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THE EFFECTS OF INTANGIBLE ASSETS ON COMPANY PERFORMANCE IN CRISIS PERIOD: THE CASE OF TURKEY[1]

MADDİ OLMAYAN DURAN VARLIKLARIN KRİZ DÖNEMİNDE ŞİRKET PERFORMANSINA ETKİSİ: TÜRKİYE ÖRNEĞİ

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Abstract

Despite the lack of physical form, intangible fixed assets can yield unique, identifiable advantages, crucial in goods production and service provision. During periods of economic upheaval, these non-physical investments demonstrated resilience, even exhibiting growth in some contexts, thus featuring their economic significance. This study scrutinizes the impact of intangible fixed assets on company profitability and financial performance under varying economic conditions and within existing accounting policies. Using Dynamic Panel Data Analysis and the Arellano and Bover/Blundel and Bond System Generalized Moments Method Estimator, the study offers pertinent recommendations. Our findings confirm that intangible fixed assets positively influence return on equity and net profit margin during crisis periods.

Keywords: Intangible Assets, Financial Performance, Dynamic Panel Data Analysis

JEL Classification: C33, G01, G17

Öz

Fiziksel bir formun eksikliğine rağmen, maddi olmayan duran varlıklar, mal üretiminde ve hizmet sunumunda kritik öneme sahip, benzersiz ve tanımlanabilir avantajlar sağlayan varlıklardır. Küresel mali kriz ve takip eden durgunluk dönemlerinde fiziki sermaye yatırımları neredeyse tüm dünyada azalırken, fiziki olmayan varlık yatırımları nispi olarak düşük bir gerileme kaydetmiş, bazı ekonomilerde artış göstererek ekonomik yapı içindeki konumunu güçlendirmiştir. Bu çalışma, değişken ekonomik koşullar altında ve mevcut muhasebe politikaları çerçevesinde, maddi olmayan duran varlıkların firmaların karlılık ve finansal performansı üzerindeki etkisini incelemektedir. Dinamik Panel Veri Analizi Yöntemlerinden Arellano ve Bover/ Blundel ve Bond Sistem Genelleştirilmiş Momentler Yöntemi Tahmincisi sonuçlarına yer verilerek tespit edilen bulgular doğrultusunda önerilerde bulunulmuştur. Bulgularımız, maddi olmayan duran varlıkların kriz dönemlerinde öz kaynak karlılığını ve net kar marjını olumlu yönde etkilediğini göstermektedir.

Anahtar Kelimeler: Maddi Olmayan Duran Varlıklar, Finansal Performans, Dinamik Panel Veri Analizi

JEL Sınıflandırması: C33, G01, G17

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1.Introduction

According to the International Valuation Standards, intangible fixed assets are characterized as assets that provide economic characteristics, rights, and privileges to their owners, despite not having a physical presence. They usually generate income for their owners. These assets can be divided into the following categories (p.137):

• Rights (e.g., supply contracts, distribution contracts, procurement contracts),

• Relationships (e.g., assembled workforce, customer relations, supplier relations),

• Grouped intangible assets (e.g., goodwill),

• Intellectual property rights (e.g., brand or trade names, copyrights, patents, trademarks, trade secrets, or know-how).

Another definition asserts that intangible fixed assets are "assets that, while lacking a physical entity, can generate distinguishable and definable benefits. These assets can be used in producing goods, service delivery, to the advantage of third parties, or exploited by their owner" (Örten, Kaval, and Karapınar, 2008: 590).

According to the definitions given above, two basic features of intangible assets emerge: the absence of a physical structure and their ability to benefit the owner/organization currently or in the future.

Intangible fixed assets offer several advantages to businesses. They provide a competitive advantage, but as these assets are protected by property law, exhibit high originality, and are challenging to replicate, companies can obtain a competitive edge through their rare and hard-to-imitate assets (Andonova and Ruiz-Pava, 2016: 4379). Barney (1991) proposed four main criteria to discern which resource attributes can provide a competitive advantage: the resource must add positive value to the company, must be unique and scarce among current and potential competitors, and must be inimitable and irreplaceable (Dumitrescu, 2012: 548; Okemwa, 2011: 146). Intangible fixed assets encapsulate all four of these attributes. Another study posited that a company's investment in intangible fixed assets is a crucial management decision that could generate sustainable performance differences between companies. Hence, high intangible assets can yield a significant competitive advantage for companies (Ipate and Parvu, 2016: 97).

In today's global competitive environment, rapid developments in environmental factors can push businesses into crises. Economic crises occur intermittently globally and within our country (Erol, 2010: 166).

Due to internal and external conjunctures, economic crises can be characterized as sudden and unexpected changes in the behavior and activities of decision-making units in the economy, namely households or individuals, companies, and the government. In any given country, economic crises can be described as "macroeconomic upheavals that arise unexpectedly or due to inadequate or mismanaged choices during a specific period." Chronic and high inflation, devaluation, radical governmental monetary policies, imbalances in foreign trade, and increasing internal and external debt are the primary catalysts for economic crises (Apak and Aytaç, 2009: 1).

