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The Impact of Derivatives Use on Firm Value: Do Smaller Firms Benefit More? (Evidence from Borsa Istanbul)

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ABSTRACT

While the impact of derivatives use on firm value is still debated theoretically and empirically, whether smaller or larger firms benefit more from the use of derivatives is largely untouched empirically. In this context, the impact of the intensity of derivatives use on firm value separately for smaller and larger firms using derivatives is analyzed with the 2010-2021 annual data of 70 non-financial Borsa Istanbul (BIST) firms. Difference and System Generalized Method of Moments (GMM) estimation results of the dynamic panel data model show that derivatives use positively and significantly affects firm value in smaller firms, and there is no significant effect of derivatives use on firm value in larger firms. Theories proposing that derivatives use can increase firm value are valid for smaller firms. On the other hand, in BIST, smaller firms benefit more than larger firms from derivatives use. The results of the analysis are also consistent with theories suggesting that the value-enhancement effects of derivatives use for hedging are concentrated in smaller firms. The results are encouraging for smaller firms discussing the decision related to financial risk management with derivatives.

Keywords: Financial risk management, Derivatives, Hedging, Firm Value, Panel Data.

JEL Classification Codes: C23, G17, G32

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INTRODUCTION

In today's technology world where competition grows day by day, the future is full of more unknowns anymore, and every individual/institutional decision related to the future carries risks at different levels. Risk, which does not have a universal definition and can be defined differently in various disciplines, fundamentally refers to the probability of deviation of the expected outcome from the actual outcome in Finance. Risk differs from uncertainty by being measurable. As well as risk has a negative perception in general, it may bring out negative (threat) or positive (opportunity) results when it is realized. Risk also includes the opportunity of gain in addition to the threat of loss. According to Fabozzi and Drake (2009), the main aim of firms is to reach financial success by taking risks and benefiting from its side providing opportunities. The risks firms face can be classified according to different criteria. Sharpe (1964) expresses that firm risk is the sum of systematic risks (market risks) and unsystematic risks, and while general economic activity brings out systematic risks, firm-specific conditions bring out unsystematic risks. Mowbray, Blanchard, and Williams (1969), who classify risks as pure and speculative, state that risks causing only negative outcomes are pure, and risks causing negative or positive outcomes are speculative. As financial risk-oriented traditional risk approaches have started to give way to integrated risk approaches globally in the 21st century, BIS (2009) groups liquidity, credit, and market risks as financial, and risks staying out of these and related to operational processes, employees, information technology systems, etc. as non-financial. Vaughan and Vaughan (2008) categorize credit, liquidity, and market risks as financial, and operational, reputational, strategic, and compliance risks as non-financial.

In recent years, more firms have been forced to better understand and measure risks because of increasingly interrelated risks with globalization, fast-changing markets, and sector dynamics, rising awareness that volatility in earnings can significantly affect firm value, and growing organizational requirements for risk-related information to define risk appetite and improve decision-making. In this context, risk management approaches have begun to become widespread. Risk management is a process that comprises identifying, measuring, and managing risk exposures within the

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scope of corporate finance and strategy (Rogers, 2019). The term "risk management", which aims to maximize the positive impacts and minimize the negative impacts of risk, was first used in the middle of the last century (Lee, 2021). Risk management, whose roots are based in the insurance sector, emerged in the modern sense in the 1950s due to various types of insurance that became incompetent and costly. During the 1960s, some firms implemented practices like reserve funds against possible losses. The use of derivatives began to increase to manage both insurable and uninsurable risks as a result of rising price movements in the markets, and financial risk management practices started to become prevalent in the 1970s (Dionne, 2013). During the 1990s, firm value-enhancement-oriented enterprise risk management (ERM) was developed by expanding the scope of traditional risk management. ERM pays attention to all risks (financial and non-financial) related to accomplishing strategies and reaching financial goals, defines risk as the threat of loss as well as the opportunity of gain, intends to manage risks instead of avoiding risk, and includes applications targeting to manage risks holistically (Lee, 2021). According to the Committee of Sponsoring Organizations of the Treadway Commission (COSO), which standardized the general framework of ERM with its work dated 2004, ERM, which is a dynamic process, aims to reach goals connected with strategy, operations, reporting, and compliance. On the other hand, the need for standardization at the international level has occurred because of increasing interest in risk management so the first version of ISO 31000 was published in 2009, and introduced global risk management standards.

