 | 19.62 *** | −0.18 | −1.41 |
| | Cap. Repay. | coef. | 0.000 | 0.035 | −0.026 | −0.029 | −0.001 | 0.353 | 0.000 |
| | | z | 0.70 | 4.29 *** | −5.37 *** | −6.17 *** | −0.19 | 27.46 *** | 0.09 |
| | Labour Prod. | coef. | 0.007 | 0.339 | 0.209 | 0.098 | 0.050 | 0.057 | 0.683 |
| | | z | 1.65 | 5.23 *** | 5.07 *** | 2.56 ** | 1.54 | 1.06 | 17.54 *** |
| | Exog. Crisis | coef. | −0.002 | −0.007 | 0.002 | −0.010 | −0.019 | 0.000 | −0.023 |
| | | z | −3.76 *** | −1.01 | 0.44 | −1.58 | −6.13 *** | −0.05 | −10.31 *** |

Source: authors' elaboration based on data from Amadeus database; Level of significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Moreover, lagged ROA has positive significant effects over Labour Prod. only when we account for crisis. Usually in crisis periods, labour productivity decreases especially due to the reduction of the firm turnover, and at the same time determines decreasing of ROA. Fin. Lev. has a positive significant impact over Labour Prod. when crisis is accounted for and is negative when crisis is not included. The positive relation between Fin. Lev. and Labour Prod. is explained by the contracting of loans for investments (due to the lack of liquidities in crisis periods) in order to increase turnover that determines the increase in Labour Prod. This relation may be explained also by the increasing of the period of trade credit offered in order to increase turnover, and implicitly Labour Prod., but cashing later the receivables determines the accumulation of debts that cannot be paid in time, determining the increase of Fin. Lev. Crisis also has a negative influence over Ass. Turn. and Labour Prod., this influence being explained by the natural reduction of turnover in the period of crisis.

By comparison (see Table 6), higher significant impacts were attained when the performance measure used is ROE, but exogenous crisis only seems to be relevant considering Ass. Turn. and Labour Prod., also having a negative effect as in the case of ROA.

**Table 6.** Panel VAR estimations using ROE excluding crisis.

| | | Dependent | ROE | Fin. Lev. | Liquidity | Solvency | Ass. Turn. | Cap. Repay. | Labour Prod. |
|---|---|---|---|---|---|---|---|---|---|
| Indep.-lagged 1 | ROE | coef. | 0.292 | −0.192 | −0.076 | −0.067 | 0.045 | −0.048 | 0.017 |
| | | z | 29.43 *** | −3.56 *** | −2.88 *** | −2.43 ** | 2.40 ** | −1.28 | 1.74 * |
| | Fin. Lev. | coef. | 0.032 | 0.590 | −0.023 | −0.028 | 0.021 | 0.024 | −0.012 |
| | | z | 12.54 *** | 35.63 *** | −3.15 *** | −3.80 *** | 4.22 *** | 1.93 * | −3.99 *** |
| | Liquidity | coef. | 0.022 | −0.014 | 0.550 | −0.006 | 0.009 | −0.004 | 0.005 |
| | | z | 5.24 *** | −0.64 | 26.08 *** | −0.28 | 1.05 | −0.17 | 0.84 |
| | Solvency | coef. | 0.029 | 0.002 | 0.014 | 0.634 | −0.050 | −0.075 | −0.034 |
| | | z | 4.44 *** | 0.07 | 0.52 | 19.04 *** | −4.11 *** | −2.09 ** | −3.19 *** |
| | Ass. Turn. | coef. | 0.058 | −0.021 | −0.049 | −0.068 | 0.495 | −0.042 | −0.107 |
| | | z | 6.97 *** | −0.47 | −2.00 ** | −2.75 *** | 18.95 *** | −1.10 | −8.28 *** |
| | Cap. Repay. | coef. | 0.001 | 0.041 | −0.021 | −0.027 | −0.009 | 0.355 | −0.008 |
| | | z | 0.64 | 4.98 *** | −4.53 *** | −5.85 *** | −3.25 *** | 26.12 *** | −3.80 *** |
| | Labour Prod. | coef. | 0.036 | 0.579 | 0.385 | 0.232 | 0.018 | 0.112 | 0.737 |
| | | z | 3.94 *** | 8.19 *** | 8.41 *** | 5.61 *** | 0.57 | 2.09 ** | 20.41 *** |

Source: authors' elaboration based on data from Amadeus database; Level of significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Lagged ROA affects all other variables with significance except Labour Prod., whereas lagged ROE does not seem to influence Cap. Repay., but positively impacts Labour Prod. All variables are significantly affected by Fin. Lev. independently of the performance measure used (ROA or ROE). Using both ROA and ROE, lagged liquidity seems to exert a positive statistically significant impact over ROA, ROE and liquidity. This positive relationship between liquidity and profitability was also found by Holz [34], Kurawa and Abubaker [4] and Khidmat and Rehman [35]. However, financial performance exerts a negative influence over liquidity favouring the results of Dahiyat [2] especially with respect to ROA.