Many debate whether the central point of economic crises is the phenomenon of globalization. In contrast, others argue that due to the nature of capitalism, crises can inevitably emerge along with the dynamism it creates. Globalization promotes the spread of trade and facilitates the global-scale movement of capital and production in various dimensions. As a result, a crisis in one country's economy can, over time, affect other countries' economies, either through the globalization of trade or the globalization of capital movements, making its spread or contagion inevitable (Engin and Göllüce, 2016: 28).

Economic crises substantially affect enterprises' financial structures at a micro level and the national economy at a macro level. One of the most significant impacts of crises on businesses is the loss of equity caused by devaluations during crisis periods. This loss mainly affects businesses facing resource shortages in the current period. On the one hand, an economic crisis triggers changes in business indicators, such as input, production, price, investment decisions, employment opportunities, and capacity utilization rates. On the other hand, it leads to adverse outcomes such as damaging shareholders' trust, reductions in sales, negative impacts on profit and profitability, decreased productivity, loss of prestige, and deterioration of relationships with the outside world (Tuğay, Dalğar, and Tekşen, 2014: 2-3).

In this context, the 2008 Global Economic Crisis, considered the second largest economic crisis after the 1929 Economic Depression, profoundly affected economies and businesses worldwide, including our country. The Turkish economy was primarily affected by the 2008 crisis through four different channels, reflected as a decrease in foreign demand, a decline in foreign credit, a contraction in domestic credit, and a loss of confidence in the economy (Aras, 2010: 99). Problems in domestic and foreign demand impacted the Turkish economy, and as a result, data on production, exports, and unemployment were negatively affected. The uncertainties stemming from the deteriorated confidence environment and an increased perception of risk and contraction in credit opportunities

led to a decline in economic activities (Göze Kaya and Durgun Kaygısız, 2015: 180). Factors such as the tightening of global credit taps, the increase in credit costs, and the contraction of export markets resulted in significant losses in the real sector (Kılıç and Özdemir, 2011: 184).

Performance analysis (measurement) in businesses involves making specific calculations and comparisons to determine how closely businesses have met their goals or how far they have deviated from them. This process identifies the positive or negative deviations based on current standards, the averages of the sector in which the business operates, and the business's status in previous years (Aktaş, 2017: 4).

In the contemporary world, rapid and continuous changes in economic, technological, and social fields substantially impact businesses. Adapting to these changes requires businesses to measure and improve performance (Kahraman, 2009: 413).

Studies suggest that businesses have three main performance measurements: financial performance, non-financial performance, and performance measurement based on management accounting. In comprehensive evaluations like measuring a business's overall performance, non-financial performance indicators and performance measurements based on management accounting are also used in addition to financial criteria. Among these three methods, financial performance indicators are most commonly used (Aktaş, 2017: 4). The primary reason these techniques are favored by management today is that financial performance measures provide precise and objective results (Gökbulut, 2009: 44). Performance measurement through financial analyses aids managers in making future-oriented management and investment decisions, assists lending institutions in determining the creditworthiness of the business, and helps investors evaluate their investment preferences related to the business (Alparslan et al., 2015: 319).

Purpose of the study; to investigate whether intangible assets affect the profitability and financial performance of businesses in different economic conjunctures, taking into account the accounting policies in force, and to make suggestions in line with the research findings. Dynamic Panel Data Analysis was used as the method of the research. In this context, unit root tests were performed and suggestions were made in line with the findings by including the results of Arellano and Bover/Blundel and Bond System Generalized Moment Method Estimator, which are among the Dynamic Panel Data Analysis Methods. Since there are not many studies in the literature on the effect of intangible assets on company profitability, the study was created within the framework of this subject. In addition, in the literature reviews, it was seen that the subject was mostly investigated using regression analysis. For this reason, the Dynamic Panel Data Analysis method, which is a more up-to-date method and provides stronger and more accurate results than the regression analysis method, was preferred as the research method. Since the number of studies using the Dynamic Panel Data Analysis method is quite low, it is thought that the study will contribute to the literature in this sense.

For this purpose, a literature review was conducted in the second part of the study. In the methodology section, which is the third part of the study, information is given about the scope and periods of the research and Dynamic Panel Data as the analysis method. In the fourth part of the study, the research findings were evaluated. The fifth chapter, the last part of the study, consists of discussion, conclusions and suggestions.

2.Literature Review

Tahat, Ahmed, and Alhadab (2018) conducted a study encompassing the 1995-2015 period of 150 non-financial companies listed on the London Stock Exchange (UK FTSE). They gathered compelling evidence supporting the role of intangible assets in boosting company performance. This study broadly categorized intangible assets under goodwill and research & development (R&D). The research findings highlighted that goodwill positively impacts companies' present and future financial performance, whereas R&D investments positively affect the companies' future financial performance.

Another study conducted by Andonova and Ruiz-Pava (2016) assessed industry-related factors of Colombian companies from 1995 to 2012. They found that intangible fixed assets played a significant role in some performance factors of companies. The research findings endorsed that intangible fixed assets catalyze competitive advantage in a developing environment. Consequently, the impact of intangible fixed assets on the total variance explained by company performance is nearly 60% of the effect attributed to industry-related factors.