In a firm where risk management is performed, when risk appetite, the amount of risk exposure that the firm accepts, is below the risk exposure of the firm, risk management is implemented to return the exposure level back within the accepted range. There are three alternatives for managing the risk for the firm that identifies the relevant risk: to retain the risk, to mitigate/neutralize the risk and, to transfer the risk. A non-financial firm can bear the risk with potential loss/gain without mitigating or transferring it, reduce the probability of risk occurrence via efficient asset-liability management and/or other internal control processes within the firm, or transfer risk to a third party by traditional insurance, derivatives, alternative risk transfer (ART), also known as structured insurance, and structured financing (Fabozzi and Drake, 2009). While structured financing and ART, which combines traditional insurance products and capital market solutions, are mostly preferred by larger firms, insurance and derivatives are used by firms commonly for transferring risks for long years. From the standpoint of firms, the main determinants of choice between insurance and derivatives use are relative costs and benefits and whether the risk is insurable or uninsurable. Unlike insurance contracts, derivatives are linked to specific market indexes, can be traded between parties, can make profits, and are not limited to a subject or an amount. They are more suitable for transferring risks correlated with a reference index (Banks, 2004). A derivative is a financial instrument that is derived from financial or real assets like interest rates, stocks, bonds, foreign exchange rates, commodities, and market indexes. etc. and whose value is determined by the value (price) of the underlying asset. Derivatives, which are traded in the futures market, are basically used for hedging (risk transfer via derivatives) and speculation. They may be used for arbitrage. Derivatives are classified into four main groups: forward, futures, swap, and option contracts.

Although derivatives have recently started to be used for transferring non-financial risks like operational risk, these instruments are mostly used to hedge financial risks like credit and market risks (interest rate, foreign exchange, commodity, and equity risks) (Garcia, 2017). With reference to the 2022 data of the Bank for International Settlements (BIS), in global organized exchanges, the daily average turnover of foreign exchange and interest rate futures and option contracts in December was 7.9 trillion US dollars. In over-the-counter (OTC) markets, the same statistic for foreign exchange and interest rate forward, option and swap contracts in April was 10.6 trillion dollars. OTC trading surpassed exchange trading, continuing the trend that started around 2010. After the 2007-2008 Financial Crisis, OTC trading benefited from innovations like central clearing, trade compression, and swap execution facilities. According to the data from BIS, by the end of 2022, the outstanding notional amounts (value of the underlying asset) of all OTC derivatives were approximately 618 trillion dollars. As presented in Figure 1, after a period with decreased hedging in the mid-2010s due to low and stable policy rates in advanced economies, the total notional amounts started to rise again in 2016. In 2022, the share of interest rate, foreign exchange, credit, equity, and commodity OTC derivatives in outstanding notional amounts (618 trillion US dollars) were, respectively, 79.4%, 17.4%, 1.6%, 1.1%, and 0.4%.

While derivatives are intensively used as financial risk management instruments on a global level, especially in developed countries, and value-oriented ERM becomes more common among firms, whether risk management increases the firm value or not is still debated theoretically and empirically. Moreover, views about whether smaller or

