Journal of
Risk and Financial Management

MDPI

Article

The Effect of ECB Unconventional Monetary Policy on Firms' Performance during the Global Financial Crisis

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Abstract: This study aims to analyse and investigate the most important factors affecting the performance of listed firms in the Athens Stock Exchange, emphasising capital structure, size and sovereign debt rate as a proxy for firms' borrowing rate. Yet, the most remarkable factor taken into consideration to affect firms' profitability is the delta of ECB assets as a proxy of the ECB's strategy during the financial crisis. Indeed, the examination of the ECB's delta is innovative for such analysis and differentiates this study from previous ones. The survey was conducted for the period 2005–2019, and the sample consisted of 49 firms from all sectors of the economic activity, except for the financial sector, as its companies' capital structure is subject to supervisory restrictions. Thus, the financial sector's inclusion in the sample would affect its homogeneity. The sample is divided into two sub periods, based on the statement of ECB's president Mario Draghi "Whatever it takes," in 2012, expressing the ECB's strategy for backing and boosting the Eurozone economy. The empirical approach of our analysis is based on a panel data analysis, which allows the combination of both cross-section and time series data. In addition, we develop, test and analyse four specifications of our main model, each one with a different dependent variable as a proxy for profitability. These variables are EPS (earnings per share), ROE (return on equity), ROA (return on assets) and TOBIN's Q. Our findings lead to some very interesting conclusions, which in most cases are consistent for the specification of all the examined models. More specifically, the results show a negative influence of debt-to-equity ratio and 10-year Greek yield bond on firms' profitability regardless of the proxy used (EPS, ROE or TOBIN's Q), while there is a positive impact of firms' size and the delta of ECB's total assets on firms' profitability. However, the soundest outcome of this study shows that the expansion of the ECB's balance sheet and the unconventional policy does contribute to the improvement of firms' performance and economic stability. The findings become even more impressive, considering the turning of ECB's strategy after the implementation of the unconventional policy in 2012. Our findings are useful for policymakers of international institutions and government authorities as we propose strategies favouring economic stability and economic activity but also for managers and stakeholders who can identify the factors which determine firms' performance in order to apply the best policies for financing, investments and growth.

Keywords: capital structure; profitability; debt; leverage; financial crisis; earnings per share; return on equity; return on assets; Tobin's Q; non-conventional monetary policy; European Central Bank

Citation: Basdekis, Charalampos, Apostolos Christopoulos, Evgenios Gakias, and Ioannis Katsampoxakis. 2023. The Effect of ECB Unconventional Monetary Policy on Firms' Performance during the Global Financial Crisis. *Journal of Risk and Financial Management* 16: 258. https://doi.org/10.3390/jrfm16050258

Academic Editor: Thanasis Stengos

Received: 30 March 2023
Revised: 22 April 2023
Accepted: 23 April 2023
Published: 27 April 2023

1. Introduction

The effect of micro and macro environments and the impact of firms' capital structure on profitability have paramount importance for both economic growth and economic activity, especially in periods of high volatility or economic recession. In such an environment, there have arisen specific issues for firms related to managers' decisions for financing and investment purposes, affecting both their operational and strategic planning.

Our research is addressed both to academics and professionals. For empirical purposes, we use alternative measures of profitability, aiming to examine and explain the impact of the most important factors that affect firms' profitability. This is one issue that differentiates this study from previous relative studies and can assist the academic community in perceiving whether different tools end up with the same output and whether the impact of various factors on profitability affects firms' performance regardless of the way they are approached. In their turn, managers can clarify the main factors affecting firms' profitability, pushing them to take the appropriate decisions for business planning, mitigating, at the same time, their risk. In addition, they will benefit from their knowledge of the influence of factors affecting profitability under special occasions, seeking the interference of international bodies, agencies and institutions to cope with the situation for the benefit of societies and economies.

The critical point of this study is the implementation of the unconventional monetary policy by the ECB. Besides that, the importance and the role of the implementation of unconventional monetary policy have been highly evaluated and emphasised and should be an integral part of central banks' toolkits in order to either prevent or mitigate the effects of economic recessions and crises (Bernanke 2020). In the case of our research, the implementation of unconventional monetary policy is captured by the sound interference of the ECB and the well-known statement of the former ECB president Mario Draghi "Whatever it takes" in 2012, related to the transformation of the ECB's strategy in backing and boosting Eurozone economy. This decision was a milestone in the contemporary history of monetary policy implementation, proceeding to Quantitative Easing (QE) in order to contribute to boosting the European economy.

Firms' main goal, regardless of the economic conditions, is to achieve the optimal capital structure to be sustainable, to minimise its cost of capital, maximise the inherent firms' value, profitability and, eventually, its shareholders' wealth. In order to achieve their goal, managers seek optimal decisions related to dividend, financing and investment policies (Vasiliou et al. 2008).

The term "capital structure" is determined from the relationship between the various long-term sources of funding, such as equity, preferred equity and long-term debt (Gangeni 2006; Parmansivan and Subramanian 2009). Alternatively, a firm's capital structure is determined entirely by the ratio of long-term debt and equity, and the decision of the capital structure implementation is of major importance as it is closely linked with a firm's value (Gitman and Zutter 2012), while the main purpose of the capital structure is to determine the optimal combination of debt and equity (Brigham and Ehrhardt 2011).

The final decision on a firm's capital structure takes into consideration the capital structure target, the average duration of its debt and the mix of investment projects' financing sources at any given time (Gangeni 2006).

Economic crises are usually caused by disruptions in the financial intermediation system, which may lead to a sharp increase in external financing and significant changes in credit and asset prices. The adjustment of persistent vulnerable economic conditions requires the mediation of competent authorities in order to actively support, contribute to and enhance market liquidity and recapitalisation. However, understanding and predicting the real causes of financial crises is not an easy process, and so far, apart from certain macroeconomic imbalances, endogenous and exogenous shocks, as well as fundamental economic and financial factors, there are even more factors contributing to the creation of financial crises that are not considered reasonable (Kotios and Galanos 2010). These effects are even more sound in the case of country unions, where the spillover effects make their presence even more pronounced due to their construction structure, and the necessity of a formal international body or institution intervention seems to be imperative (Cortes et al. 2022).

Several studies and theories focus on corporate asset prices bubble, allowing them to issue high and unsustainable debt and ultimately turn into crises. Moreover, assets

overrating by the markets lead to long-term recession, causing immense economic and social consequences.

The global financial crisis caused a liquidity crisis in financial markets, being associated with intense upheavals and turbulence and highly increased risks for both the financial industry and firms, which even burden their own sustainability. Besides, firms' investments during the financial crisis were at very low levels (Graham et al. 2014). Limited investments worldwide were mainly due to the restriction of external financing as a result of the increased cost of debt and the reduced financing by financial institutions. The prevailing conditions above resulted, as expected, in the reduction of firms' leverage.

In such a context, our empirical methodology focuses on the influence of microeconomic (firms' size), financial (leverage) and macroeconomic (cost of sovereign debt) factors on the profitability of firms listed on the Athens Stock Exchange. Moreover, it is examined the impact of the strategy implemented by the ECB in order to protect the Euro area and economic activity. The process of measuring firms' profitability simultaneously in four different ways, combined with the approach of the ECB to cope with the financial crisis in EMU countries, imparts a specific feature of our research compared to other studies focusing on firms' profitability issues. For the purposes of this study, we used four specifications for our basic model, each one corresponding to a different way of measuring profitability.

This paper is developed as follows: Section 2 presents a brief literature review related to the factors affecting firms' performance, while Section 3 focuses on the impact of leverage on firms' profitability, especially during periods of crisis. Section 4 analyses the hypotheses testing and the sample under consideration. Section 5 presents the methodology and model's specification, and Section 6 focuses on the empirical results. Finally, at the end of the paper, important conclusions are discussed, while policy implications and further research propositions are suggested.

2. An Overview of Factors Affecting Firms' Performance

Since the 2000s, there has been an ongoing research effort and interest from the academic community, managers, shareholders, state and other stakeholders related to the factors affecting firms' profitability. This concern is very reasonable since firms and their development consist of the backbone and lifeblood of economies worldwide. However, the results of the studies conducted are, to somewhat extent, ambiguous. This differentiation may be due to the way of measuring probability, the general economic conditions during the research period, or even a lack of sample uniformity, including uneven geographical areas or sectors under consideration. This study attempts to restrict these issues arisen, focusing on the specific area of a period of great interest before and after the financial crisis, using different approaches to measuring profitability in order to extract more robust, clear and interesting results.