Fındık and Ocak (2016) investigated the impact of intangible fixed assets on the financial performance of companies listed on the Borsa Istanbul (BIST) National All Index (XUTUM). Using the panel data analysis fixed effects method for the 2005-2013 period, they found that as the ratio of intangible assets to the total assets owned by the companies (lnIA) increased, so did the return on assets (ROA_{it}). Moreover, the increase in the annual investment amount of the companies in intangible fixed assets (lnIA) also enhanced the return on assets (ROA_{it}).

Gamayuni (2015) studied companies listed on the Indonesian Stock Exchange and discovered a positive and significant relationship between intangible fixed assets and return on assets. In this study, the difference between

companies' market value and book value was used as an indicator when calculating intangible fixed assets. In contrast, Return on Assets (ROA) was used as a performance measure.

Haji and Mohd Ghazali (2018) scrutinized the role of intangible fixed assets and intangible liabilities (including environmental spills, air pollution, and poor corporate reputation) in the company performance of Malaysian companies from 2008 to 2013. They concluded that companies with intangible fixed assets have superior financial performance to those with intangible liabilities. Moreover, intangible fixed assets had a significant positive effect on companies' financial performance, while intangible liabilities had a significant negative impact.

Ghapar, Brooks, and Smyth (2014) researched the correlation between a company's patent applications and financial performance. The study spanned the 1994-2008 period for 1,694 businesses in Malaysia, employing various estimation methods like the fixed effects method, random effects method, and Generalized Method of Moments (GMM). The results indicate that patent-related activities positively influence businesses' profit margins.

Kutukız (2006) analyzed how activities that could be considered intangible assets affected profit over five years. The study used data from two mid-sized private businesses in the tourism sector. The study employed the percentage method and correlation method to identify relationships. As a result, a strong positive relationship was discovered between customer satisfaction, the ratio of loyal customers, room sales price, number of employees, and staff turnover rate. Furthermore, a medium-level negative relationship was found between customer satisfaction and occupancy rate. A strong positive relationship was determined between net profit and factors such as staff turnover rate, the number of fairs attended, the level of education, and customer satisfaction. Conversely, a negative relationship was identified with fair expenditures, capital, and the number of sales centers.

In a study involving 18,237 businesses in the United States conducted by Villilonga (2004), the findings corroborated that intangible assets play a substantial role in sustaining a company’s competitive advantage. It was determined that increased investment in intangible assets strengthens businesses' competitive advantages, whereas less investment leads to losing these advantages.

Upon reviewing relevant literature, it is apparent that studies focus on the relationship between patents and R&D - components of intangible fixed assets - with financial performance rather than considering intangible fixed assets as a balance sheet item. Also, numerous studies investigate the relationship between intangible fixed assets and companies' market value. However, there is a scarcity of both domestic and international research related to the relationship between intangible fixed assets and financial performance. This study aims primarily to fill this gap in the literature. Another aspect that sets this study apart from previous research is its use of the Dynamic Panel method to measure the lagged effect of intangible fixed assets on financial performance. Thus, an attempt was made to determine after how many periods (three months, six months, nine months, etc.) the investments in intangible fixed assets made by businesses contributed to the business profit.

3. Methodology

The research sample was drawn from the BIST100 Index, specifically the companies listed as of May 2015 when the research began. While the research was intended to include all companies in the BIST100, companies in banking, insurance, real estate investment partnerships, and holdings were excluded due to their unique balance sheet structures. Of the remaining companies, only 39 had traceable financial histories dating back to 1998, which was chosen as the starting point for analysis. However, four companies had gaps in their financial disclosure, leaving a final sample of 35 companies.

The analysis period was determined considering the 2008 Global Economic Crisis and the 2005 mandate for publicly traded companies to comply with Turkish Financial Reporting Standards (TFRS). As the Istanbul Stock Exchange's financial archive provides data dating back to 1998, that year was selected as the research period's starting point. Financial data from 2009 onwards is accessible through the Public Disclosure Platform. The dataset used in the study was compiled up to the 2017 annual data, the most recent data available. Therefore, the research period is 20 years, from 1998 to 2017.

The TFRS mandate in 2005 gave public companies' accounting records and financial statements an international quality. It also increased their capacity to represent accurate and up-to-date information. Considering these factors and drawing from similar studies in international literature, the study's first focus is comparing company performance in terms of intangible fixed assets before and after TFRS. Hence, the pre-TFRS period is 1998-2004, termed the "Period of Weak Accounting Policies Before TFRS," while the post-TFRS period is 2005-2017, termed the "Period of Strong Accounting Policies After TFRS."

The study's second focus is to compare companies' pre-and post-crisis performance in terms of intangible fixed assets. Therefore, the pre-crisis period covers the years 1998-2007, termed the "Pre-Economic Crisis Period," while the post-crisis period includes 2008 (when the global economic crisis began) through 2017, termed the "Period of Economic Crisis and After."

Following the determination of the research sample and period, the dependent and independent variables used in the study were selected, and the related ratios were calculated per-company basis. While numerous ratios can be calculated in ratio analysis, an excessive or insufficient number of ratios can compromise the analysis's success. The chosen ratios were influenced by studies on company financial performance and literature in the field, the capabilities of current financial statements (income statement and balance sheet), and the necessity for a sufficient number of independent variables in the study's Dynamic Panel Data analysis method to ensure robust explanatory power for the findings.