Solvency is more important when considering ROE since it exerts a statistical positive influence contradicting the negative relationship found by Khidmat and Rehman [35]. Our results even confirm those of Dahiyat [2] which found no impact between solvency and profitability using ROA as the performance measure.

On the other hand, lagged Ass. Turn. is more important and statistically significant when ROE is used, revealing a negative impact over all variables except on ROE and Ass. Turn. These impacts are still present when we account for exogenous crisis with lower revealed coefficient values.

With respect to Cap. Repay., it loses significance over Ass. Turn. and Labour Prod. whenever crisis is included, keeping its non-statistical significance influence over ROE or ROA independently of the crisis effect. Thus, Cap. Repay. is not the best variable to explain financial performance. The opposite happens with Labour Prod., being statistically significant to explain performance using ROE and crisis, but it is never significant over Ass. Turn. except when considering ROA and excluding the crisis effect. Moreover, the effect of lagged Labour Prod. over the other variables is always positive when it is significant.

Considering the exogenous crisis (Table 7), it statistically and negatively influenced ROA, Ass. Turn. and Labour Prod., especially due to reducing of turnover. By observing that in general variables keep their significance effect and sign when including crisis, this shows us that crisis is in fact a relevant variable to be accounted for.

**Table 7.** Panel VAR estimations using ROE including crisis.

| | | Dependent | ROE | Fin. Lev. | Liquidity | Solvency | Ass. Turn. | Cap. Repay. | Labour Prod. |
|---|---|---|---|---|---|---|---|---|---|
| Indep.-lagged 1 | ROE | coef. | 0.295 | −0.148 | −0.051 | −0.044 | 0.063 | −0.050 | 0.030 |
| | | z | 28.45 *** | −2.70 *** | −2.16 ** | −1.70 * | 3.27 *** | −1.33 | 3.18 *** |
| | Fin. Lev. | coef. | 0.029 | 0.578 | −0.031 | −0.026 | 0.035 | 0.026 | 0.005 |
| | | z | 12.54 *** | 37.70 *** | −5.90 *** | −4.63 *** | 7.08 *** | 2.56 ** | 2.10 ** |
| | Liquidity | coef. | 0.018 | −0.040 | 0.548 | 0.000 | 0.015 | −0.001 | 0.011 |
| | | z | 4.36 *** | −1.96 * | 26.98 *** | −0.01 | 1.81 * | −0.05 | 1.79 * |
| | Solvency | coef. | 0.020 | −0.035 | 0.001 | 0.647 | −0.016 | −0.074 | 0.010 |
| | | z | 3.57 *** | −1.48 | 0.06 | 22.06 *** | −1.53 | −2.66 *** | 1.21 |
| | Ass. Turn. | coef. | 0.046 | −0.035 | −0.070 | −0.053 | 0.541 | −0.035 | −0.029 |
| | | z | 5.87 *** | −0.77 | −3.26 *** | −2.36 ** | 19.94 *** | −1.00 | −2.10 ** |
| | Cap. Repay. | coef. | 0.000 | 0.038 | −0.023 | −0.025 | −0.003 | 0.354 | −0.002 |
| | | z | −0.14 | 4.67 *** | −5.37 *** | −6.07 *** | −1.19 | 27.60 *** | −0.81 |
| | Labour Prod. | coef. | 0.022 | 0.462 | 0.325 | 0.188 | −0.023 | 0.127 | 0.635 |
| | | z | 2.37 ** | 6.97 *** | 7.44 *** | 4.73 *** | −0.69 | 2.34 ** | 16.57 *** |
| | Exog. Crisis | coef. | 0.002 | −0.006 | 0.006 | −0.005 | −0.019 | −0.001 | −0.023 |
| | | z | 1.230 | −0.82 | 1.12 | −0.85 | −6.43 *** | −0.10 | −10.53 *** |

Source: authors' elaboration based on data from Amadeus database; Level of significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Tables A1 and A2 (Appendix A) show forecasting error variance decomposition (FEDV) effects for forecasting horizons (FH) of 1, 2, 5, 8 and 10 years. The FEDV indicates the amount of information each of the variables in the panel VAR (PVAR) contribute to the other variables in the auto regression, determining how much of the FEVD of the variables can be explained by exogenous shocks to the other variables. Tables A3 and A4 show FEVD values for ROA and ROE, respectively, also including into estimations exogenous crisis for robustness check.