Alarussi and Alhaderi (2018) focus on the impact of various factors on listed firms' profitability in the Malaysian Stock Exchange. Their findings imply that there is a positive statistically significant relationship between firms' profitability and size, working capital and efficiency (Frank and Goyal 2003; Christopoulos et al. 2019). On the other hand, leverage seems to negatively affect profitability and investment opportunities (Rajan and Zingales 1995). Their results are congruent with Basdekis et al. (2020) in similar research for automobiles in selected EU countries.

Lim and Rokhim (2021) also find similar results on the impact of firms' size on firms' profitability in the pharmaceutical sector of listed firms in Indonesia, measuring profitability with ROA, which is not verifying when EPS is applied as a profitability index. Moving to the sectoral analysis of various factors affecting profitability, Dimitrić et al. (2019) ended up with mixed conclusions. Their analysis focuses on the tourism sector in Mediterranean countries from 2007 to 2015, finding different results across the countries. More specifically, firms' size has a significant influence only on hotels in Spain and Portugal, while the solvency ratio positively affects all hotels in the Mediterranean countries except Greece due to its excessive debt and its difficult management.

According to Susilo et al. (2020), firms' size, growth and working capital exert a positive influence on manufacturing companies in Indonesia, while capital structure does not seem to affect their profitability. Their results seem to be congruent with the pecking order and financial agency theory. On the other hand, Farah and Supartika (2016) found that firms' size, growth and lagged profitability affect in a negative statistically significant way firms' profitability listed on the Indonesia Stock Exchange.

The impact of leverage on firms' performance and value is mainly the result of the combination of firms' capital structure, investments, and dividend policy decisions. As the main financial decisions act as communicating vessels, each decision should not be taken in a separate, isolated and sterile way.

More specifically, according to Georgakopoulos et al. (2022), there is a significant relationship between major capital structure, corporate governance parameters and the firm performance of 10 leading-energy-sector companies traded in the NYSE. Furthermore, their findings imply that pecking order and agency cost theories play an important role in the financing of these firms, while static trade and relevance theory find no support.

Regarding firms' financing, Leary and Roberts (2008) examined US companies setting a leverage level. According to their findings, firms are rather in favour of internal financing of their investment projects over debt, and they raise external financing only in case they follow an aggressive long-term investment strategy.

In the same context, Shyam-Sunder and Myers (1999) found that low-levered firms indicate high profitability and reduced investments. On the other hand, firms with intense investment activity appear to increase their debt over time. However, the reasons are determined by the need for external capital and not for achieving the optimal debt ratio level. Respectively, Fama and French (2000) found that more profitable firms and firms implementing a restricted investment policy, indicating a high dividend payout ratio and are less levered. On the contrary, firms that follow an aggressive investment policy implement a low dividend payout ratio policy as an alternative source of external financing.

However, the level of leverage and the sources of financing firms' projects are mainly dependent on the prevailing economic conditions. More specifically, Kahle and Stulz (2013), examining the causes and consequences of the global financial crisis on the economy and firms from another point of view, argued that the financial crisis led to a reduction in demand for consumer goods and services, resulting in external financing limitation and less new equity issues, while the lack of investments has led to cash retention. Moreover, they found that in 2007, one year before the crisis outbreak, firms' debt issues increased, while after 2008, there was observed a decline in issuing new debt for all firms regardless of the activity of the sector.

On the other hand, Flannery and Rangan's (2006) findings are not aligned with the aforementioned ones. In their study, they extracted that it does not seem to be any leveraging effect on the firms' value, regardless of the type and the level of the investment, applying market timing or pecking order theories. Moreover, Frank and Goyal (2003) found a positive impact of leverage on the profitability of the industrial sector and that industrial companies indicate, on average, higher leverage levels than other sectors. The need to preserve higher debt is more intense in lower-valued firms and start-ups in order to cover their deficits.

According to Graham and Harvey (2001), decisions on dividend policy and financing are of major importance for firms' performance. They show that the most important factors for issuing new debt and equity are financial flexibility, credit rating and the reduction of dividend yield.

According to Kayhan and Titman (2004), the most important factors affecting the target of firms' leverage level and, thus, the capital structure decision policies are stock returns, firms' investment activities and cash flows.

Chen and Hammes's (2004) findings indicate a positive impact of tangible assets and growth opportunities on firms' leverage, while there is a negative impact of firms' profitability and size on leverage. It is of great interest that their findings may differ while

applying their model in Chinese firms compared to other more advanced economies. More specifically, the funding and capital structure determination of Chinese companies is mainly based on self-financing, using retained earnings and reserves (Vasiliou and Eriotis 2008) and only in cases of emergency do they head towards financing their investments by issuing new common stock and new long-term debt. This strategy followed is argued by the fact that the Chinese state is the main shareholder contributing significantly to the reduction of financial distress.

Voulgaris et al. (2004) concluded that an increase in long-term debt contributes to firms' size growth and that leverage seems to be negatively related to profitability but positively to investment opportunities. Moreover, they found that the increase in receivables and reserves does affect firms' leverage and that transparency is necessary in order to improve their capital structure and terms of financing, while high profitability leads to increased short-term debt.

According to Daskalakis and Psillaki (2008), firms do not follow a common optimal capital structure target, and they seem to be reluctant to issue long-term debt as they are not in favour of amending their capital structure in the long run.

According to Basdekis (2010), the mitigation of legal, political, and foreign exchange risk affects the cost of equity in a positive way, which in turn leads firms to enjoy higher profitability rates. This risk mitigation is more apparent for member countries of the EU as it has been observed that there are higher convergence rates in the cost of equity and more chances for firms' profitability and effective performance.

3. Leverage and Firms' Performance in Times of Crisis

In overindebted economies, firms' leverage is being affected more related to economies with stable economies infrastructures and regulatory regimes, as the added burden affects, among others, the banking sector and its ability to finance firms' investment projects at a low cost of capital. In such cases, the implementation of an unconventional monetary policy could inject firms with the necessary liquidity, contributing to the reduction of the cost of capital (Rodnyansky and Darmouni 2017). A typical example is the case of overindebted economies in the EU, as the burden of sovereign debt contributed to the intensification of the economic crisis (Acharya et al. 2012) and the collapse of GDP (Basdekis et al. 2022). Moreover, the economic dynamics and the regulatory regime play a dominant role in economies' development and convergence. More specifically, stronger economies seem to pay more attention to economic and regulatory factors, while weaker economies seem more reluctant to coordinate and cooperate in order for convergence to be achieved (Toudas 2018).

This situation may differentiate firms' capital structure strategy and, thus, in turn, firms' performance may be affected intensively in case of extreme economic recession and interference of international institutions and provide a picture different compared to that of an economic stability period. More specifically, Iqbal and Kume (2014) studied the impact of the recent economic crisis on firms' capital structure in England, France, and Germany. Their results showed a high increase in external financing, which resulted in firms' leverage. At the same time, they found that low-levered firms in the period before the outbreak of the global financial crisis indicated a gradual increase in their leverage during the financial crisis. According to Akbar et al. (2013), the global financial crisis mostly affected negatively corporate debt ratio and, to a lesser extent, short-term borrowing. Nevertheless, despite the ominous conditions, most companies did not change their dividend policy. The main problems appeared in the investment process due to the difficulty in issuing new debt, which in turn negatively affected returns and the financing of new investments. Katsampoxakis et al. (2015) extracted that it does not seem to be a stable and specific effect of leverage examined on firms' profitability, as it observed different impacts before and after the crisis's outbreak. An extension of their study in 2018 (Katsampoxakis et al. 2018) found that, before the Greek economic crisis of 2009, the optimal debt ratio was—on average—40.9%, much less than for the whole period examined (2005–2016).

Augustin et al. (2018) stated that the unexpected increase in sovereign credit does affect firms' performance, as from a business point of view, they are facing higher levels of financing costs. Thus, the non-conventional monetary policy implemented by the ECB had obvious effects on facing the unfavourable issues arising in the money and capital markets and left a positive footprint on the real economy.

Burriel and Galesi (2018) consider that firms performing in European countries with more fragile banking systems are more affected by the financial crisis, as they don't benefit to a great extent from the ECB's unconventional monetary policy implementation, and internal financing represents the most economical option for these firms.

According to Acharya et al. (2019), the ECB Outright Monetary Transactions (OMTs) program contributed to market stabilisation but without setting the necessary growth conditions. The "zombie lending" state prevailed in markets, while the recapitalised banks were reluctant to decisively contribute to the boost of economic activity, as they didn't pump the ECB's financing to the real economy, preferring instead to increase their reserves.