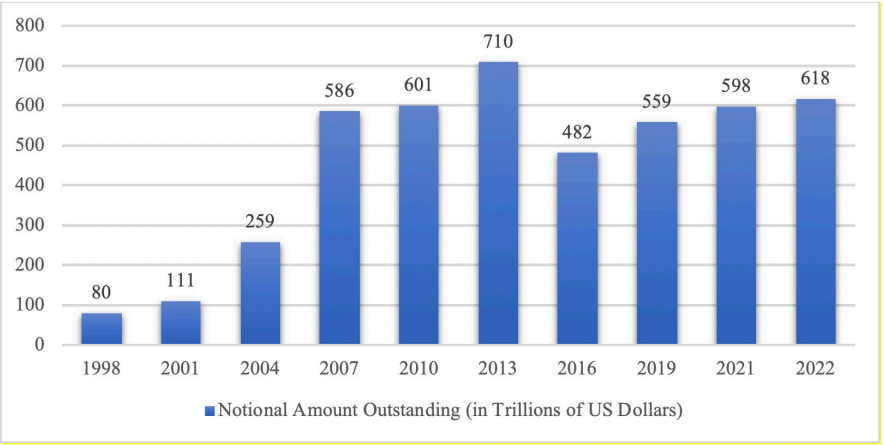

Figure 1. Global OTC Derivatives Market

Source: www.bis.org

larger firms benefit more from the use of derivatives have recently come forward, and derivatives use-firm value relation has begun to be studied at firm size scale. Clark and Mefteh (2010), who find a positive relationship between the use of derivatives and firm value only in larger firms, and Yu (2021), who reports that the use of derivatives positively affects firm value in both smaller and larger firms, are one of the limited researchers that made empirical studies aiming to answer the related question. In this context, the impact of financial risk management with derivatives on firm value is investigated in this study, and by deepening this relation, the impact of the intensity of derivatives use on firm value separately for smaller and larger firms using derivatives is mainly analyzed. For that purpose, after the theoretical and empirical literature is presented, dynamic panel data analysis is employed with the 2010-2021 annual data of 70 non-financial Borsa Istanbul (BIST) firms that used derivatives for hedging at least once during the sample period. This study, which is one of the few articles dealing with derivatives use-firm value relation by separate models for smaller and larger firms, also aparts from other studies by using hand-collected notional values instead of simple dummy variable and a longer 12-year data set.

THEORETICAL AND EMPIRICAL LITERATURE

The theoretical foundation of the nexus between risk management and firm value is based on the study of Modigliani and Miller (1958), which is accepted as one of the main theories of Modern Finance. According to the M&M Theory assuming perfectly competitive capital markets, the average cost of capital and market value of a firm are independent of its capital structure, and firm value, which is unaffected by financing decisions, depends on expected earnings (profits) from investments and cost of capital related to its risk class. Smith and Stulz (1985) and MacMinn (1987) state that risk management practices are financing decisions, and risk management does not affect/increase firm value in the approach of M&M Theory.

Another theory supporting the irrelevance between risk management and firm value is the Capital Asset Pricing Model (CAPM), which was developed by Treynor (1961), Sharpe (1964), Lintner (1965, 1969), and Mossin (1966). The basis of the theory comes from Markowitz's (1952) Modern Portfolio Theory, which focuses on the expected return-risk relation and argues that the expected return can be maximized for a given level of risk via portfolio diversification. CAPM, which divides the risk of a financial asset into two components as systematic and unsystematic, associates the expected return of the financial asset with its systematic risk linked to movements affecting the whole economy. According to the theory, the value of the financial asset is not affected by unsystematic (diversifiable for investors) risk because investors can eliminate unsystematic risk by building up a portfolio in a competitive market. Financial assets having high systematic risk measured by the β coefficient also have high expected returns. With respect to the CAPM, the relation between the expected return and risk of a stock is as follows:

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] \qquad i = 1,\ldots..,N$$

$E(Ri)$: The expected return on the stock

Rf: The risk-free interest rate

βi: The measure of systematic risk of the stock

$E(Rm)$: The expected return of the market portfolio

$E(Rm) - Rf$: The market risk premium

$\beta i[E(Rm) - Rf]$: The risk premium of the stock

In the CAPM, where the total risk of a firm (stock) is composed of systematic (market) risk and unsystematic (firm-specific) risk, risk management related to firm-specific risks does not affect firm value because the expected return on a stock is unaffected by unsystematic risks. On the other hand, Smith (1995) expresses that risk management related to systematic risks also does not affect firm value due to the fact that risk is correctly priced in parallel with the assumptions of the model.