By first comparing the values excluding crisis, it can be observed that ROA and ROE are mainly explained by shocks of Fin. Lev. and Labour Prod., whereas Ass. Turn., liquidity and solvency explain more ROE variations than ROA. Both Labour Prod. and performance are important to explain Fin. Lev., while Fin. Lev. and Labour Prod. are the most important effects explaining the FEVD of liquidity. Values are higher in terms of explanatory capacity considering ROE.

Solvency is more explained by liquidity and Fin. Lev., while Ass. Turn. decomposition effects are more explained by ROA and solvency or by ROE and Fin. Lev. in Table A2. Cap. Repay. movements are mainly due to Fin. Lev. and solvency. Finally, although marginally, Labour Prod. is more explained by exogenous shocks of Ass. Turn.

When considering exogenous crisis into our PVAR estimates, it can be observed that all variables increase their explanatory capacity over ROA, but solvency and Labour Prod. explanatory capacity decrease. With respect to ROE, all other variables see their explanatory capacity to explain ROE when FEDV decreases.

In general, the FEDV of all other variables decreases when considering crisis, but interestingly ROA and ROE capacity in explaining Ass. Turn. and Labour Prod. is higher. Ass. Turn. explanatory capacity is also higher over Labour Prod. accounting for crisis in ROA but being lower when considering ROE (Table A4). On the other hand, Fin. Lev. explains more of the FEDV of liquidity when considering crisis, but Labour Prod. loses some of its explanatory capacity. Labour Prod. has lower impact over ROE and Fin. Lev. when accounting for crisis.

These results confirm the importance of including crisis into estimations because these exogenous shocks significantly affect firm performance in European countries. Thus, we are able to confirm the findings of Seilspoor and Ahmadi [10], but now considering European firms as a whole.

PVAR estimates indicated a positively and highly significant impact over performance confirming the findings of López and Lima [42] and De Bandt et al. [6] but contradicting those of Nawaz et al. [5] and Nguyen et al [60]. Correlation values confirmed this positive effect over ROE [6] but revealed a negative coefficient between Fin. Lev. and performance (as in Nawaz et al. [5]; Sena [24]; Ibhagui and Olokoyo [27]; Agrawal and Knoeber [43] which developed a similar study on large companies and

Jouida [61] on financial institutions). In fact, the FEDV reveals that Fin. Lev. explanatory capacity is higher over ROA when considering crisis, but in magnitude terms the 3.3% of explanatory capacity excluding crisis and the 3% when considering it, over ROE is much higher.

The positive relationship found between liquidity and profitability may mean that by holding more liquid assets, firms benefit from a higher market perception allowing them to reduce financing costs and increasing profitability. According to Eljelly [30] liquidity management is important in good times, but even more in troubled times. The author argues that liquidity management efficient levels on a firm are highly important for profitability and wellbeing. Our results confirm this positive association even when we account for crisis.

The leverage effect also revealed to be positive over performance. This may be attributed to lower interest rates observed in Europe associated to debt payments or repayments during the period considered, whose signs remain unchanged even in face of the crisis effect. It could even mean lower amounts of debt because of repayments and that is a normal situation for firms within the sample that are large non-financial firms. Larger firms have lower growth opportunities (if they are already at their maturity stage) and as such leverage may be exerting positive impacts when ROA is higher than interest rate. Moreover, large firms are more credible within financial markets and creditors are less reluctant in lending money to these specific firms. Therefore, these are more prone to increase profits and profitability even facing the crisis.

The positive solvency influence is somehow related to both liquidity and Fin. Lev. effects. The firms in the sample were able to meet their obligations and their financial viability and ability to cover obligations and this is reflected in higher performance in both the short and long term. In fact, liquidity may be taught as short-term solvency of a firm.

Ass. Turn. is essential to keep a product-focused business running resulting in higher revenue. The results point for a positive effect of Ass. Turn. over ROE including and excluding crisis, but only a positive effect over ROA when crisis is accounted for in PVAR. This reveals that the firms in the sample were even more efficient in face of a crisis once the companies seemed to be deploying its assets in generating revenue. The same happens with Labour Prod. as results show its positive significance over performance, higher in face of crisis inducing us to think that both managers and employees are more prone to increase efficiency and thus provide more profits and increase performance.