A more representative picture of the prevailed situation during the financial crisis period in the EU can be revealed by the study of Katsampoxakis (2021), who examined the impact of fiscal conditions on banks' credit margins in Eurozone countries and the contribution of the ECB's unconventional monetary policy in Eurozone crisis. The period under consideration consisted of three subperiods. The first one refers to the period before the collapse of Lehman Brothers and the outbreak of the crisis. The second period refers to the instability of the Eurozone banking system, and the third one started in 2012 when the ECB decided to implement an expansionary, unconventional monetary policy in order to contribute to the stability of the Eurozone economy and its banking system. The main finding of the first period is that there are not observed any credit risk spillover effects before the outbreak of the Irish banking system crisis. During the second period, it is observed strong evidence of credit risk spillover effects among European countries on their banking system due to the apparent deterioration of fiscal conditions. Finally, during the third period, no credit risk spillover effects to the Euro area countries were observed as a result of the implementation of unconventional monetary policy by the ECB.

Last but not least, extending the role of monetary policy spillover effects, it is proved that the degree of coordination of unconventional monetary policies globally does affect the direction (positive or negative) of international monetary policy spillover effects (Cortes et al. 2022). It also has to be noted the interconnection between Eurozone and subprime crises, as can be seen by the fact that the ECB's QE overlaps with the three rounds of QE conducted by the US Federal Reserve in response to the subprime crisis (Cortes et al. 2022), especially while considering the magnitudes of QE spillover effects stemming from the US Federal Reserve (Dedola et al. 2020).

4. Hypotheses and Data

4.1. Hypothesis

Firms' capital structure is a deterministic factor for firms' performance, activity and growth. There have been conducted several studies related to the most important factors affecting firms' performance, indicating contradictory in some cases results.

The global financial crisis of 2008, affected the economies worldwide, creating both a concern and an intense scientific interest in determining how companies' capital structure and other internal or external environmental factors affect firms' profitability. The crisis forced firms to resort to new financing sources beyond the traditional ones. Thus, the 2008 financial crisis led firms' managers to reshape their strategies for firms' growth.

Derived from the aforementioned rationale, the current study attempts to test specific significant factors affecting Greek listed firms' performance. The research's analysis focuses on the period before and after the crisis of 2008, being extended from 2005 to 2019. The results will provide us with the appropriate knowledge and information related to the way firms' managers may take the necessary decisions for achieving better financial performance and implementing beneficial long-term strategies.

So far, the most important empirical issues arising can be summarised as follows:

- How leverage and firms' size, sovereign debt, and capital structure during the crisis affected the profitability of listed companies?
- How the non-conventional monetary policy implemented by ECB during the crisis affected listed firms' performance?

4.2. Sample

According to the European Commission (2013), the 2008 crisis affected all economies worldwide in a manifold way. Thus, this crisis couldn't leave firms' performance unaffected, regardless of their size, field of activity, level of leverage and the general economic situation of each state. Alternatively, firms faced a sharp fall in demand, which affected their activities, employment and capital movement.

The prescribed situation triggered the European Commission to proceed with necessary legislation in order to protect employees, provide the required solutions to EU members and operate in a precautionary way. These measures come in alignment with the implementation of unconventional monetary policy measures pursued by the ECB in order to boost economic activity.

During the 2008 crisis, both in Greece and other EU countries, the financial recession created imbalances and distortions within the EU, according to the competitiveness level of each economy. The economic crisis caused an increase in public expenses, which led in turn to fiscal instability in European countries, launched sovereign debt and spread the extent of the crisis in the financial credit system, affecting, in a direct way, firms' capital structure and, in turn, their performance.

The sample of our study consisted of firms of all sectors of activity listed on the Athens Stock Exchange, excluding the financial sector due to its particularity, for the period 2005–2019 (Table 1). Our data were extracted from the Reuters Refinitiv Workspace database, and the total sample accounts for 584 observations, corresponding to 49 listed companies. It is used the EVIEWS 10.0 econometric program in order to test all the specifications of our main model, applying panel data analysis.

Table 1. Companies' sample.

No	Entities	No	Entities	No	Entities
1	OTE	17	CENE	33	ENTERSOFT
2	AEGEAN	18	GR. PLASTICS	34	PLAISIO
3	OPAP	19	QUEST	35	IKTINOS
4	POWER CORP.	20	COCA COLA	36	INTRACOM HOL
5	JUMBO	21	AUTOHELLAS	37	BRIQ
6	MYTILINEOS	22	ELLAKTOR	38	PROFSYSTEM
7	HEL. PETRELEUM	23	THE SPORT	39	PAPOUTSANIS
8	TERNA ENERGY	24	KRIKRI	40	TECH. OLYMPIC
9	MOTOROIL	25	ATHEX	41	INTRACOM
10	LAMDA DEV.	26	FOURLIS	42	ALUMIL
11	VIOHALCO	27	THRACE PLASTICS	43	LOULIS MILLS
12	TITAN	28	IASO CLINIC	44	PETROPOULOS
13	GEK TERNA	29	THES. WATER	45	ELTON
14	EYDAP	30	ATH. MEDICAL	46	SPACE
15	SARANTIS	31	AVAX	47	INFORM
16	PIR. PORT	32	FLEXOPACK	48	ASCOMP
				49	CENTRIC

5. Methodology—Model Specification

For purposes of empirical analysis, we tested four (4) specifications of our main model in order to estimate the impact of firms' size, leverage and non-conventional ECB policy on firms' performance. Each model's specification was built, taking into consideration four different proxies for measuring firms' profitability.

The main model used is the following:

$$Y_{t,i} = c_0 + c_1 * DER_{i,t} + c_2 * \ln\_size_{i,t} + c_3 * \ln\_TA\_ECB_t + c_4 * 10\_YBY_t + c_5 * crisis_t + \mu_i + u_{i,t} \quad (1)$$

where $Y_{t,i}$ corresponds to $EPS_{t,i}$, $ROE_{t,i}$, $ROA_{t,i}$ and $Q\_ratio_{t,i}$ depending on the specification used in each case under examination.

More specifically:

Earnings per Share (EPS): EPS is calculated as a company's profit divided by the outstanding shares of its common equity. The outcome serves as a measure of a firm's profitability. The higher the EPS value, the more profitable the firm. The formula of EPS's computation is: $EPS = \frac{Net\ Income - Preferred\ Stocks\ Dividends}{\text{Average outstanding shares of the firm}}$

In our case, $EPS_{t,i}$ is the Earnings per Share of firm i at time t ($i = 1, \ldots, 49$, $t = 2005, \ldots, 2019$).

Return on Equity (ROE): ROE is a financial indicator used to estimate the efficient management of own capital by firms in order to generate profit. Therefore, ROE is a measure to show how effectively a firm invests shareholders' equity and reserves. A high value of ROE tends to cause investors' wealth to increase. The formula of ROE's computation is: $ROE = \frac{Net\ Income}{\text{Shareholders' Equity}}$

For our model specification, $ROE_{t,i}$ is the Return on Equity of firm i at time t ($i = 1, \ldots, 49$, $t = 2005, \ldots, 2019$). When the ROE of a firm is lying between 15–20%, it is a good sign of the firm's profitability. In this study, the ROE of Greek listed firms' value ranges between 0–4%.

Return on Assets (ROA): ROA is a proxy of a firm's performance, and it indicates its profitability related to its total assets. It is a very important financial measure of the efficient management of a firm's assets to generate profit. A high value of ROA implies that a firm is more efficient and productive at managing its assets in order to generate profits, while a lower ROA indicates that the firm needs to change its investment strategy and address its assets to more efficient projects. The formula of ROA's computation is: $ROA = \frac{Net\ Income}{\text{Total Assets}}$

For the purposes of our specifications, $ROA_{t,i}$ is the Return on Assets of firm i at time t ($i = 1, \ldots, 49$, $t = 2005, \ldots, 2019$). Start-ups which invest more tend to indicate lower ROA values. Values of ROA above 5% are considered satisfactory.

Tobin's Q (Q ratio): The Q ratio, known as Tobin's Q, expresses the relationship between a firm's market value and its intrinsic value. Alternatively, the Q ratio is the valuation tool used to explore whether a firm is considered overvalued or undervalued. A low Q ratio takes values between 0 and 1. In such cases, the stock's price is considered undervalued, and thus, the replacement cost of assets is greater than the firm's stock price. On the other hand, if the Q ratio takes prices higher than 1, then the stock price is considered as overvalued as a firm's stock is more expensive than the firm's assets replacement cost. The formula of EPS's computation is: $Q\ ratio = \frac{Total\ Market\ Value}{Total\ Assets\ Value}$

For our empirical analysis purposes, $Q\_ratio_{t,i}$ is the Tobin Q of firm i at time t ($i = 1, \ldots, 49$, $t = 2005, \ldots, 2019$).

The independent variables used for all model's specifications in order to interpret firms' performance are the following:

Debt-to-Equity ratio (D/E): The D/E ratio compares a firm's total liabilities to its shareholder equity. The D/E ratio shows the way firms choose their financing (Vasiliou and Eriotis 2008). It is considered a leverage ratio as its value is a sign of a firm's leverage level. High values of the D/E ratio imply that high-levered firms and shareholders bear higher risks and vice versa.