Table1: Dependent and Independent Variables

Independent Variables	
Liquidity Ratios	• **Current Ratio (CR):** Current Assets/Short-Term Liabilities • **Acid Test (AT):** (Current Asset-Stocks)/Short-Term Liability • **Cash Ratio (CaR):** (Current Securities + Securities)/Short-Term Liabilities • **Stock Dependency Ratio (SDR):** Short-Term Liabilities- (Fixed Securities + Securities)/Inventories
Efficiency Rates	• **Inventory Turnover (IT):** Cost of Sales/Average Stock • **Receivable Turnover Rate (RTR):** Net Sales/Average Trade Receivables • **Asset Turnover (AssT):** Net Sales/Asset • **Working Capital Turnover (WCT):** Net Sales/ Current Assets • **Net Working Capital Turnover (NWCT):** Net Sales/ (Current Assets-Short-Term Liabilities) • **Equity Turnover (ET):** Net Sales/ Equity
Financial Ratios	• **Intangible Fixed Assets / Equity (IFAE)** • **Intangible Fixed Assets / Assets (IFAA)**
Growth Rates	• **Asset Growth** (AG):% • **Growth in Sales** (GS): %
Dependent Variables	
Profit Investment Relationship	• **Return on Equity (ROE):** Net Profit/ Equity • **Return on Assets (ROA):** Net Profit/Asset
Profit-Sales Relationship	• **Gross Profit Ratio (GPR):** Gross Profit/Net Sales • **Net Profit Margin (NPM):** Net Profit/Net Sales

The ratios on the identified dependent and independent variables have been calculated, and the Dynamic Panel Data Analysis, which is the method of the study, has been applied to the results obtained. A summary of information related to the method used is presented below.

3.1. Dynamic Panel Data Models ve System GMM

In econometric analyses, three types of data are used. These are classified as time-series data, cross-sectional data, and panel data. Time-series data contains variable changes according to time units, such as day, month, season, and year. Cross-sectional data refers to the data collected from different units at a particular time. Here, "unit" refers to econometric units such as individuals, households, firms, sectors, and countries. Panel data combines cross-sectional observations on units such as individuals, countries, firms, and households over a certain period. Panel data consists of N units and T number of observations corresponding to each unit (Yerdelen Tatoğlu, 2016: 1-2).

The data formed by combining time-series and cross-sectional data is called "Pooled Data." Pooled data, which shows the change over time of the same set of units with the cross-sectional units remaining unchanged, is called "Panel Data" (Güriş, 2015: 2; Gujarati, 2003: 28).

The most significant feature distinguishing panel data from a pooled cross-section is tracking the same cross-sectional units (such as individuals, firms, or countries) over a specific period (Wooldridge, 2012: 10).

A panel data regression model (Baltagi, 2008: 154);

$$y_{it} = a + X'_{it}\,\beta + u_{it} \quad i = 1, \ldots\ldots, N;\ \ t = 1, \ldots\ldots, T \tag{1}$$

In the model, i represents households, individuals, companies, or countries, and t represents time. Therefore, while the t index represents the time series dimension, i represents the cross-sectional dimension. N is the number of units, and T is the number of periods. u_it is the error term, a is the constant parameter, and β is the slope parameter (Baltagi, 2008: 154; Güriş, 2018: 7).

The panel data analysis methods, which are still in the process of development today, are generally categorized under two main headings: static and dynamic. While static models, divided into Pooled, Fixed, and Random Effects, do not consider the dynamic structure between the variables, the dynamic models, also known as the Generalized Method of Moments, adapted to panel data by Anderson and Hsiao (1981), and later developed by Arellano and Bond (1991) and Blundell and Bond (1998), also take into account the dynamic structure between the dependent and independent variables (Özer, 2012: 143).

As economic behavior in a period is primarily influenced by past experiences and old behavior patterns, it is crucial to consider the lagged values of variables as explanatory factors when examining economic relationships. In panel data models, the dynamic structure is frequently used. Hence, unlike static panel data models, dynamic panel data models include lagged variables or variables (Yerdelen Tatoğlu, 2013: 65).

The general expression of dynamic models is as follows (Baltagi, 2005: 135);

$$Y_{it} = \delta Y_{it-1} + \beta X'_{it} + u_{it} \qquad i = 1, \dots, N; t = 1, \dots, T \qquad (2)$$

$$u_{it} = v_{it} + \mu_{it}$$

The most significant problem encountered in this model is the issue of the lagged dependent variable being included in the model as an independent variable. Generally, due to past shocks, it is known that Y_{it-1} is correlated withu_{it-1} in dynamic models. In addition to this, in panel data models, since Y_{it} is a function of μ_{it}, Y_{it-1} is a function of μ_{it}. Therefore, in the (2) model, Y_{it} is correlated with the error term, which includes μ_{it} (Baltagi, 2005: 135; Yerdelen Tatoğlu, 2013: 66).

Fixed-effects models are the most commonly used models in estimating dynamic models. These models are preferred in practice because they both consider unit effects and allow for correlation between the unit effect and independent variables.