However, Cap. Repay. reveals no statistical significance among results and explains little or none of the FEDV of the other variables included in the sample. This associated with the positive effect of Fin. Lev. over performance reinforces the lower debt ratio argument presented previously.

Finally, the crisis exogenous impact is only statistically and negatively significant when accounting for ROA. It also has a negative impact over Ass. Turn. and Labour Prod. As such, results evidence the transitional character of firms' corporate environment of 28 European countries, indicating the need for additional forms to be executed by these in order to gain profitability and helping firms improve their financial performance during crisis.

To sum up, the study also shows the higher capacity that larger and more liquid firms have in demonstrating higher performance and profitability, as compared to other authors analysing smaller firms, which found opposite impacts, even if not accounting for the financial crisis effect.

## 5. Conclusions

This paper uses an unbalanced annual panel data set considering non-financial large firms among 28 European countries between 2006 and 2015. By accounting for crisis effects, factors influencing firm performance (ROA and ROE) are analysed, considering leverage, liquidity, solvency, assets turnover, capital repayment and labour productivity. Panel vector autoregressive analysis was used to account for possible dynamic interactions and forecasting error variance decomposition is used in order to take some policy recommendations. It was possible to verify that all these factors are important in explaining ROE and ROA considering crisis.

This paper brings an essential contribution to the analysis of factors affecting financial performance of companies acting in all sectors of activity around the world. No recent significant analyses involved a large number of companies in different sectors and in a significant number of years. The combination of econometric, statistical and economic analyses provide benefits both for academics and managers. The econometric analysis provides scientific rigor and validates proposed hypotheses. Also, it reveals the main factors influencing the evolution of dependent variables (ROA and ROE), as well as connections between these dependent variables. The IRFs and FEVDs show the effects of shocks on variables' adjustment paths and measure each type of shock's contribution to the forecast error variance. Moreover, the statistical analysis highlights the main companies' trends and provides average values and variances for the reference economic and financial measures, which can provide useful information for managers seeking to diversify and identify new markets. The use of a dummy variable for crisis allows the analysis to be customised to any period, country, region or continent. Also, the economic analysis translates the findings of the statistical and econometric analyses into concrete measures and recommendations for managers.

Results allowed us to conclude the importance of considering dynamic possible interactions of these variables to explain firms' financial performance given that these may be simultaneously the cause and the effect of the other variables. Although not higher, it was possible to infer the relative importance of Fin. Lev. and Labour Prod. in explaining ROA and ROE forecast error variance decomposition. It was possible to infer higher explanatory capacity of ROA and ROE and Labour Prod. over Fin. Lev. and the high influence of Fin. Lev. and Liquidity over solvency. Almost all variables explanatory capacity decreases whenever the exogenous crisis effect is accounted for leading us to state that crisis is clearly one of the factors influencing firms' financial performance and should be certainly considered by investors and managers when making their financing decisions. Thus, firm performance is affected not only by endogenous variables and management practices, but also by exogenous effects such as crisis which is unable to be controlled. Managers must be able to react and make better decisions in order to reduce the negative effects of external factors that may affect firm performance.

Results also revealed the extreme capacity of these large firms analysed in surpassing the crisis effect by lowering Fin. Lev. and increasing productivity efficiency in order to provide more profits and increase performance.

Results in the future may be improved by analysing individual sectors within 28 European countries and accounting for correlated effects over firms' financial performance of these countries. The already ongoing research will help in more appropriate ways to understand how investors should place and make investment decisions among sectors provided that some of them guarantee higher results than other when a crisis occurs. These also verifies which sectors are more capable in assuring higher profitability ratios and thus higher performance and good investment and funding decision-making.

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**Conflicts of Interest:** The authors declare no conflicts of interest.

## Appendix A

**Table A1.** Forecast error variance decomposition using ROA with no crisis effect and forecasting horizons (FH) of 1, 2, 5, 8 and 10 years.