In our model, $DER_{t,i}$ is the D/E ratio of firm i at time t ($i = 1, \ldots, 49$, $t = 2005, \ldots, 2019$), which is very important as it imprints each firm's level of leverage, which in turn affects the firm's profitability.

Firms' size: The size of a firm may positively affect its performance. Large firms have easier and cheaper access to international money and capital markets. This contributes to the reduced cost of issuing new debt. Similarly, large companies have stronger negotiating power over their suppliers and can achieve low costs of sales. There are two mainstream proxies for quantifying the size of a company. The first one takes coincides with total sales (Chen and Hammes 2004; Kayhan and Titman 2004; Rajan and Zingales 1995), while the second one is based on a firm's total assets (Chen and Hammes 2004; Flannery and Rangan 2006). For the purposes of our analysis, it is implemented the approach of total assets to measure firms' size.

A firm's size is approached by the natural logarithm ($\ln\_size_{i,t}$) of total assets of firm i at time t ($i = 1, \ldots, 49$, $t = 2005, \ldots, 2019$).

ECB Total Assets (TA_ECB): This variable refers to the ECB's total assets, derived from ECB financial statements, for the period under examination and consists of a proxy of the ECB's monetary policy, as the change in assets provides a clear sign of ECB monetary policy over time. More specifically, the ECB's extended asset purchase program (APP) and the repurchase of sovereign debt as an unconventional policy process may lead to significant changes to the ECB's financial statements.

More specifically, this variable consists of a monetary variable of crucial importance related to the implementation of ECB's unconventional policy in order to face economic instability and spillover effects in euro area countries. It is computed by the natural logarithm of the ECB's total assets as stated in the published financial statements at time t ($t = 2005, \ldots, 2019$).

Ten years bond yield (10_YBY): The Greek 10-year government bond yield is considered a benchmark for firms' borrowing costs and the weighted average cost of capital. A 10-year government bond yield gives a strong sign of the prevailing economic conditions of a country. When the borrowing cost is low, firms' access to capital markets is easy. In such cases, firms' cost of capital is reduced, and their stock price is increased. This condition leads firms to achieve better borrowing terms, increase their investment opportunities and generate more profit.

For our analysis purposes, 10_YBY_t is the long-term yield of a country's debt at time t ($t = 2005, \ldots, 2019$).

Crisis: It is a dummy variable used to control the influence of the implementation of the ECB's unconventional policy on firms' profitability. It takes a value of 0 for the period 2005–2011 and a value of 1 for the period 2012–2019. The reference point of this change is the date of the ECB's former president's statement related to the use of all available monetary tools in order to prevent further crisis transmission within the Euro area (July 2012).

$crisis_t$ is the dummy variable used for the effect on the global financial crisis and the Greek sovereign debt crisis at time t ($t = 2005, \ldots, 2019$) and is very important for our analysis as it splits our sample into two sub-periods; before and after the implementation of the unconventional monetary policy by the EBC. This separation of the sample can provide a clearer picture regarding the impact of factors affecting firms' performance before and after the interference of the ECB.

μ_i is each firm's fixed effects ($i = 1, \ldots, 49$).

$u_{i,t}$ is the stochastic term error of firm i at time t ($i = 1, \ldots, 49$, $t = 2005, \ldots, 2019$).

6. Empirical Results

In Table 2, we present the main descriptive statistics of all variables of the sample under consideration. According to the results, most of the variables seem to be skewed and indicate kurtosis. The natural logarithm of the ECB's total assets seems to be symmetric, while all other variables except EPS are right-skewed and exhibit a positive symmetry. As far as the kurtosis is concerned, all variables examined are leptokurtic, contrary to the ECB's total assets, which can be characterised as mesokurtic and follow a normal distribution.

Jarque–Bera normality test takes values more than 0 for all variables, so the null hypothesis that the variables follow a normal distribution is rejected, thus verifying the values of kurtosis and skewness analysed above.

The average value of all dependent variables lies near 0 (EPS, ROE, ROA and Q_ratio). This implies that there is no observed high deviation from the mean, evidence of absence of variability and outliers. This is an important outcome, as it is not observed intense variability for the total of the sample, where it is included in the financial crisis period. Nevertheless, the variability seems to be more acute in the case of predetermined factors, prominently for firms' size.

Table 2. Descriptive Statistics.

	DER	Ln_Size	Ln_TA_ECB	10_YBY	EPS	ROA	ROE	Q_ratio
Mean	1.049658	973.2439	2.675441	8.451733	0.248320	0.054722	0.083367	0.645047
Std. Dev	6.211510	2057.763	1.170617	7.842741	0.715923	0.357453	0.231941	0.799867
Skewness	24.72504	3.751930	0.513012	2.641242	−1.227462	23.70665	9.751106	5.059916
Kurtosis	624.0049	19.93701	2.107303	9.524240	31.34942	592.0150	169.4886	44.14927
Jarque-Bera	10,527,005	9480.073	56.64498	2158.154	22,975.69	9,617,182	787,937.1	49,530.65
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Observations	651	663	735	735	681	661	673	662

Table 3 presents the correlation coefficients of all independent and dependent variables. Our results indicate that no variable seems to indicate high values of correlation, either positive or negative. In such cases, it can be perceived that there does not seem to emerge any problem of multicollinearity for all specifications of the model examined.

Table 3. Correlation Matrix.

	DER	ln_Size	ln_TA_ECB	10_YBY	EPS	ROA	ROE	Q_Ratio
DER	1.000.000							
ln_size	0.160397	1.000000						
lnTA_ECB	0.107924	0.002189	1.000000					
10_YBY	−0.033572	−0.065761	−0.113151	1.000000				
EPS	−0.084126	0.244443	−0.008792	−0.082069				
ROA	−0.205962	0.183864	−0.092181	−0.094052	0.531957	1.000000		
ROE	−0.146290	0.299990	−0.137695	−0.106633	0.663813	0.837003	1.000000	
Q_ratio	−0.247562	0.216890	−0.147470	−0.169170	0.327863	0.669526	0.644679	1.000000

6.1. Econometric Tests

6.1.1. Unit Root Test

Before proceeding to a panel data analysis, we test stationarity for all series. For testing for stationarity, we applied the Levin, Lin & Chu, Pesaran & Shin, Dickey–Fuller and Phillips–Perron stationarity tests as the most important and often used tests in the bibliography. The application of all stationarity tests was performed to examine if our series have a unit root to provide accurate and reliable results.

The results presented in the next table (Table 4) show that all variables, except the natural logarithm of firms' size and total assets of the ECB, indicate stationarity.

Table 4. Unit Root tests.

	EPS				ROE			
Method	**Statistic**	**Prob. ***	**Cross-Sections**	**Obs**	**Statistic**	**Prob. ***	**Cross-Sections**	**Obs**
Levin, Lin & Chu t	67.9947	1.0000	49	632	−17.7175	0.0000	48	622
Im. Pesaran and Shin W-stat	4.74459	1.0000	48	629	−7.40125	0.0000	47	619
ADF—Fisher Chi-square	160.011	0.0001	49	632	184.716	0.0000	48	622
PP—Fisher Chi-square	176.983	0.0000	49	632	197.234	0.0000	48	622
	ROA				**Q_ratio**			
Method	**Statistic**	**Prob. ***	**Cross-Sections**	**Obs**	**Statistic**	**Prob. ***	**Cross-Sections**	**Obs**
Levin, Lin & Chu t	−8.37233	0.0000	47	612	−11.6131	0.0000	47	613
Im. Pesaran and Shin W-stat	−5.84394	0.0000	46	609	−5.33958	0.0000	46	610
ADF—Fisher Chi-square	178.064	0.0000	47	612	149.623	0.0002	47	613
PP—Fisher Chi-square	187.007	0.0000	47	612	192.087	0.0000	47	613
	DER				**ln_size**			
Method	**Statistic**	**Prob. ***	**Cross-Sections**	**Obs**	**Statistic**	**Prob. ***	**Cross-Sections**	**Obs**
Levin, Lin & Chu t	−188.082	0.0000	46	593	−4.00048	0.0000	47	612
Im. Pesaran and Shin W-stat	−54.6483	0.0000	46	593	−1.59376	0.0555	46	609
ADF—Fisher Chi-square	147.055	0.0002	46	593	108.074	0.1521	47	612
PP—Fisher Chi-square	169.130	0.0000	46	593	131.877	0.0061	47	612
	ln_TA_ECB				**10_YBY**			
Method	**Statistic**	**Prob. ***	**Cross-Sections**	**Obs**	**Statistic**	**Prob. ***	**Cross-Sections**	**Obs**
Levin, Lin & Chu t	1.47529	0.9299	49	686	−11.8426	0.0000	49	686
Im. Pesaran and Shin W-stat	8.78931	1.0000	49	686	−6.20215	0.0000	49	686
ADF—Fisher Chi-square	9.85204	1.0000	49	686	176.774	0.0000	49	686
PP—Fisher Chi-square	6.16776	1.0000	49	686	178.480	0.0000	49	686

* It refers to each level of statistical significance: $p < 0.01$ (1% significance level), $p < 0.05$ (5% significance level), $p < 0.1$ (10% significance level).