Although the main theories of Modern Finance argue that risk management does not increase firm value, theoretical approaches suggesting that efficient risk management may increase firm value gradually advanced from the 1980s with the spread of ERM implementations. Positive theories propose that derivatives within the scope of risk management can increase firm value by reducing tax liability and several costs (agency costs, costs of financial distress, and cost of capital). According to Stulz (1984), one of the theorists stating that risk management can positively affect firm value, firms where managers' compensation depends on the change in the value of the firm can increase their value by using derivatives within active risk management policies. Considering the Agency Theory related views of Jensen and Meckling (1976), who suggest that practices like giving managers stock options can decrease agency costs, the use of derivatives can increase firm value by reducing these costs. Stulz and Smith (1985) propose that risk management can boost firm value by decreasing the costs of financial distress and reducing the expected tax liability with decreasing volatility of pre-tax firm value. According to Campbell and Kracaw (1987), risk management enabling managers to work more efficiently increases firm value by decreasing agency costs. Froot, Scharfstein, and Stein (1993) state that, in a firm not managing its risks, there will be volatility in cash flows generated by real assets, and volatile internal financing sources make external financing sources costlier and lessen the amount of investment. Hedging can reduce this variability in cash flows so it can increase the value of the firm. DeMarzo ve Duffie (1995) express that risk management will reduce the information asymmetry between managers and shareholders, and this will improve managers' investment decisions and lead to higher firm value. Judging from the approach of Stulz (1990), who argues that information asymmetry increases agency costs via unproductive investments within the scope of the Agency Theory, it can be said that risk management can increase firm value by reducing information asymmetry.

In particular of the nexus between risk management and firm value, arguments about whether smaller or larger firms implementing risk management benefit more in terms of firm value have begun to become prevalent. Haushalter (2000) proposes that smaller firms, which have more information asymmetries, can increase their value relatively more than larger firms with reduced information asymmetry by risk management. Guay and Kothari (2003) suggest that risk management with derivatives can increase the firm value more in smaller firms by decreasing the expected costs of financial distress more in these firms with referencing to Warner (1977), who states that the costs of financial distress do not increase proportionately with firm size. Guay and Kothari (2003) also argue that in larger firms where risk management practices are various and more complex, derivatives for hedging have a limited share in general risk management programs so the effect of these instruments on value will be less. In a different view from those, according to Allayannis and Weston (2001), who point out that the use of derivatives has large fixed start-up costs, larger firms using derivatives can increase their firm value more due to the advantage of economies of scale.

While there are many studies analyzing the impact of the use of derivatives on firm value without considering firm size, there are a few articles searching the relationship between derivatives and firm value for smaller and larger firms separately. Clark and Mefteh (2010) use the data of 176 non-financial French firms for the year 2004 in multiple regression analysis, divide firms into two groups as smaller and larger, and analyze the effect of derivatives use on firm value for two separate groups. According to the results of the study, in which Tobin's q is used as a proxy for firm value, and the notional values of foreign exchange derivative contracts represent the use of derivatives, the intensity of derivatives use positively and significantly affects firm value in larger firms and does not significantly affect firm value in smaller firms. Yu (2021) analyzes the effect of derivatives use on firm value with quarterly data of North American firms for the 2006-2017 period by grouping firms as smaller and larger. The results of two-stage least squares regression models estimated for smaller and larger firms show that the use of derivatives positively and significantly affects firm value in both smaller and larger firms, and this effect is bigger in smaller firms. In addition, there are two main studies searching the effect of derivatives use on firm value for non-financial firms in Turkey. Ayturk, Gurbuz, and Yanik (2016), and Akpinar and Fettahoglu (2016), who don't group firms according to size, can't find significant effect of derivatives use on firm value.