| | **Impulse Variable** | | | | | | |
|---|---|---|---|---|---|---|---|
| | ROA | Fin. Lev. | Liquidity | Solvency | Ass. Turn. | Cap. Repay. | Labour Prod. |
| FH | Response Variable—ROA | | | | | | |
| 1 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.994 | 0.003 | 0.001 | 0.001 | 0.001 | 0.000 | 0.001 |
| 5 | 0.975 | 0.010 | 0.001 | 0.004 | 0.002 | 0.000 | 0.007 |
| 8 | 0.970 | 0.011 | 0.002 | 0.004 | 0.002 | 0.000 | 0.011 |
| 10 | 0.969 | 0.012 | 0.002 | 0.005 | 0.002 | 0.000 | 0.011 |
| | Response Variable—Fin. Lev. | | | | | | |
| 1 | 0.032 | 0.968 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.037 | 0.955 | 0.000 | 0.000 | 0.000 | 0.001 | 0.007 |
| 5 | 0.041 | 0.924 | 0.000 | 0.001 | 0.000 | 0.002 | 0.032 |
| 8 | 0.041 | 0.916 | 0.000 | 0.001 | 0.001 | 0.002 | 0.040 |
| 10 | 0.041 | 0.914 | 0.000 | 0.001 | 0.001 | 0.002 | 0.041 |
| | Response Variable—Liquidity | | | | | | |
| 1 | 0.008 | 0.042 | 0.950 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.006 | 0.052 | 0.931 | 0.001 | 0.000 | 0.001 | 0.009 |
| 5 | 0.005 | 0.066 | 0.888 | 0.002 | 0.000 | 0.003 | 0.035 |
| 8 | 0.005 | 0.068 | 0.878 | 0.003 | 0.001 | 0.003 | 0.041 |
| 10 | 0.005 | 0.069 | 0.877 | 0.003 | 0.001 | 0.003 | 0.042 |
| | Response Variable—Solvency | | | | | | |
| 1 | 0.010 | 0.110 | 0.177 | 0.704 | 0.000 | 0.000 | 0.000 |
| 2 | 0.008 | 0.123 | 0.172 | 0.694 | 0.000 | 0.001 | 0.001 |
| 5 | 0.007 | 0.142 | 0.167 | 0.676 | 0.001 | 0.003 | 0.004 |
| 8 | 0.007 | 0.146 | 0.165 | 0.673 | 0.002 | 0.003 | 0.005 |
| 10 | 0.007 | 0.146 | 0.165 | 0.672 | 0.002 | 0.003 | 0.005 |
| | Response Variable—Ass. Turn. | | | | | | |
| 1 | 0.068 | 0.005 | 0.004 | 0.001 | 0.921 | 0.000 | 0.000 |
| 2 | 0.069 | 0.006 | 0.006 | 0.006 | 0.910 | 0.000 | 0.002 |
| 5 | 0.068 | 0.018 | 0.008 | 0.019 | 0.879 | 0.000 | 0.009 |
| 8 | 0.067 | 0.021 | 0.008 | 0.022 | 0.871 | 0.000 | 0.011 |
| 10 | 0.067 | 0.021 | 0.008 | 0.022 | 0.870 | 0.000 | 0.012 |
| | Response Variable—Cap. Repay. | | | | | | |
| 1 | 0.004 | 0.007 | 0.007 | 0.018 | 0.003 | 0.960 | 0.000 |
| 2 | 0.005 | 0.011 | 0.006 | 0.023 | 0.004 | 0.951 | 0.000 |
| 5 | 0.007 | 0.014 | 0.006 | 0.026 | 0.004 | 0.942 | 0.001 |
| 8 | 0.007 | 0.014 | 0.006 | 0.027 | 0.004 | 0.941 | 0.001 |
| 10 | 0.007 | 0.014 | 0.006 | 0.027 | 0.004 | 0.941 | 0.001 |
| | Response Variable—Labour Prod. | | | | | | |
| 1 | 0.015 | 0.005 | 0.002 | 0.000 | 0.031 | 0.000 | 0.948 |
| 2 | 0.012 | 0.004 | 0.001 | 0.002 | 0.020 | 0.000 | 0.959 |
| 5 | 0.010 | 0.004 | 0.001 | 0.007 | 0.021 | 0.001 | 0.957 |
| 8 | 0.010 | 0.004 | 0.001 | 0.008 | 0.023 | 0.001 | 0.954 |
| 10 | 0.010 | 0.004 | 0.001 | 0.008 | 0.023 | 0.001 | 0.953 |

**Table A2.** Forecast error variance decomposition using ROE with no crisis effect and forecasting horizons (FH) of 1, 2, 5, 8 and 10 years.