In such cases, we tested for the first differences of non-stationary series in order to transform them into stationary ones. The results presented in Table 5 verify that the first differences of both series are stationary, allowing us to proceed to the models' estimation.

Table 5. Unit Root tests.

	D(ln_TA_EBC)				D(ln_Size)			
Method	**Statistic**	**Prob. ***	**Cross-Sections**	**Obs**	**Statistic**	**Prob. ***	**Cross-Sections**	**Obs**
Levin, Lin & Chu t	−26.1842	0.0000	49	588	−12.4099	0.0000	44	505
Im. Pesaran and Shin W-stat	−15.6643	0.0000	49	588	−9.39500	0.0000	44	505
ADF—Fisher Chi-square	415.753	0.0000	49	588	264.268	0.0000	44	505
PP—Fisher Chi-square	197.000	0.0000	49	637	422.061	0.0000	44	551

* It refers to each level of statistical significance: $p < 0.01$ (1% significance level), $p < 0.05$ (5% significance level), $p < 0.1$ (10% significance level).

6.1.2. Hausman Test

In our analysis, we use panel data, combining together cross-section data and time series. The test of the unobserved terms expressing the cross-section and times series effect is carried out by choosing between the fixed effects and the random effects model.

More specifically, the fixed effects model provides the possibility for the fixed term to alternate between cross-section observations resulting in the use of all data using dummy variables. If this is the case, the OLS method is applied. Therefore, in such a way, the test for the variables' statistical significance becomes more reliable as the effects of the variables that were omitted are included in the fixed term.

On the other hand, when testing the random effects model, the fixed term is considered a random variable, and thus, the GLS method is applied. In such cases, we assume that unobserved effects and independent variables are not correlated.

To determine whether the fixed effects or random effects model will be used, we used the Hausman Test. More specifically, according to the Hausman Test, we tested the null hypothesis that the random effects model is valid. On the contrary, in the case of rejecting the null hypothesis (H_0), the regression is estimated using the fixed effects model.

Table 6 presents the results of the Hausman test for all specifications of the model tested in order to end up whether the estimation of each specification will be done through the fixed or random effects method.

Table 6. Hausman Tests.

Correlated Random Effects—Hausman Test									
Equation: EQEPS					**Equation: EQROE**				
Test Cross-Section Random Effects					**Test Cross-Section Random Effects**				
Test Summary	**Chi-Sq.**	**Statistic**	**Chi-Sq. d.f.**	**Prob. ***	**Test Summary**	**Chi-Sq.**	**Statistic**	**Chi-Sq. d.f.**	**Prob. ***
Cross-section random		6.727611	5	**0.2417**	Cross-section random		0.560475	5	0.9897
Variable	Fixed	Random	Var(Diff.)	Prob.	Variable	Fixed	Random	Var(Diff.)	Prob.
DER	−0.21389	−0.177232	0.000473	0.0919	DER	−0.028541	−0.02913	0.000011	0.8583
D(ln_size)	0.138647	0.138839	0.000012	0.9551	D(ln_size)	0.039625	0.039589	0.000000	0.9398
D(ln_TA_ECB)	0.387494	0.393170	0.000045	0.3961	D(ln_TA_ECB)	0.086578	0.086936	0.000001	0.7066
10_YBY	−0.00807	−0.008269	0.000000	0.2877	10_YBY	−0.003384	−0.00338	0.000000	0.9664
crisis	−0.10012	−0.094122	0.000020	0.1801	crisis	−0.080290	−0.07988	0.000000	0.5200
Equation: QROA					**Equation: EQQ_Ratio**				
Test Cross-Section Random Effects					**Test Cross-Section Random Effects**				
Test Summary	**Chi-Sq.**	**Statistic**	**Chi-Sq. d.f.**	**Prob. ***	**Test Summary**	**Chi-Sq.**	**Statistic**	**Chi-Sq. d.f.**	**Prob. ***
Cross-section random		22.591725	5	**0.0004**	Cross-section random		3.810531	5	0.5770
Variable	Fixed	Random	Var(Diff.)	Prob.	Variable	Fixed	Random	Var(Diff.)	Prob.
DER	−0.12054	−0.003533	0.000622	0.0000	DER	−0.142412	−0.16036	0.00173	0.1721
D(ln_size)	0.000447	−0.000052	0.000031	0.9284	D(ln_size)	0.302538	0.302626	0.000004	0.9636
D(ln_TA_ECB)	−0.03036	−0.037446	0.000091	0.4566	D(ln_TA_ECB)	0.207779	0.208225	0.000015	0.9086
10_YBY	−0.00116	−0.001016	0.000000	0.5312	10_YBY	−0.019232	−0.01918	0.000000	0.6069
crisis	−0.05833	−0.066438	0.000036	0.1750	crisis	−0.357651	−0.35429	0.000007	0.2035

* It refers to each level of statistical significance: $p < 0.01$ (1% significance level), $p < 0.05$ (5% significance level), $p < 0.1$ (10% significance level).

As we can see from Table 6, the model's specifications, with dependent variables EPS, ROE and Q ratio (respectively in the first, second and fourth models) reject the null hypothesis, meaning that the fixed effects model better explains those three (3) specifications model's estimations as the *p*-value is greater than 5% ($p > 0.05$).

On the contrary, the third specification model, where the depended variable is ROA, can be better explained through the use of the random effects model, as it accepts the null hypothesis and the *p*-value is less than 5% ($p = 0.0004 < 0.05$).

6.1.3. Autocorrelation

Autocorrelation refers to the degree of correlation of the same variables between two successive time intervals. It measures how the lagged version of the value of a variable is related to the original version of it in a time series. In order to test for autocorrelation, we followed the Wooldridge methodology and used the Wald test. In the next table (Table 7), we can see that for all model specifications, the null hypothesis for non-autocorrelation is rejected, and the alternative hypothesis is accepted. This outcome indicates the existence of autocorrelation, as the values exceed 0. Thus, the autocorrelation has to be corrected in the specification of all models.

Table 7. Wald Test.

	WALDEPS			WALDROE			ROA			WALDQ_Ratio		
Test Statistic	**Value**	**df**	**Prob. ***	**Value**	**df**	**Prob.**	**Value**	**Df**	**Prob. ***	**Value**	**df**	**Prob.**
T-stat.	33.3125	531	0.0000	50.23408	529	0.0000	9.25738	518	0.0000	79.59503	531	0.000
F-stat.	1109.72	(1.531)	0.0000	2523.463	(1.529)	0.0000	85.699	(1.518)	0.0000	6335.370	(1.531)	0.000
Chi-square	1109.72	1	0.0000	2523.463	1	0.0000	85.699	1	0.0000	6335.370	1	0.000
Null Hypothesis: C(1) = −0.5												
Null Hypothesis Summary:												
Normalized Restriction (=0)	Value	Std. Err.		Value	Std. Err.		Value	Std. Err.		Value	Std. Err.	
0.5 + C(1)	1.2494	0.03751		1.25655	0.02501		0.4026	0.043490		1.220724	0.01534	

* It refers to each level of statistical significance: $p < 0.01$ (1% significance level), $p < 0.05$ (5% significance level), $p < 0.1$ (10% significance level).

6.2. Regression Analysis

To correct autocorrelation, various tests are applied in all regressions, differentiating the variance-covariance method. More specifically, as it can be observed from Tables 8–11, the methods used are the Ordinary (Column 1) & (Column 2) for comparison reasons with the other two methods: White Period (Column 3) & (Column 4) and Period SUR (Column 5) & (Column 6). The purpose of using the last two methods (White Period and Period SUR) is to correct for autocorrelation. Once correcting all model specifications for autocorrelation, we can proceed to all models' specifications estimation.

6.2.1. 1st Model Specification Output: EPS as Proxy Variable of Profitability

According to the first model specification, earnings per share (EPS) are considered the proxy variable for measuring firms' profitability.

The results of the empirical approach of this model are presented in Table 8. More specifically, the negative impact of the D/E ratio and 10-year government bonds on firms' profitability can be observed, regardless of the method used.