ECONOMETRIC ANALYSIS

Data Set, Variables, and Descriptive Statistics

In the econometric analysis[1] of the study, 2010-2021 annual data of non-financial firms quoted on Borsa Istanbul are utilised for searching the impact of derivatives use for hedging on firm value separately for smaller and larger firms. Financial firms, which are subject to specific capital regulations, are excluded from the data set because they are market-makers in the derivatives market and use derivatives for different motivations. Though detailed information about the use of derivatives is available with the International Financial Reporting Standards (IFRS) 7 - Financial Instruments: Disclosures, which came into force for Turkish quoted firms in 2007, the beginning year of the data set is taken as 2010 due to increasing level of the intensity of derivatives use and growing data set from this year. Before getting the final sample, non-financial firms having year-end open derivative contracts for hedging at least once during the 2010-2021 period are determined, and 70 firms with complete information related to the notional values of derivative contracts are selected by reading financial reports in detail. In accordance with the main purpose of the study, these firms are split into two groups according to the year-end asset size in 2021: smaller firms and larger firms. 35 firms with the lowest total assets are categorized as smaller, and 35 firms with the highest total assets are categorized as larger. Derivative contracts firms declared that they used for speculative aims are not included in the computation of annual notional amounts. When there is no information for the notional values of contracts in TRY (Turkish lira), values are converted into TRY with year-end exchange rates. The notional values of forward, futures, swap, and option contracts are all taken without separating instruments. The data of firms are taken from Finnet and the website of the PDP (kap.org.tr), and the year-end exchange rates are gotten from the website of the CBRT (tcmb.gov.tr).

In this study, which aims to handle the impact of the use of derivatives on firm value in the axis of firm size, in addition to two variables representing firm value (dependent) and derivatives use (independent), five control variables are selected. The variables are chosen from the studies of Allayannis and Weston (2001), Junior and Laham (2008), Clark and Mefteh (2010), and Nova, Cerqueira, and Brandao (2015), who searched derivatives use-firm value relation. The year-end values of balance sheet items are taken in the calculations related to the variables.

[1] All analyses are performed by Stata 15 Software.

Dependent Variable:

Firm Value (Q): Tobin's q is used as a proxy for firm value. Tobin (1969) defines q as the ratio of the market value of assets divided by the replacement cost of the assets. For getting the q**,** the method that Junior and Laham (2008), Clark and Mefteh (2010), and Nova, Cerqueira, and Brandao (2015) use is preferred in the study.

$$Q = \frac{TA - TE + MVE}{TA}$$

TA: Book value of the assets

TE: Book value of the equity

MVE: Market value of the equity

Independent Variable:

Derivatives Use (DERIV): The notional values of derivative contracts, which have higher informative power than the simple dummy variable, are taken for measuring derivatives use to get more accurate results like in the studies of Junior and Laham (2008), Clark and Mefteh (2010), Marami and Dubois (2013), and Nova, Cerqueira, and Brandao (2015). The ratio, which also represents the intensity of derivatives use, is calculated as notional value divided by total assets.

$$DERIV = \frac{\text{Notional Value}}{\text{Assets}}$$

Control Variables:

Leverage (LEV): Modigliani and Miller (1963) state that a firm can increase its value by using more debt because of the tax shield of interest. Leverage is calculated as percentage by considering the broad definition of debt.

$$LEV\ (\%) = \frac{\text{Liabilities}}{\text{Assets}}\ x\ 100$$

Liquidity (LIQ): Jensen (1986) proposes that managers invest sources in negative return projects in firms with high liquidity (free cash flows), and this will decrease firm value. Current ratio is used to represent liquidity.

$$LIQ = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

Investment Opportunities (INV): Future investment opportunities may increase firm value. The ratio of capital expenditures to net sales is used as a proxy for investment opportunities as in the study of Allayannis and Weston (2001).

$$\text{INV} = \frac{\text{Capital Expenditures}}{\text{Net Sales}}$$

Profitability (PROF): Allayannis and Weston (2001) suggest that more profitable firms are rewarded with higher market values. Return on assets is preferred to measure the level of profitability as a percentage.