Arellano and Bover (1995) proposed an effective instrumental variable estimator using the "orthogonal deviations" method for dynamic panel data models. Instead of taking the difference of the previous period from the current period, the difference of the average of all possible future values of a variable is taken. This way, it minimizes the data loss caused by the first differences method, especially in unbalanced panel data sets. In this method, two system equations (original and transformed) are set up and estimated together as a system. Hence, the estimator is the "System GMM" (Yerdelen Tatoğlu, 2013: 85-86).

Blundell and Bond (1998) demonstrated that difference GMM has weak estimating power in finite samples, and that coefficient estimates are biased, determining that the system GMM's estimating power is higher (138). In another study, Blundell and Bond (2000) again stated that the results obtained with the system GMM estimator are more reliable, and they obtained more reasonable results using system GMM (338-339). Baltagi (2005) also stated in his work that the system GMM estimator can overcome many of the disappointing features of the standard GMM estimator (148). In a study comparing system GMM and different GMM estimators, Hayakawa (2007) stated that the results obtained with the system GMM estimator are less biased (38).

In the study, the System GMM method and the two-step estimation method from dynamic panel data analysis methods were used to analyze the data. The reason for choosing the System GMM method is that it has been determined to have higher estimating power than the difference GMM according to various studies mentioned above. The reason for choosing the two-step estimator is that the two-step estimator, which considers that error terms may have varying variance, is asymptotically more efficient (Khadraoui, 2012: 97).

4. Evaluation of Research Findings

4.1. Unit Root Analysis Results

Before performing a statistical analysis of a time series, it is critical to examine whether the process that generates the series remains consistent over time—this is to ascertain if the series is stationary. Conducting econometric analyses with non-stationary series can lead to a phenomenon known as spurious regression. In other words, such analyses can yield biased results (Yerdelen Tatoğlu, 2013: 199).

In the literature, tests created for situations without cross-sectional correlation are first-generation tests. In contrast, those used in cross-sectional correlation are termed second-generation tests. Pesaran's CD Test is utilized to detect cross-sectional correlation. This test is based on the null hypothesis, "H_0: There is no linkage between the units". If the p-value is less than 0.05, H_0 is rejected, indicating the existence of a correlation between the units. In such cases, the preference should be to use second-generation unit root tests. The results of cross-sectional dependence for each variable utilized in the analysis are presented in the subsequent table.

In this study, we utilized the Levin, Lin, and Chu tests, Im, Pesaran, Shin tests, and Fisher Philips and Perron tests as unit root tests. These tests are based on the null hypothesis, "H_0: The panel series contains a unit root". If the p-value is less than 0.05, H_0 is rejected, implying no unit root in the series. The results of the tests conducted on the dataset for each variable included in the analysis are presented in the following table.

Table 2: Inter-Unit Correlation (Pesaran CD) Test Results

Variable		CD-Test
Current Ratio	**CR**	7.23*
Acid Test	**AT**	4.11*
Cash Ratio	**CaR**	7.19*
Stock Dependency Ratio	**SPR**	13.42*
Inventory Turnover	**IT**	13.59*
Receivable Turnover Rate	**RTR**	23.85*
Asset Turnover	**AssT**	38.25*
Working Capital Turnover	**WCT**	28.26*
Net Working Capital Turnover	**NWCT**	30.64*
Equity Turnover	**ET**	33.38*
Intangible Fixed Assets / Equity	**IFAE**	31.85*
Intangible Fixed Assets / Assets	**IFAA**	32.41*
Asset Growth	**AG**	45.63*
Growth in Sales	**GS**	30.36*
Return on Equity	**ROE**	17.01*
Return on Assets	**ROA**	17.14*
Gross Profit Ratio	**GPR**	50.16*
Net Profit Margin	**NPM**	10.52*

*,**,*** indicate 1%, 5%, and 10% significance levels, respectively.

Based on the results obtained, a cross-sectional correlation has been identified at a significance level of 1%. Consequently, second-generation unit root tests should be preferred to check the stationarity of the series. In these tests, "H_0: The panel series contains a unit root" is defined, and if the p-value < 0.05, $H_0$is rejected, meaning there is no unit root in the series. The results of the Peseran Test applied to the dataset for each variable used in the analysis are presented in the table below.

Table 3: Unit Root Test Results

Variable	t-bar	Z[t-bar]
CR	-2.445*	-4.210*
AT	-2.260*	-3.020*
CaR	-2.743*	-6.130*
SPR	-3.004*	-7.807*
IT	-4.367*	-16.574*
RTR	-3.742*	-12.549*
AssT	-4.047*	-14.514*
WCT	-4.122*	-14.993*
NWCT	-4.766*	-19.138*
ET	-3.707*	-12.329*
IFAE	-2.721*	-5.984*
IFAA	-2.518*	-4.681*
AG	-5.911*	-26.498*
GS	-6.095*	-27.681*
ROE	-5,279*	-22.436*
ROA	-5.062*	-21.038*
GPR	-3.352*	-10.045*
NPM	-4.144*	-15.136*

*,**,*** indicate 1%, 5%, and 10% significance levels, respectively.