Therefore, for the period under review, an increase in the leverage of Greek companies may lead, on average, to a decrease in their profitability. These results agree with the studies of Donaldson (1961); Rajan and Zingales (1995); Fama and French (2000); Baker and Wurgler (2002); Chen and Hammes (2004); Voulgaris et al. (2004); Eriotis et al. (2007); Kahle and Stulz (2013); Iqbal and Kume (2014) and Burriel and Galesi (2018), while contradicting the studies by Harris and Raviv (1991); Drobetz and Fix (2005) and Ross et al. (2013).

In the case of the negative statistically significant relationship between 10-year bond yields and firms' profitability, this can be explained by the fact that an increase in interest rates will lead firms to borrow less and invest less. In such cases, the reduced investments are estimated to result in lower profitability. Thus, the implementation of the QE policy by the ECB would be necessary in order to inject liquidity, through the banking system, into the real economy and hence to change the terms and balances of overall lending (Rodnyansky and Darmouni 2017). These results are aligned with those of the studies of Baker and Wurgler (2002); Gangeni (2006); Ross et al. (2013); Kahle and Stulz (2013); Akbar et al. (2013), in contrast to Riahi-Belkaoui (2002); Harris and Raviv (1991) and Acharya et al. (2019) studies.

On the other hand, there is a positive statistically significant impact of firms' size and the ECB's total assets on firms' profitability. That implies that the larger the firm, the more possible it is to generate profits. Rajan and Zingales (1995); Fama and French (2000); Voulgaris et al. (2004); Kayhan and Titman (2004) and Chen and Hammes (2004) produced a similar output, contrary to Harris and Raviv's (1991) study.

Table 8. 1st Model's Specification Regression Analysis.

Dependent Variable: EPS		1	2	3	4	5	6
C	COEF	0.44714	0.461079	0.44714	0.461079	0.44714	0.461079
	PROB *	0	0	0	0	0	0
DER	COEF	−0.177232	−0.213892	−0.177232	−0.213892	−0.177232	−0.213892
	PROB *	0	0	0.0115	0.0311	0.0127	0.0147
Δ(ln_size)	COEF	0.138839	0.138647	0.138839	0.138647	0.138839	0.138647
	PROB *	0.0212	0.0216	0.0047	0.0044	0.0249	0.0306
Δ((ln_TA_ECB)	COEF	0.39317	0.387494	0.39317	0.387494	0.39317	0.387494
	PROB *	0.0101	0.0114	0.0015	0.0019	0.0016	0.0029
10_YBY	COEF	−0.008269	−0.008074	−0.008269	−0.008074	−0.008269	−0.008074
	PROB *	0.0095	0.0115	0.0027	0.0032	0.0024	0.0044
crisis	COEF	−0.094122	−0.100117	−0.094122	−0.100117	−0.094122	−0.10012
	PROB *	0.0746	0.0589	0.2284	0.2073	0.2133	0.2049
Period included		14	14	14	14	14	14
Cross-Section included		47	47	47	47	47	47
Total Panel Obs		584	584	584	584	584	584
R-squared		0.59713	0.370964	0.59713	0.370964	0.59713	0.370964
Time effect		None	None	None	None	None	None
Cross-Section effect		Random	Fixed	Random	Fixed	Random	Fixed
Coef. covariance method		Ordinary	Ordinary	White period	White period	Period SUR	Period SUR

* It refers to each level of statistical significance: $p < 0.01$ (1% significance level), $p < 0.05$ (5% significance level), $p < 0.1$ (10% significance level).

Moreover, the positive impact of the delta of the ECB asset logarithm on firms' profitability implies that the increase in the size of the ECB's balance sheet leads firms' profitability to increase. This confirms the prevailing view that the ECB's intervention has led to a reduction in systemic risk and restoration of financial conditions. This comes in agreement with the studies by Kotios and Galanos (2010); Akbar et al. (2013); Kahle and Stulz (2013); Iqbal and Kume (2014); Burriel and Galesi (2018); Katsampoxakis et al. (2015, 2018) and Basdekis et al. (2020), while it contradicts those of Ross et al. (2013) and Acharya et al. (2019).

Nevertheless, there cannot be verified any essential difference between the two sub-periods examined (before and after the crisis), as the dummy variable does not seem to have any statistically significant impact on profitability, regardless of the method followed at the 5% significance level. However, at the 10% significance level, it is observed a distinction between the two sub-periods because of unconventional policy implementation by ECB, according to the ordinary method.

6.2.2. Second Model Specification Output: ROE as Proxy Variable of Profitability

Table 9 summarises the results of factors affecting firms' profitability, using ROE as a proxy variable for measuring profitability. In the cases of the way capital structure (negative), bond yields (negative), the ECB's total assets (positive) and firms' size (positive) affect firms' profitability, the results seem to be similar to those of the first specification model, and therefore, they are aligned with the aforementioned studies.

However, the most important finding is that in all cases examined, the implementation of unconventional policies by the ECB does contribute to the differentiation between the two periods, before and after the ECB's interference. This result is a clear sign that

the implementation of this strategy contributes decisively to the empowerment of firms' performance and sustainability.

Table 9. 2nd Model Specification Regression Analysis.

Dependent Variable: ROE		**1**	**2**	**3**	**4**	**5**	**6**
C	COEF	0.161855	0.159983	0.161855	0.159983	0.161855	0.159983
	PROB *	0	0	0	0	0	0
DER	COEF	−0.029134	−0.028541	−0.029134	−0.028541	−0.029134	−0.028541
	PROB *	0.0012	0.0029	0.115	0.1362	0.0486	0.1117
Δ(ln_size)	COEF	0.039589	0.039625	0.039589	0.039625	0.039589	0.039625
	PROB *	0.001	0.001	0.0007	0.0005	0.0007	0.001
Δ((ln_TA_ECB)	COEF	0.086936	0.086578	0.086936	0.086578	0.086936	0.086578
	PROB *	0.0042	0.0044	0.0001	0.0002	0.0002	0.0004
10_YBY	COEF	−0.003383	−0.003384	−0.003383	−0.003384	−0.003383	−0.003384
	PROB *	0	0	0	0	0	0
crisis	COEF	−0.079879	−0.08029	−0.079879	−0.08029	−0.079879	−0.08029
	PROB *	0	0	0.0013	0.0013	0.0009	0.0013
Period included		14	14	14	14	14	14
Cross-Section included		47	47	47	47	47	47
Total Panel Obs		583	583	583	583	583	583
R-squared		0.56566	0.558006	0.56566	0.558006	0.56566	0.558006
Time effect		None	None	None	None	None	None
Cross-Section effect		Random	Fixed	Random	Fixed	Random	Fixed
Coef. covariance method		Ordinary	Ordinary	White period	White period	Period SUR	Period SUR

* It refers to each level of statistical significance: $p < 0.01$ (1% significance level), $p < 0.05$ (5% significance level), $p < 0.1$ (10% significance level).

6.2.3. Third Model Specification Output: ROA as Proxy Variable of Profitability

The results of factors affecting firms' profitability, using ROA for measuring firms' profitability, are presented in the table below (Table 10).

ROA does not seem, in our case, to be the best measure to estimate the impact of factors affecting firms' profitability. This happens as, in most cases, there cannot be observed a statistically significant relationship between the predetermined variables of the model and ROA at any statistical significance level. This conclusion contradicts that of Lim and Rokhim (2021), using ROA as a proxy variable of firms' profitability. The only exceptions are the negative impact of leverage on profitability (for all methods only for fixed effects) and the negative impact of 10 tears bond yields (White Period method at 5% significance level and Period SUR at 10% significance level). Moreover, the discrimination between the two sub-periods because of the implementation of the ECB's unconventional policy is apparent only when using the ordinary method (random effects) and the White Period method (fixed effects), both at the 10% statistical significance level.

Table 10. 3rd Model Specification Regression Analysis.

Dependent Variable: ROA		1	2	3	4	5	6
C	COEF	0.107204	0.198994	0.107204	0.198994	0.107204	0.198994
	PROB *	0.0075	0	0.0071	0.007	0.0271	0
DER	COEF	−0.003533	−0.120537	−0.003533	−0.120537	−0.003533	−0.120537
	PROB *	0.8575	0.0002	0.816	0.0532	0.8472	0
Δ(ln_size)	COEF	-5.22×10^{-5}	0.000447	-5.22×10^{-5}	0.000447	-5.22×10^{-5}	0.000447
	PROB *	0.999	0.9911	0.9974	0.9832	0.9983	0.986
Δ((ln_TA_ECB)	COEF	−0.037446	−0.030357	−0.037446	−0.030357	−0.037446	−0.030357
	PROB *	0.7154	0.7685	0.6374	0.6637	0.6251	0.6836
10_YBY	COEF	−0.001016	−0.00116	−0.001016	−0.00116	−0.001016	−0.00116
	PROB *	0.6352	0.5902	0.0291	0.0007	0.0658	0.0895
crisis	COEF	−0.066438	−0.058327	−0.066438	−0.058327	−0.066438	−0.058327
	PROB *	0.0601	0.1035	0.1307	0.0704	0.1336	0.1532
Period included		14	14	14	14	14	14
Cross-Section included		46	46	46	46	46	46
Total Panel Obs		570	570	570	570	570	570
R-squared		0.6361	0.50994	0.6361	0.50994	0.6361	0.509943
Time effect		None	None	None	None	None	None
Cross-Section effect		Random	Fixed	Random	Fixed	Random	Fixed
Coef. covariance method		Ordinary	Ordinary	White period	White period	Period SUR	Period SUR

* It refers to each level of statistical significance: $p < 0.01$ (1% significance level), $p < 0.05$ (5% significance level), $p < 0.1$ (10% significance level).