$$\text{PROF (\%)} = \frac{\text{Net Income}}{\text{Assets}}\ x\ 100$$

Firm Size (SIZE): According to Demsetz and Lehn (1985), larger firms have more capital sources and higher market values. In the literature, total assets, total sales, or the total number of employees are commonly defined as proxies for firm size. Total assets are used to measure the firm size in the analysis. Total assets are deflated by Consumer Price Index (CPI) (2003=100) and converted into natural logarithms.

$$\text{SIZE} = \text{LN (Assets)}$$

Tables 1 and 2 report the descriptive statistics of the variables for smaller and larger firms (2010-2021).

According to the descriptive statistics, while the average valuation of smaller firms as measured by Tobin's q is higher, the use of derivatives is generally more intensive in larger firms. Dolde (1993) suggests that even if smaller firms overcome large start-up costs barriers related to risk management, they will continue to face large fixed costs. At this point, it can be said that continuous large costs for smaller firms using derivatives lead to the lower intensity of derivatives use in these firms. Larger firms operate more profitably than smaller firms on average. The mean size of larger firms is approximately 13.5 times that of the mean size of smaller firms.

Smaller and larger firms are also compared by using a t-test. Based on the results of the test, the mean values of the intensity of derivatives use and firm size are significantly different between smaller and larger firms (Table 3).

Method of the Analysis and Results

Dynamic econometric models are models with lagged dependent variables. Because static estimators are biased and inconsistent due to potential endogeneity arising from the lagged dependent variable and other endogenous independent variables, instrumental variable estimators were introduced. Dynamic panel data models are consistently estimated via valid instrumental variables with Generalized Method of Moments (GMM). Arellano and Bond's (1991), Arellano and Bover's (1995), and Blundell and Bond's (1998) GMM estimators are extensively used to estimate.

Table 1. Descriptive Statistics (Smaller Firms)

Smaller Firms	Q	DERIV	LEV (%)	LIQ	INV	PROF (%)	SIZE (in Millions of TRY)
Mean	1.746	0.052	53.616	1.852	0.057	4.825	187.99
Median	1.210	0.000	55.985	1.530	0.005	4.215	149.84
Max.	61.580	0.983	103.720	9.090	3.383	43.310	677.38
Min.	0.550	0.000	9.800	0.300	-0.529	-30.120	15.78
Std. Dev.	3.342	0.119	20.289	1.152	0.236	8.168	145.99
No. Obs.	420	420	420	420	420	420	420

Table 2. Descriptive Statistics (Larger Firms)

Larger Firms	Q	DERIV	LEV (%)	LIQ	INV	PROF (%)	SIZE (in Millions of TRY)
Mean	1.354	0.095	56.949	2.146	0.084	6.233	2,537.26
Median	1.200	0.022	60.810	1.400	0.028	5.885	1,110.81
Max.	6.220	1.101	103.850	17.400	2.963	43.330	18,406.33
Min.	0.220	0.000	7.470	0.210	-2.487	-27.280	63,18
Std. Dev.	0.626	0.168	22.605	2.502	0.265	8.494	3,267.00
No. Obs.	420	420	420	420	420	420	420

Table 3. Smaller Firms vs Larger Firms – Mean Differences

	$Mean_l$ (Larger Firms)	$Mean_s$ (Smaller Firms)	Difference	t-statistic
Q	1.354	1.746	-0.392	2.363**
DERIV	0.095	0.052	0.043	-4.280***
LEV	56.949	53.616	3.333	-2.249**
LIQ	2.146	1.852	0.294	-2.187**
INV	0.084	0.057	0.027	-1.559
PROF	6.233	4.825	1.408	-2.449**
SIZE	2,537.26	187.99	2,349.27	-14.722***

****, **, * denote significance at the 1%, 5%, and 10% levels, respectively.*

Assuming that the lagged dependent variable affects the current value of the dependent variable, Arellano-Bond GMM estimator is preferred to form a dynamic model and solve the potential endogeneity issue. This estimator is based on differencing the model. All valid lagged values of dependent and endogenous independent variables can be used as instrumental variables within Difference GMM approach. The Sargan (1958) test, Arellano-Bond autocorrelation test, and the Wald (1943) test are performed after estimating the model.