| | **Impulse Variable** | | | | | | |
|---|---|---|---|---|---|---|---|
| | ROE | Fin. Lev. | Liquidity | Solvency | Ass. Turn. | Cap. Repay. | Labour Prod. |
| FH | Response Variable—ROE | | | | | | |
| 1 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.953 | 0.014 | 0.010 | 0.006 | 0.014 | 0.000 | 0.003 |
| 5 | 0.876 | 0.032 | 0.021 | 0.010 | 0.023 | 0.000 | 0.037 |
| 8 | 0.859 | 0.033 | 0.021 | 0.010 | 0.023 | 0.000 | 0.054 |
| 10 | 0.857 | 0.033 | 0.021 | 0.010 | 0.023 | 0.000 | 0.057 |
| | Response Variable—Fin. Lev. | | | | | | |
| 1 | 0.016 | 0.984 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.019 | 0.962 | 0.000 | 0.000 | 0.000 | 0.001 | 0.018 |
| 5 | 0.018 | 0.898 | 0.000 | 0.001 | 0.001 | 0.002 | 0.081 |
| 8 | 0.017 | 0.879 | 0.000 | 0.001 | 0.002 | 0.002 | 0.099 |
| 10 | 0.017 | 0.876 | 0.000 | 0.002 | 0.002 | 0.002 | 0.101 |
| | Response Variable—Liquidity | | | | | | |
| 1 | 0.008 | 0.033 | 0.960 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.007 | 0.036 | 0.928 | 0.000 | 0.000 | 0.001 | 0.028 |
| 5 | 0.007 | 0.040 | 0.839 | 0.000 | 0.002 | 0.003 | 0.109 |
| 8 | 0.007 | 0.041 | 0.818 | 0.000 | 0.004 | 0.003 | 0.126 |
| 10 | 0.007 | 0.041 | 0.816 | 0.000 | 0.004 | 0.003 | 0.128 |
| | Response Variable—Solvency | | | | | | |
| 1 | 0.006 | 0.102 | 0.185 | 0.707 | 0.000 | 0.000 | 0.000 |
| 2 | 0.006 | 0.110 | 0.181 | 0.695 | 0.000 | 0.001 | 0.007 |
| 5 | 0.005 | 0.122 | 0.174 | 0.665 | 0.003 | 0.003 | 0.028 |
| 8 | 0.006 | 0.125 | 0.172 | 0.657 | 0.004 | 0.003 | 0.033 |
| 10 | 0.006 | 0.125 | 0.172 | 0.656 | 0.004 | 0.003 | 0.033 |
| | Response Variable—Ass. Turn. | | | | | | |
| 1 | 0.018 | 0.011 | 0.003 | 0.001 | 0.967 | 0.000 | 0.000 |
| 2 | 0.019 | 0.009 | 0.005 | 0.006 | 0.961 | 0.000 | 0.000 |
| 5 | 0.019 | 0.018 | 0.006 | 0.015 | 0.941 | 0.001 | 0.001 |
| 8 | 0.019 | 0.020 | 0.007 | 0.017 | 0.936 | 0.001 | 0.002 |
| 10 | 0.019 | 0.020 | 0.007 | 0.017 | 0.935 | 0.001 | 0.002 |
| | Response Variable—Cap. Repay. | | | | | | |
| 1 | 0.000 | 0.010 | 0.007 | 0.019 | 0.005 | 0.960 | 0.000 |
| 2 | 0.000 | 0.014 | 0.006 | 0.024 | 0.005 | 0.950 | 0.001 |
| 5 | 0.000 | 0.018 | 0.006 | 0.028 | 0.006 | 0.939 | 0.003 |
| 8 | 0.000 | 0.018 | 0.006 | 0.028 | 0.006 | 0.938 | 0.003 |
| 10 | 0.000 | 0.018 | 0.006 | 0.028 | 0.006 | 0.938 | 0.003 |
| | Response Variable—Labour Prod. | | | | | | |
| 1 | 0.009 | 0.007 | 0.007 | 0.000 | 0.033 | 0.000 | 0.945 |
| 2 | 0.008 | 0.007 | 0.006 | 0.002 | 0.021 | 0.000 | 0.956 |
| 5 | 0.007 | 0.005 | 0.005 | 0.006 | 0.025 | 0.001 | 0.950 |
| 8 | 0.007 | 0.006 | 0.005 | 0.007 | 0.028 | 0.001 | 0.947 |
| 10 | 0.007 | 0.006 | 0.005 | 0.007 | 0.029 | 0.001 | 0.946 |

**Table A3.** Forecast error variance decomposition using ROA with crisis effect and forecasting horizons (FH) of 1, 2, 5, 8 and 10 years.