6.2.4. Fourth Model Specification Output: Tobin's Q as Proxy Variable of Profitability

The results presented in Table 11 generally confirm the main findings derived from the first two model's specifications, applying EPS and ROE as proxy variables of firms' performance. Using Tobin's Q as a proxy variable for measuring firms' profitability, we can observe a negative statistically significant impact of firms' leverage and borrowing cost on their profitability, while the impact of their size is related positively. Moreover, there is a statistically significant relationship between ECB's total assets and profitability (White and SUR Period methods). Combining this result with dummy variable estimation, which distinguishes the whole sample into two sub-periods, it can be extracted that unconventional policy implemented by the ECB does contribute to the improvement of firms' performance and economic sustainability.

Table 11. 4th Model Specification Regression Analysis.

Dependent Variable: Q_Ratio							
		1	2	3	4	5	6
C	COEF	1.092988	1.059682	1.092988	1.059682	1.092988	1.059682
	PROB *	0	0	0	0	0	0
DER	COEF	−0.160357	−0.142412	−0.160357	−0.142412	−0.160357	−0.142412
	PROB *	0	0.0005	0.0146	0.0317	0.0106	0.0655
Δ(ln_size)	COEF	0.302626	0.302538	0.302626	0.302538	0.302626	0.302538
	PROB *	0	0	0	0	0	0

Table 11. *Cont.*

Dependent Variable: Q_Ratio							
		1	**2**	**3**	**4**	**5**	**6**
Δ((ln_TA_ECB)	COEF	0.208225	0.207779	0.208225	0.207779	0.208225	0.207779
	PROB *	0.1108	0.1117	0.0017	0.0017	0.0033	0.0041
10_YBY	COEF	−0.019175	−0.019232	−0.019175	−0.019232	−0.019175	−0.019232
	PROB *	0	0	0	0	0	0
Crisis	COEF	−0.354293	−0.357651	−0.354293	−0.357651	−0.354293	−0.357651
	PROB *	0	0	0.0018	0.0017	0.0013	0.0016
Period included		14	14	14	14	14	14
Cross-Section included		47	47	47	47	47	47
Total Panel Obs		584	584	584	584	584	584
R-squared		0.6718	0.612885	0.6718	0.612885	0.6718	0.612885
Time effect		None	None	None	None	None	None
Cross-Section effect		Random	Fixed	Random	Fixed	Random	Fixed
Coef. covariance method		Ordinary	Ordinary	White period	White period	Period SUR	Period SUR

* It refers to each level of statistical significance: $p < 0.01$ (1% significance level), $p < 0.05$ (5% significance level), $p < 0.1$ (10% significance level).

7. Conclusions

Firms' profitability is a particularly considerable research issue, which on the one hand, has been examined intensively, but on the other hand, there are still unexplored paths, and it is a critical issue which causes a permanent concern for managers, shareholders, employees and the state.

The current research focuses on the most important factors affecting firms' performance across all sectors of economic activity except the financial one, listed on the Athens Stock Exchange for the period 2005–2019. The factors selected for testing their impact on firms' profitability are the index of capital structure, sovereign debt rate and firms' size. However, the most important factor used to explain firms' performance is the delta of ECB assets as a proxy for measuring the ECB's interference in EMU countries in 2012 to secure economic stability and provide guarantees for economic growth. This special feature differentiates our study related to other similar ones. Another feature that our study contributes to the international literature is that we applied four (4) specifications of our ordinary model. Each specification corresponds to a different measure of firms' profitability as a dependent variable; earnings per Share (EPS), return on equity (ROE), return on assets (ROA) and Tobin's Q in order to achieve a clearer and more robust picture of factors affecting firms' performance, regardless the proxy of profitability measurement. Moreover, it would be very remarkable to perceive whether all ways of measuring profitability produced the same results.

In our study, we conducted the required diagnostic tests for all model specifications, whereas we also applied a panel data analysis, specified with random and fixed effects model, following the methods of ordinary, White Period and Period Sur.

It is of great interest that all model specifications, except the one using ROA as a dependent variable, lead to the same outcome. Thus, according to these results, there is a statistically significant negative impact of leverage and borrowing rates on firms' performance. That implies that an increase in the debt cost of capital leads firms to restrict their borrowing, and thus, firms suspend their investment projects which would assist them in achieving better performance. Furthermore, high-levered firms will cope with performance issues. Moreover, debt increases above the optimal debt level will lead firms to generate less profit.

Another interesting outcome of this study is that it finds a statistically significant positive relationship between firms' size and their profitability. More specifically, large firms are more favourable to creating profitable conditions, as they have a substantial capital raising advantage, economies of scope and scale and enjoy lower costs of capital. However, we consider the most important finding of our research to be the statistically significant positive impact of the ECB's total assets on firms' profitability. The expansion of the ECB's balance sheet contributes to boosting economic activity, as the ECB buys more assets under Large Scale Asset Purchases (LSAPs) as an instrument of an unconventional monetary policy known as qualitative easing (QE). The importance of the implementation of the QE policy by the ECB can be verified from the results of our empirical analysis, according to which there is observed a clear distinction between the method and extent the examined factors affect firms' profitability before and after the implementation of such policy.

This outcome is very remarkable and may be exploited by policymakers while drawing up policies to boost economic activity and back firms' performance, mainly in times of intense crises and deep recessions. Moreover, managers and shareholders would know that they will benefit from the intervention of official international institutions in ominous conditions in order to boost economies and keep economic activity safe and jobs intact.

The output of the current study generates new thoughts for the further expansion of this research. It will be interesting in the future to expand the analysis to a pan-European level since all member states of the Eurozone reclaimed this monetary instrument. In addition, in future work, we intend to examine also the impact of the COVID-19 pandemic and energy crisis on firms' profitability, taking into consideration the actions, statements and policies undertaken by European local governments and European institutions. Moreover, as a study extension, there could be examined the real effects of policy uncertainty due to economic recession, focusing mainly on the effects on the labour market and firms' investments, taking into consideration the intervention of international official bodies and institutions.

Author Contributions: All authors (C.B., A.C., E.G., I.K.) contributed equally to all parts of the paper. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

References

Acharya, V., I. Drechsler, and P. Schnabl. 2012. A Tale of Two Overhangs: The Nexus of Financial Sector and Sovereign Credit Risks. *Financial Stability Review* 16: 51–56.

Acharya, V., T. Eisert, C. Eufinger, and C. Hirsch. 2019. Whatever It Takes: The Real Effects of Unconventional Monetary Policy. *The Review of Financial Studies* 32: 3366–411. [CrossRef]

Akbar, S., S. Rehman, and P. Ormrod. 2013. The impact of recent financial shocks on the financing and investment policies of UK private firms. *International Review of Financial Analysis* 26: 59–70. [CrossRef]

Alarussi, A. S., and S. M. Alhaderi. 2018. Factors affecting profitability in Malaysia. *Journal of Economic Studies* 45: 442–58. [CrossRef]

Augustin, P., H. Boustanifar, J. Breckenfelder, and J. Schnitzler. 2018. Sovereign to Corporate Risk Spillovers. *Journal of Money, Credit and Banking* 50: 857–91. [CrossRef]

Baker, M., and J. Wurgler. 2002. Market timing and capital structure. *The Journal of Finance* LVII: 1–32.