Based on the results of the tests used for the stationarity check of the series utilized in the study, it has been identified that all variables used for modeling are stationary at a significance level of 1%.

4.2. Arellano and Bover / Blundell and Bond's Two-Stage System Generalized Moments Estimator Results

In this phase of the research, where the effect of intangible fixed assets on the dependent variables of the study (Net Profit Margin, Gross Sales Profit Ratio, Asset Profitability, and Equity Profitability) is investigated, various independent variable combinations thought to have explanatory qualities on dependent variables were established, and a model was constructed.

In forming independent variable combinations, a variable from liquidity, efficiency, and growth rates was chosen to minimize the probability of correlation among independent variables. To these, the current and up to two periods lagged values of "intangible fixed assets/equity" or "intangible fixed assets/assets" ratios, which are financial structure ratios and also constitute the main research subject of the study, were added to examine their impact on the dependent variable.

Since the research period is quite extensive (t=80), two dummy variables have been added to the research to represent the transition to IFRS in 2005 (D1) and the economic crisis of 2008 (D2).

Accordingly, an example model is as follows;

$$ROE_{it} = \alpha_0 + \beta_1 ROE_{it-1} + \beta_2 CR_{it} + \beta_3 IT_{it} + +\beta_4 AG_{it} + \beta_5 IFAE_{it} + \beta_6 IFAE_{it-1} + \beta_7 IFAE_{it-2} + \beta_8 D1_{it} + \beta_9 D1 * IFAE_{it} + \beta_{10} D2_{it} + \beta_{11} D2 * IFAE_{it} + \varepsilon_{it} \quad (3)$$

The description of the model numbered (3) is as follows: "the one period lag of equity profitability, current values of the current ratio, stock turnover rate, and growth rates in assets, current and up to two periods lagged values of the ratio of intangible fixed assets/equity, along with dummy variables (D1 and D2) are influential on equity profitability." In the model, the D1 dummy variable represents the transition to IFRS in 2005, while the D2 dummy variable represents the 2008 economic crisis.

In the model established, the Wald test shows whether the explanatory variables are meaningful in explaining the dependent variable together, the AR (2) test shows second-order autocorrelation among the variables, and the Sargan test shows whether the instrumental variables are used fully and correctly.

The Wald test is a statistical test that determines the joint significance of all coefficients in a model. If the null hypothesis (i.e., all coefficients are equal to zero) is rejected, the explanatory variables are significant in explaining the dependent variable.

The AR (2) test checks for second-order autocorrelation in the model's residuals. Autocorrelation refers to the correlation of a series with its past and future values. If there is second-order autocorrelation, this may indicate a problem in the model, such as omitted variables or incorrect model specification.

The Sargan test is a statistical test of the overidentifying restrictions in instrumental variable (IV) methods. This tests the null hypothesis that the instruments are valid, i.e., uncorrelated with the error term and correctly excluded from the estimated equation. A rejection casts doubt on the validity of the instruments.

These tests provide diagnostic checks for the model and are crucial in ensuring the reliability and validity of the results.

Although models with various combinations have been established for all dependent variables (ROE, ROA, GPR, PM), three dependent variables have been identified where all independent variables in the model are significant. The results related to these variables are as follows.

4.2.1. Results of the Return on Equity (ROE) Model

Table 4 presents the analysis findings related to the estimated Return on Equity (ROE) model. Notably, Intangible Fixed Assets (IFA) positively and significantly impacted Return on Equity (ROE) during 2004 and earlier years when weak accounting policies were prevalent. However, implementing International Financial Reporting Standards (IFRS) in 2005 (D1) resulted in a significant shift from this positive to damaging effect. Moreover, including the 2008 crisis in the model (D2) shows a significant and positive effect of IFAs on ROE. In numerical terms, a 1-unit investment in intangible fixed assets enhances the business's return on equity by 0.34 units during the crisis period.

Tablo 4: Equity Model Results

Variable	Coefficient	p
ROE L1	0,0233796	0,025
IFAE	**1,7154710**	0,000
IFAE L1	**-0,2189985**	0,000

IFAE L2	**-0,0514516**	0,047
CR	0,0088188	0,041
ET	-0,3558354	0,000
AG	0,1913784	0,049
D1	0,1735964	0,000
D1*IFAE	**-1,4621410**	0,001
D2	-0,0211791	0,024
D2*IFAE	**0,3428836**	0,000

The results for the estimated Return on Equity (ROE) model assumptions are as follows:

Tablo 5: Return on Equity Model Assumptions

Test	p
Wald	0,000
Sargan	0,000
Fark-Hansen GMM	1,000
Fark-Hansen iv	1,000
AR (1)	0,069
AR (2)	0,266

We applied three main tests to validate the dynamic panel data analysis assumptions. These tests include the Wald, Sargan, and AR (2) autocorrelation tests. The Wald test examines the collective significance of explanatory variables in accounting for the dependent variables. The Wald test result ($p < 0.05$) rejects the H_0 hypothesis, demonstrating that the overall model is statistically significant.