To search the impact of derivatives use on firm value for smaller and larger firms with the 2010-2021 annual data of 70 non-financial BIST firms, two-step estimator requiring estimation of a weighting matrix is employed, and appropriate lagged values of variables are used as valid instrumental variables. The balanced panel data

$$Q_{it} = \beta_1 Q_{it-1} + \beta_2 DERIV_{it} + \beta_3 LEV_{it} + \beta_4 LIQ_{it} + \beta_5 INV_{it} + \beta_6 PROF_{it} + \beta_7 SIZE_{it} + u_i + v_i$$

Table 4. Estimation Results of Dynamic Panel Data Model – Difference GMM

Difference GMM	**Dependent Variable: Q**	
Independent Variables	**Smaller Firms**	**Larger Firms**
Q(-1)	.164768 *** (.0203546)	.3645493*** (.042589)
DERIV	1.958215*** (.5576061)	.0840188 (.2253965)
LEV	.0145862*** (.003344)	.0113725*** (.0019693)
LIQ	-.2512531*** (.0526953)	-.0153917 (.0162565)
INV	-.1774582 (.184327)	.0117985 (.0518343)
PROF	.0811696*** (.0052054)	.0163495*** (.0020293)
SIZE	.034329 (.1312732)	-.0677458 (.0447668)
m2	-1.1562	-1.6429
Inst. variables for the equations in first differences	Q(-2 to -4), DERIV(-2 to -3), LEV(-2 to -2), LIQ(-2 to -3), INV(-2 to -3), PROF(-2 to -3), SIZE(-2 to -3)	Q(-2 to -6), DERIV(-2 to -4), LEV(-2 to -8), LIQ(-2 to -6), INV(-2 to -6), PROF(-2 to -5), SIZE(-2 to -6)
Sargan stat.	28.34211	32.43983
Wald chi2 stat.	1912.38***	1073.50***
Number of Observations	350	350

****, **, * denote significance at the 1%, 5%, and 10% levels, respectively. Standard errors are represented in parentheses.*

Table 5. Estimation Results of Dynamic Panel Data Model – System GMM

System GMM	Dependent Variable: Q	
Independent Variables	**Smaller Firms**	**Larger Firms**
Q(-1)	.3055375*** (.0138455)	.4039948*** (.0340999)
DERIV	1.332865*** (.508307)	-.2005346 (.1226432)
Control Variables	Yes	Yes
m2	-1.168	-1.484
Instrumental variables for the equations in level	One-period lagged first differences of variables	One-period lagged first differences of variables
Sargan stat.	31.28521	32.00639
Wald chi2 stat.	1191.19***	2174.08***
Number of Observations	385	385

****, **, and * respectively indicate significance at the 1%, 5%, and 10% levels and standard errors are in parentheses.*

model where independent variables are treated as endogenous like in the studies of Loncan and Caldeira (2014) and Ayturk, Gurbuz, and Yanik (2016), is presented. Table 4 shows the coefficient estimation results of the model based on two separate samples[2].

The m2 test statistics show that there are no second-order serial correlations in the error terms of the first-differenced equations as expected. The Sargan test indicates that instrumental variables are exogenous as a group in estimations for smaller and larger firms. The results of the Wald test represent that the overall model is significant for two samples. That the lagged dependent variables have positive and significant coefficients confirms the selection of the dynamic approach.