Basdekis, H. 2010. European Union enlargement and equity cost: An empirical analysis on risk sharing and market integration. *International Journal of Financial Services Management* 4: 153–74. [CrossRef]

Basdekis, C., A. Christopoulos, I. Katsampoxakis, and A. Lyras. 2020. Profitability & Optimal Debt Ratio of the Automobiles & Parts Sector in the Euro Area. *Journal of Capital Market Studies* 4: 113–27. [CrossRef]

Basdekis, C., I. Katsampoxakis, and D. Moutsios. 2022. The Chronicle of Greek economy development and prospects since its entry in EMU. *International Journal of Financial Engineering and Risk Management* 15: 8174. [CrossRef]
Bernanke, B. S. 2020. The New Tools of Monetary Policy. *American Economic Review* 110: 943–83. [CrossRef]
Brigham, E., and M. C. Ehrhardt. 2011. *Financial Management: Theory and Practice*. Mason: South-Western Cengage Learning.
Burriel, P., and A. Galesi. 2018. Uncovering the heterogeneous effects of ECB unconventional monetary policies across euro area countries. *European Economic Review* 101: 210–29. [CrossRef]
Chen, Y., and K. Hammes. 2004. Capital Structure Theories and Empirical Results—A Panel Data Analysis. *Corporate Finance: Capital Structure & Payout Policies eJournal*. [CrossRef]
Christopoulos, A. G., I. G. Dokas, P. Kalantonis, and T. Koukkou. 2019. Investigation of financial distress with a dynamic logit based on the linkage between liquidity and profitability status of listed firms. *Journal of the Operational Research Society* 70: 1817–29. [CrossRef]
Cortes, G. S., G. P. Gao, F. B. Silva, and Z. Song. 2022. Unconventional Monetary Policy and Disaster Risk: Evidence from the Subprime and COVID–19 Crises. *Journal of International Money and Finance* 122: 102543. [CrossRef] [PubMed]
Daskalakis, N., and M. Psillaki. 2008. Do country or firm factors explain capital structure? Evidence from SMEs in France and Greece. *Applied Financial Economics* 18: 87–97. [CrossRef]
Dedola, L., G. Georgiadis, J. Gräb, and A. Mehl. 2020. Does a Big Bazooka Matter? Quantitative Easing Policies and Exchange Rates. *Journal of Monetary Economics* 117: 489–506. [CrossRef]
Dimitrić, M., I. T. Žiković, and A. A. Blecich. 2019. Profitability determinants of hotel companies in selected Mediterranean countries. *Economic Research-Ekonomska Istraživanja* 32: 1977–93. [CrossRef]
Donaldson, G. 1961. *Corporate Debt Capacity: A Study of Corporate Debt Policy and the Determination of Corporate Debt Capacity*. Boston: Division of Research, Harvard Graduate School of Business Administration. Available online: https://www.worldcat.org/search?q=au%3ADonaldson%2C+ (accessed on 23 May 2022).
Drobetz, W., and R. Fix. 2005. What are the Determinants of the Capital Structure? Evidence from Switzerland. *Swiss Journal of Economics and Statistics (SJES)* 141: 71–13, EconPapers.repec.org/RePEc:ses:arsjes:2005-i-3.
Eriotis, N., D. Vasiliou, and Z. Ventoura-Neokosmidi. 2007. How firm characteristics affect capital structure: An empirical study. *Managerial Finance* 33: 321–31. [CrossRef]
European Commission. 2013. *To Understand the Policies of the European Union How the European Union Works*. Brussels: European Publications Office.
Fama, E., and K. French. 2000. *Testing Tradeoff and Pecking Order Predictions About Dividends and Debt*. CRSP Working Paper No. 506. Chicago: Center for Research in Security Prices, Graduate School of Business, University of Chicago.
Farah, M., and N. Supartika. 2016. Factors Affecting Profitability of Small Medium Enterprises (SMEs) Firms Listed in Indonesia Stock Exchange. *Journal of Economics, Business and Management* 4: 132–37.
Flannery, M. J., and K. P. Rangan. 2006. Partial Adjustment toward Target Capital Structures. *Journal of Financial Economics* 79: 469–506. [CrossRef]
Frank, M. Z., and V. K. Goyal. 2003. Testing the Pecking Order Theory of Capital Structure. *Journal of Financial Economics* 67: 217–48. [CrossRef]
Gangeni, C. 2006. The Relationship between Capital Structure and the Financial Performance of the Firm. Master Thesis, University of Pretoria, Pretoria, South Africa.
Georgakopoulos, G., K. Toudas, E. Poutos, T. Kounadeas, and S. Tsavalias. 2022. Capital Structure, Corporate Governance, Equity Ownership and Their Impact on Firms' Profitability and Effectiveness in the Energy Sector. *Energies* 15: 3625. [CrossRef]
Gitman, L. J., and C. J. Zutter. 2012. *Principles of Managerial Finance*, 13th ed. Boston: Addison Wesley.
Graham, J., and C. Harvey. 2001. The Theory and Practice of Corporate Finance: Evidence from the Field. *Journal of Financial Economics* 60: 187–243. [CrossRef]
Graham, John, Mark T. Leary, and Michael R. Roberts. 2014. *Hoe Does Government Borrowing Affect Corporate Financing and Investment*. NBER Working Paper Series, Working Paper 20581. Cambridge: National Bureau of Economic Research Inc.
Harris, M., and A. Raviv. 1991. The Theory of Capital Structure. *The Journal of Finance* 46: 297–355. [CrossRef]
Iqbal, A., and O. Kume. 2014. Impact of Financial Crisis on Firms' Capital Structure in UK, France, and Germany. *Multinational Finance Journal* 18: 249–80. [CrossRef]
Kahle, K. M., and R. Stulz. 2013. Access to capital, investment, and the financial crisis. *Journal of Financial Economics* 110: 280–99. [CrossRef]
Katsampoxakis, I. 2021. ECB's unconventional monetary policy and spillover effects between sovereign and bank credit risk. *EuroMed Journal of Business* 17: 218–45. [CrossRef]
Katsampoxakis, I., H. Basdekis, and K. Anathreptakis. 2015. How firm and market characteristics affect profitability: An empirical study. *International Journal of Corporate Finance & Accounting* 2: 67–83. [CrossRef]
Katsampoxakis, I., C. Basdekis, and K. Anathreptakis. 2018. How do Greek crisis affect firms' profitability limits of leverage: An empirical study. In *Perspectives, Trends, and Applications in Corporate Finance and Accounting*. Edited by C. Zopounidis, A. Christopoulos and P. Kalantonis. Hershey: IGI Global Publications. [CrossRef]
Kayhan, A., and S. Titman. 2004. *Firms' Histories and Their Capital Structures*. NBER Working Paper No. w10526. Cambridge: National Bureau of Economic Research Inc.

Kotios, A., and G. Galanos. 2010. *Crisis of Economics or Crisis of Economic Science? Myths and Reality of a Dogmatic Dialogue*. Series of Research Papers. Karditsa: University of Thessaly.
Leary, M. T., and M. R. Roberts. 2008. Do Firms Rebalance Their Capital Structures? *Journal of Finance* 60: 2575–619. [CrossRef]
Lim, H., and R. Rokhim. 2021. Factors affecting profitability of pharmaceutical company: An Indonesian evidence. *Journal of Economic Studies* 48: 981–95. [CrossRef]
Parmansivan, T., and C. Subramanian. 2009. *Financial Management*. New Delhi: New Age International Pvt. Ltd.
Rajan, R. G., and L. Zingales. 1995. What Do We Know About Capital Structure? Some Evidence from International Data. *The Journal of Finance* 10: 1421–60. [CrossRef]
Riahi-Belkaoui, A. 2002. Productivity, Profitability, and Firm Value. *Journal of International Financial Management and Accounting* 10: 188–201. [CrossRef]
Rodnyansky, A., and O. M. Darmouni. 2017. The Effects of Quantitative Easing on Bank Lending Behavior. *The Review of Financial Studies* 30: 3858–87. [CrossRef]
Ross, S. A., R. W. Westerfield, and J. Jaffe. 2013. *Corporate Finance*, 10th ed. New York: McGraw-Hill/Irwin.
Shyam-Sunder, L., and S. C. Myers. 1999. Testing Static Tradeoff against Pecking Order Models of Capital Structure. *Journal of Financial Economics* 51: 219–44. [CrossRef]
Susilo, D., S. Wahyudi, and I. R. Demi Pangestuti. 2020. Profitability determinants of manufacturing firms in Indonesia. *International Journal of Economics and Business Administration* 8: 53–64. [CrossRef]
Toudas, K. 2018. The international standards on auditing as a convergence parameter between US GAAP and IFRS. *Corporate Board: Role, Duties and Composition* 14: 15–22.
Vasiliou, D., and N. Eriotis. 2008. *Financial Administration: Theory and Practice*. Athens: Rosili, pp. 34–72.
Vasiliou, D., N. Eriotis, and S. Papathanasiou. 2008. Technical trading profitability in Greek stock market. *The Empirical Economics Letters* 7: 749–56.
Voulgaris, F. A., D. Asteriou, and G. Agiomirgianakis. 2004. Size and Determinants of Capital Structure in the Greek Manufacturing Sector. *International Review of Applied Economics* 18: 247–62. [CrossRef]