| | **Impulse Variable—Including Exogenous Crisis** | | | | | | |
|---|---|---|---|---|---|---|---|
| | ROA | Fin. Lev. | Liquidity | Solvency | Ass. Turn. | Cap. Repay. | Labour Prod. |
| FH | Response Variable—ROA | | | | | | |
| 1 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.992 | 0.004 | 0.001 | 0.000 | 0.002 | 0.000 | 0.000 |
| 5 | 0.970 | 0.014 | 0.004 | 0.000 | 0.007 | 0.000 | 0.005 |
| 8 | 0.964 | 0.016 | 0.004 | 0.000 | 0.007 | 0.000 | 0.008 |
| 10 | 0.963 | 0.016 | 0.004 | 0.000 | 0.007 | 0.000 | 0.009 |
| | Response Variable—Fin. Lev. | | | | | | |
| 1 | 0.031 | 0.969 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.036 | 0.957 | 0.000 | 0.000 | 0.000 | 0.001 | 0.006 |
| 5 | 0.038 | 0.934 | 0.001 | 0.001 | 0.000 | 0.002 | 0.024 |
| 8 | 0.038 | 0.929 | 0.001 | 0.001 | 0.000 | 0.002 | 0.029 |
| 10 | 0.038 | 0.929 | 0.001 | 0.001 | 0.000 | 0.002 | 0.029 |
| | Response Variable—Liquidity | | | | | | |
| 1 | 0.007 | 0.045 | 0.948 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.005 | 0.056 | 0.928 | 0.000 | 0.000 | 0.002 | 0.008 |
| 5 | 0.005 | 0.070 | 0.893 | 0.000 | 0.000 | 0.003 | 0.028 |
| 8 | 0.005 | 0.072 | 0.887 | 0.000 | 0.000 | 0.004 | 0.032 |
| 10 | 0.005 | 0.072 | 0.887 | 0.000 | 0.000 | 0.004 | 0.032 |
| | Response Variable—Solvency | | | | | | |
| 1 | 0.011 | 0.113 | 0.168 | 0.708 | 0.000 | 0.000 | 0.000 |
| 2 | 0.009 | 0.126 | 0.166 | 0.697 | 0.000 | 0.001 | 0.001 |
| 5 | 0.008 | 0.144 | 0.162 | 0.679 | 0.000 | 0.003 | 0.004 |
| 8 | 0.008 | 0.147 | 0.161 | 0.676 | 0.000 | 0.003 | 0.004 |
| 10 | 0.008 | 0.147 | 0.161 | 0.676 | 0.000 | 0.003 | 0.004 |
| | Response Variable—Ass. Turn. | | | | | | |
| 1 | 0.075 | 0.005 | 0.004 | 0.000 | 0.916 | 0.000 | 0.000 |
| 2 | 0.081 | 0.007 | 0.004 | 0.001 | 0.905 | 0.000 | 0.001 |
| 5 | 0.084 | 0.025 | 0.004 | 0.002 | 0.877 | 0.000 | 0.007 |
| 8 | 0.084 | 0.030 | 0.004 | 0.003 | 0.869 | 0.000 | 0.011 |
| 10 | 0.084 | 0.030 | 0.004 | 0.003 | 0.868 | 0.000 | 0.012 |
| | Response Variable—Cap. Repay. | | | | | | |
| 1 | 0.003 | 0.008 | 0.007 | 0.018 | 0.003 | 0.961 | 0.000 |
| 2 | 0.005 | 0.011 | 0.007 | 0.022 | 0.003 | 0.952 | 0.000 |
| 5 | 0.007 | 0.014 | 0.007 | 0.025 | 0.003 | 0.944 | 0.001 |
| 8 | 0.007 | 0.014 | 0.007 | 0.025 | 0.003 | 0.944 | 0.001 |
| 10 | 0.007 | 0.014 | 0.007 | 0.025 | 0.003 | 0.944 | 0.001 |
| | Response Variable—Labour Prod. | | | | | | |
| 1 | 0.018 | 0.006 | 0.002 | 0.000 | 0.036 | 0.000 | 0.938 |
| 2 | 0.021 | 0.007 | 0.004 | 0.001 | 0.032 | 0.000 | 0.935 |
| 5 | 0.024 | 0.008 | 0.007 | 0.002 | 0.028 | 0.000 | 0.931 |
| 8 | 0.024 | 0.008 | 0.008 | 0.003 | 0.027 | 0.000 | 0.930 |
| 10 | 0.024 | 0.008 | 0.008 | 0.003 | 0.027 | 0.000 | 0.930 |

**Table A4.** Forecast error variance decomposition using ROE with crisis effect and forecasting horizons (FH) of 1, 2, 5, 8 and 10 years.