The Sargan test investigates the validity of instrumental variables by conducting an endogeneity check (the correlation between explanatory variables and the error term). The null hypothesis for this test is "H_0: The instrumental variables used are valid (exogenous)." The Sargan test results ($p <0.05$) reject the H_0 hypothesis. However, the robust Difference-in-Hansen tests, which check the exogeneity of instrumental variables, fail to reject the H_0 hypothesis for both levels and GMM equalities. Thus, the instrumental variables employed in the regression are valid. Consequently, no endogeneity issue is detected in the model, suggesting the instrumental variables used in the estimates bear no relation to the error term and hence are valid.

Lastly, the Arellano-Bond (AB) autocorrelation test was used to verify autocorrelation in the model. For the effectiveness of the GMM estimators, there should be no second-order autocorrelation, and the test hypothesis is set as "H_0: There is no second-order autocorrelation". The AR (2) test results ($p> 0.05$) accept the H_0 hypothesis, indicating no autocorrelation issue in the model.

4.2.2. Results of the Net Profit Margin (NPM) Model

Upon reviewing the model results in Table 6, it is evident that during and prior to 2004, a period characterized by weak accounting policies, Intangible Fixed Assets (IFA) had a significant and negative impact on Net Profit Margin. However, introducing the International Financial Reporting Standards (IFRS) in 2005 (D1) transformed this negative effect into a positive and significant one. Upon incorporating the 2008 crisis into the model (D2), the significant and positive influence of IFA on the Net Profit Margin has increased. To quantify this impact, investing 1 unit in intangible fixed assets can enhance the company's net profit margin by 1.71 units during the crisis period.

Table 6: Net Profit Margin Model Results

Variable	Coefficient	p
NPM 1	0,446286	0,000
IFAE	**3,101216**	0,000
IFAE L1	**-5,997688**	0,000
IFAE L2	**2,136571**	0,006
AT	0,077359	0,000
AssT	-0,319287	0,000
GS	-0,003239	0,000
D1	0,014692	0,000
D1*IFAE	**0,938869**	0,037
D2	-0,016168	0,015
D2*IFAE	**1,712801**	0,000

The statistical values in Table 7 indicate no issues of endogeneity (Sargan: 0.000 < 0.05, though Difference-Hansen: 1.000 > 0.05) or autocorrelation (AR(2): 0.177 > 0.05) within the model. It is evident that the instrumental variables in the model are valid, and there is no correlation between the error terms. Furthermore, the independent variables significantly contribute to explaining the model as a whole (Wald: 0.00 < 0.05).

Table 7: Net Profit Margin Model Assumptions

Test	p
Wald	0,000
Sargan	0,000
Fark-Hansen GMM	1,000
Fark-Hansen iv	1,000
AR (1)	0,149
AR (2)	0,177

4.2.3. Results of the Gross Profit Margin (GPM) Model

Upon examining the analysis results from Table 8, it becomes evident that intangible fixed assets significantly and positively impacted the Gross Profit Margin (GPM) up to and including 2004. However, following the implementation of the International Financial Reporting Standards (IFRS) in 2005 (D1), this positive effect shifted to a negative, significant impact. Furthermore, when included in the model, the 2008 financial crisis (D2) emphasized the negative and significant influence of intangible fixed assets on the GPM. It is observed that investments in intangible fixed assets during the crisis period led to a decrease in a company's gross profit margin, with a one-unit increase in such assets causing a 1.06 unit decrease in the company's GPM.

Table 8: Gross Margin Model Results

Variable	Coefficient	p
GPR L1	-0,028100	0,098
IFAE	**-1,613745**	0,000
IFAE L1	**3,830653**	0,000
IFAE L2	**0,759742**	0,000
CaR	0,007060	0,008
IT	-0,002491	0,001
GS	0,003512	0,038
D1	0,193988	0,000
D1*IFAE	**-2,322352**	0,000
D2	0,025072	0,001
D2*IFAE	**-1,061206**	0,000

Test results to test whether the Gross Margin model is compatible with dynamic panel data analysis assumptions are below.

Table 9: Gross Margin Model Assumptions

Test	p
Wald	0,000
Sargan	0,000
Fark-Hansen GMM	1,000
Fark-Hansen iv	1,000
AR (1)	0,285
AR (2)	0,491

The statistical values presented in Table 9 suggest that the independent variables in the model significantly contribute to explaining the model as a whole (Wald: 0.00 < 0.05). Additionally, no endogeneity (Sargan: 0.000 < 0.05, Difference-Hansen: 1.000 > 0.05) or autocorrelation (AR(2): 0.491 > 0.05) issues were detected in the model.

The conclusion drawn is pivotal to this study, which explores the influence of intangible fixed assets on business performance during a crisis period. The inverse relationship between net profit margin and gross sales profitability can be attributed to an increase in the cost of sales due to the depreciation (amortization portion) resulting from investments in intangible fixed assets. Considering that twenty-seven of the 35 analyzed companies are listed on the BIST Manufacturing Industry Index, most of the sample comprises manufacturing companies. These companies add the amortization shares of intangible fixed assets used in production to the book value of stocks

(IAS 38, article 99), which means that the investments made in these assets can escalate the cost of sales, decreasing gross sales profit.