Estimations of the model point out that the intensity of derivatives use in smaller firms positively and significantly affects firm value, and there is no significant effect of the intensity of derivatives use on firm value in larger firms. This result supports the views of Stulz (1984), Stulz and Smith (1985), Campbell and Kracaw (1987), Froot, Scharfstein, and Stein (1993), and DeMarzo and Duffie (1995), who argue that efficient risk management with derivatives increases firm value, for smaller firms. Positive and significant coefficient of derivatives use in smaller firms, and insignificant coefficient of derivatives use in larger firms are in line with the remarks of Haushalter (2000), and Guay and Kothari (2003), who state that the potential benefits of hedging are concentrated in smaller firms. Smaller firms benefit more than larger firms from derivatives use. Although the intensity of derivatives use in smaller firms is lower, the value-enhancement effect of the intensity of derivatives use is higher in these firms. This study confirms the size effect of derivatives use on firm value for firms in Turkey. The results partially match up with the findings of Yu (2021), who analyzes the effect of derivatives use on firm value and finds that derivatives use positively and significantly affects firm value in both smaller and larger firms, and this effect is bigger in smaller firms.

In addition to the diagnostic tests of the results from the Difference GMM estimator, for robustness check, the model is also estimated by using System GMM developed by Arellano and Bover (1995), and Blundell and Bond (1998). System GMM estimator, which uses the moment restrictions of the system including level equation as well as difference equation, exploits additional orthogonality conditions allowing the use of lagged first differences of variables as instruments for equations in level. Table 5 presents the results of the coefficient estimation for two separate samples by two-step System GMM, where one-period lagged first differences of independent variables are used for the equations in level in addition to the instrumental variables in the Difference GMM approach.

There are no remarkable differences between the results taken from Difference and System GMM estimators. The effect of derivatives use on firm value for smaller firms is positive and significant with a slight decrease in the coefficient. Even if the sign of the coefficient of derivatives use changes, it is still insignificant for larger firms[3].

[2] The model is estimated with the xtabond Stata command.

[3] The model is estimated with the xtdpdsys Stata command.

CONCLUSIONS

That firms face more risks due to fast-changing market dynamics day by day forces more firms to manage the risks. The spread of ERM practices, which define risk as the threat of loss as well as the opportunity of gain, and focus on value-enhancement integrated risk management implementations, causes the relationship between risk management and firm value to be searched more. While theoretical and empirical studies about this subject continue, this relation has recently begun to be investigated at firm size scale, and questions about whether the potential positive effect of risk management is more intensive in smaller or larger firms have started to be asked. In this context, the impact of derivatives use, one of the commonly used financial risk management instruments, on firm value is analyzed with the data of firms quoted on BIST, and the dynamic panel data model is separately estimated for smaller and larger firms. The results of model estimation show that derivatives use causes an increase in value in smaller firms and has no significant effect on value in larger firms. It is obvious that smaller firms benefit more than larger firms from derivatives use. This study shows that there is a size effect of derivatives use on firm value for firms in Turkey.

The results of the analysis confirm that the efficient use of derivatives for hedging decreases costs more in smaller firms, so smaller firms benefit more than larger firms. In the framework of related theories, which focus on whether smaller or larger firms benefit more from derivatives, there are two sources of this outcome: decreasing agency costs due to reduced information asymmetry and decreasing costs of financial distress. Smaller firms have more information asymmetry than larger firms. Risk management with derivatives reduces information asymmetry between managers and shareholders, and this makes investments more productive and decreases agency costs more in smaller firms. On the other hand, smaller firms face relatively higher costs of financial distress. Risk management with derivatives decreases the costs of financial distress more in smaller firms. In the end, derivatives use increases firm value more in smaller firms. Although smaller firms use derivatives less intensively due to continuous large costs related to risk management, they increase their value with the help of these financial risk management instruments. Additionally, it can be said that derivatives for hedging have a limited share in general risk management programs of larger firms and, larger firms face likely lower agency costs, costs of financial distress, and cost of capital, so the effect of these instruments on value is limited and insignificant. In Turkey, derivatives use is not a value-enhancement tool for larger firms. It is only a risk transfer instrument for these firms. The general results of the analysis are encouraging for smaller firms discussing the decision related to risk management with derivatives. Further research can study the exact sources of the distinct value-enhancement effect of derivatives use between smaller and larger firms.

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