| | **Impulse Variable—Including Exogenous Crisis** | | | | | | |
|---|---|---|---|---|---|---|---|
| | ROE | Fin. Lev. | Liquidity | Solvency | Ass. Turn. | Cap. Repay. | Labour Prod. |
| FH | Response Variable—ROE | | | | | | |
| 1 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.969 | 0.012 | 0.005 | 0.003 | 0.009 | 0.000 | 0.001 |
| 5 | 0.923 | 0.029 | 0.012 | 0.007 | 0.018 | 0.000 | 0.012 |
| 8 | 0.917 | 0.030 | 0.012 | 0.007 | 0.018 | 0.000 | 0.016 |
| 10 | 0.916 | 0.030 | 0.012 | 0.007 | 0.018 | 0.000 | 0.017 |
| | Response Variable—Fin. Lev. | | | | | | |
| 1 | 0.020 | 0.980 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.022 | 0.966 | 0.000 | 0.000 | 0.000 | 0.001 | 0.011 |
| 5 | 0.021 | 0.937 | 0.001 | 0.001 | 0.000 | 0.002 | 0.038 |
| 8 | 0.021 | 0.931 | 0.001 | 0.001 | 0.000 | 0.002 | 0.043 |
| 10 | 0.021 | 0.931 | 0.001 | 0.001 | 0.000 | 0.002 | 0.044 |
| | Response Variable—Liquidity | | | | | | |
| 1 | 0.006 | 0.040 | 0.954 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 0.006 | 0.048 | 0.926 | 0.000 | 0.000 | 0.001 | 0.019 |
| 5 | 0.006 | 0.057 | 0.872 | 0.001 | 0.001 | 0.003 | 0.060 |
| 8 | 0.007 | 0.058 | 0.863 | 0.001 | 0.001 | 0.003 | 0.067 |
| 10 | 0.007 | 0.058 | 0.862 | 0.001 | 0.001 | 0.003 | 0.068 |
| | Response Variable—Solvency | | | | | | |
| 1 | 0.005 | 0.111 | 0.175 | 0.708 | 0.000 | 0.000 | 0.000 |
| 2 | 0.005 | 0.120 | 0.173 | 0.697 | 0.000 | 0.001 | 0.004 |
| 5 | 0.005 | 0.132 | 0.169 | 0.676 | 0.001 | 0.002 | 0.015 |
| 8 | 0.005 | 0.134 | 0.168 | 0.671 | 0.001 | 0.003 | 0.017 |
| 10 | 0.005 | 0.135 | 0.168 | 0.671 | 0.001 | 0.003 | 0.017 |
| | Response Variable—Ass. Turn. | | | | | | |
| 1 | 0.019 | 0.011 | 0.004 | 0.000 | 0.966 | 0.000 | 0.000 |
| 2 | 0.021 | 0.009 | 0.004 | 0.001 | 0.965 | 0.000 | 0.000 |
| 5 | 0.021 | 0.021 | 0.003 | 0.002 | 0.953 | 0.000 | 0.000 |
| 8 | 0.021 | 0.024 | 0.003 | 0.003 | 0.949 | 0.000 | 0.001 |
| 10 | 0.021 | 0.024 | 0.003 | 0.003 | 0.948 | 0.000 | 0.001 |
| | Response Variable—Cap. Repay. | | | | | | |
| 1 | 0.000 | 0.010 | 0.007 | 0.018 | 0.004 | 0.960 | 0.000 |
| 2 | 0.000 | 0.015 | 0.006 | 0.023 | 0.005 | 0.950 | 0.001 |
| 5 | 0.000 | 0.019 | 0.006 | 0.027 | 0.005 | 0.940 | 0.003 |
| 8 | 0.000 | 0.019 | 0.006 | 0.027 | 0.005 | 0.939 | 0.003 |
| 10 | 0.000 | 0.019 | 0.006 | 0.027 | 0.005 | 0.939 | 0.003 |
| | Response Variable—Labour Prod. | | | | | | |
| 1 | 0.011 | 0.005 | 0.004 | 0.001 | 0.036 | 0.000 | 0.944 |
| 2 | 0.012 | 0.006 | 0.007 | 0.001 | 0.030 | 0.000 | 0.944 |
| 5 | 0.013 | 0.006 | 0.011 | 0.003 | 0.026 | 0.000 | 0.940 |
| 8 | 0.013 | 0.006 | 0.012 | 0.004 | 0.025 | 0.000 | 0.939 |
| 10 | 0.013 | 0.006 | 0.012 | 0.004 | 0.025 | 0.000 | 0.939 |

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