This study aligns with and is corroborated by research conducted by Tahat, Ahmed, and Alhadab (2018), Andonova and Ruiz-Pava (2016), Findik and Ocak (2016), Gamayuni (2015), Haji and Mohd Ghazali (2018), Ghapar, Brooks, and Smyth (2014), and Villilonga (2004). These studies identified strong, positive, and significant effects between intangible fixed assets and financial performance indicators. Similarly, this study determined that the IFAE ratio positively and significantly impacts ROE and PM ratios during a crisis, which aligns with the mentioned studies.

However, only Findik and Ocak (2016) and Gamayuni (2015) used ROA as a financial performance indicator and identified a positive, significant relationship between IFA and ROA. In contrast, this study could not identify any models consisting entirely of significant independent variables explaining ROA. The unique use of Dynamic Panel Data Analysis in this study, unlike the methodologies in prior studies, facilitated the examination of more variables. This allowed the use of dummy variables and the examination of IFA's impact on business performance during the crisis period. Hence, this study diverges from the existing literature and contributes novelly.

5. Discussion

This study investigates the influence of intangible fixed assets on companies' financial performance during crisis periods. It covers 35 companies that have consistently traded on the Istanbul Stock Exchange from 1998 to 2017, employing Dynamic Panel Data Analysis as the analysis technique.

The data was sourced from the Istanbul Stock Exchange and the Public Disclosure Platform websites. The companies's quarterly financial statements for 1998-2009 were retrieved from the Istanbul Stock Exchange website, while those from 2010 onwards were gathered from the Public Disclosure Platform website.

Before the analysis, tests to ascertain the suitability of the data sets were conducted, including a stationarity test, Wald test, Sargan test, and the Arellano-Bond autocorrelation test. Among the Dynamic Panel Data Analysis estimators, the Two-Step System Generalized Method of Moments estimator developed by Arellano and Bover / Blundell and Bond was favored due to its higher estimation power, as identified by Blundell and Bond (1998) and Blundell et al. (2000).

The analysis considered various combinations of independent variables, believed to be explanatory of the dependent variables (ROE, ROA, PM, GPM), to discern the effect of intangible fixed assets during crisis periods on these financial performance indicators. One variable was selected from liquidity, efficiency, and growth rates to mitigate possible correlation among the variables. Furthermore, the current and delayed values (up to two periods) of the "intangible fixed asset/equity" and "intangible fixed asset/total assets" ratios were added to the analysis to evaluate their influence on the dependent variable.

Models were constructed for all dependent variables with various combinations. Three financial performance indicators, where all independent variables in the model were significant, were identified as Return on Equity Model, Net Profit Margin Model, and Gross Sales Profit Ratio Model.

The Return on Equity Model analysis revealed a positive and significant impact of intangible fixed assets on Return on Equity (ROE) up to 2004, an era characterized by weak accounting policies. This changed to a negative and significant effect after introducing the International Financial Reporting Standards (IFRS) in 2005. However, with the advent of the 2008 economic crisis, the influence of intangible fixed assets on Return on Equity turned positive and significant again. It was noted that a one-unit investment in intangible fixed assets during a crisis period increased the companies's Return on Equity by 0.34 units.

In the Net Profit Margin Model, intangible fixed assets had a negative and significant effect on the Net Profit Margin (PM) up to 2004, with the transition to IFRS in 2005 converting this negative effect into a positive and significant one. This effect continued to increase with the 2008 crisis. It was determined that a one-unit investment in intangible fixed assets during a crisis period boosted the companies's net profit margin by 1.71 units.

The Gross Sales Profit Ratio Model indicated a positive and significant impact of intangible fixed assets on the Gross Sales Profit Ratio up to 2004. This transformed into a negative and significant effect with the 2005 implementation of IFRS and continued through the 2008 crisis. It was found that a one-unit investment in intangible fixed assets during a crisis period reduced the companies's gross profit margin by 1.06 units.

Overall, investments in intangible fixed assets during a crisis period were found to have a positive and significant effect on both equity profitability and net profit margin but had a negative and significant impact on the gross profit margin. The opposing relationship between the net profit margin and the gross profit margin can be attributed to an increase in the cost of sales due to depreciation (amortization) associated with investments in intangible fixed assets. Considering the sample of 35 companies, 27 of which are listed on the BIST Manufacturing Industry Index,

the increase in the cost of sales may result in a decline in the companies's gross profit margin due to the addition of the depreciation costs of intangible fixed assets used in production to the inventory's book value.

The study's findings align with and corroborate existing literature in the field. Further, Dynamic Panel Data Analysis enabled the inclusion of dummy variables in the analysis, facilitating the examination of the effects of intangible fixed assets on financial performance in different economic periods.

6. Conclusion

In conclusion, the study found that investments in intangible fixed assets positively and significantly impact companies' equity profitability and net profit margin during a crisis period. This suggests that businesses better weather economic crises by investing more in intangible fixed assets, such as scientific or technical knowledge, design and implementation of new processes or systems, licenses, intellectual property rights, market knowledge, and brands. This is particularly crucial for companies operating in our country, which is part of the so-called fragile five and where the economy, due to its weaknesses and dependence on external factors, is prone to potential crises.

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