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Research Notes in Economics

The Determinants of FX Derivatives Use:

Empirical Evidence from Turkish Non-Financial Firms in BIST

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Özet

Gelişmekte olan ülke (GOÜ) firmalarının döviz borçluluğundaki son yıllardaki artış dikkat çeken seviyelere gelmiştir. Bu nedenle, firmaların döviz kuru riskini azaltmak gelişmekte olan ülkeler açısından öncelik haline gelmiştir. Bu bağlamda, döviz kuru üzerine yazılmış türev araçların (döviz türev) kullanılması, en yaygın yöntemlerden biri olarak ön plana çıkmaktadır. Bununla birlikte, türev araç kullanımı açısından firmalar arasında heterojenlik gözlenmektedir. Bu nedenle, hangi tip firmaların döviz türev araçlarını kullandığının ve kullanım tutarında belirleyici olan unsurların anlaşılması politika tasarımı açısından önem taşımaktadır. Bu çalışmada, Borsa İstanbul'da (BIST) işlem gören finansal kesim dışı firmaların türev kullanımında belirleyici olan unsurlar incelenmektedir. Tanımlayıcı bulgular, döviz türev araçları tarafından kaynaklanan bilanço dışı pozisyonun, bilanço içi döviz açık pozisyonunu ile beraber arttığını göstermektedir. Bu durum, bazı firmaların riskten korunma faaliyetlerinde bulunduğuna işaret etmektedir. Çalışmada ayrıca döviz türev araçları kullanan finansal kesim dışı firmaların ortak özelliklerinin belirlenmesi için kullanılan probit model sonuçları, büyük firmaların veya yüksek kaldıraç oranlarına sahip firmaların döviz türev araçlarını daha fazla kullanma eğiliminde olduğunu, ancak yüksek likidite tamponu ve maddi varlığa sahip firmaların ise daha az döviz türev aracı kullanma eğiliminde olduğunu göstermektedir. Son olarak, türev kullanım hacmi sabit etkiler panel regresyonları ile incelenmiş olup sonuçlar, firma büyüklüğünün, maddi duran varlık oranının ve operasyonel anlamda uluslararasılaşma derecesinin türev kullanım hacminde belirleyici olduğunu göstermektedir.

Abstract

The increasing share of foreign currency debt in emerging market corporates has drawn attention in the last years. Therefore, containing FX risk of the corporates has become a priority for emerging markets. In this regard, the use of FX derivatives is one of the most commonly used solutions to hedge against FX risk. However, there seems to be substantial heterogeneity across the corporates in terms of derivative use. Therefore, understanding which corporates are more likely to engage in FX derivatives is crucial in terms of policy design. This study aims to determine firm-specific factors for derivative use of the nonfinancial firms quoted in Borsa Istanbul (BIST). The descriptive findings show that off-balance sheet accounts driven by FX derivatives have increased as well as on-balance sheet FX short position, which indicates that some of the Turkish nonfinancial firms engage in hedging activities. The study also employs a probit model for the identification of common characteristics of non-financial firms which use FX derivative instruments. It is found that firms with larger size and higher leverage ratios tend to utilize FX derivatives more whereas the firms with considerably ample liquidity buffers and higher tangible assets tend to use fewer FX derivatives. Then, we investigate the extent of derivative use with fixed effects panel regressions. The results show that firm size, tangibility ratio and degree of internationalization are found to be significant determinants of the extent of derivative use.

Introduction and Related Literature

The foreign currency debt of corporates in emerging markets has more than doubled after the global financial crisis. Although foreign currency borrowing allows corporates to obtain funding at lower cost and longer horizons, the balance sheets of the corporates are adversely affected by domestic currency depreciation through valuation channel. Thus, emerging markets have become sensitive to the changes in the value of their local currencies against major ones and the prevalence of foreign currency debt is considered to be an essential backdrop for emerging markets. In this regard, many emerging markets such as India and Indonesia have implemented macroprudential measures to limit the foreign currency borrowing and encourage hedging mechanism through FX derivatives. Turkey has also taken steps to achieve more effective management of FX risk such that a direct relationship has been established between FX income and foreign currency borrowing for small and medium-sized nonfinancial enterprises. Besides this, there appears to be greater awareness about the risk management for large firms, which form the bulk of foreign currency borrowing[1].

Understanding the FX exposures of the firms is quite crucial in terms of both financial stability and policy design. However, estimating the FX exposures of the firms requires detailed information about the off-balance sheet accounts as well as on-balance sheet accounts. Although the firms in Turkey have accumulated a significant amount of FX debt, some of the firms have engaged in hedging activities through FX derivatives. However, the share of the firms using FX derivatives is low, and there is strong heterogeneity across the firms in terms of derivative use. Therefore, investigation of firm-specific factors for the derivative utilization is an important question that is aimed to be addressed by this study. In this regard, we analyze a sample of nonfinancial firms, which are quoted in BIST, to figure out the firm-specific determinants of derivative use.

There are many empirical studies about the determinants of derivative use in emerging markets, which most of them focus on the role of firm-specific factors. In this context, what kind of firms are more likely to use derivative instruments and what determines the extent of derivative use are the main two questions that have been empirically investigated. These studies tend to use firm-specific financial and operational variables which proxy for the factors that lead to derivative use. Intuition regarding these variables is mainly derived from the perspectives of corporate risk management literature, which are the cost of financial distress, the problem of underinvestment and agency conflict and managerial risk aversion.

Cost of financial distress stands as a significant catalyzer for derivative use. Given the fact that hedging activities reduce the volatility of future cash flows and the probability of extreme events, hedging is expected to mitigate the cost of financial distress as mentioned by Glaum (2002) and Raposo (1999). Thus, one would expect that the more considerable the cost of financial distress a firm faces, the more likely that particular firm chooses to utilize derivative instruments. The variables to proxy for cost of financial distress in empirical studies are mainly leverage, tangibility, profitability, and size. Leverage is expected to have a positive relationship with derivative use; whereas tangible asset and profitability ratios are expected to reduce the hedging need. The effect of firm size on derivative use is ambiguous. From the perspective of cost of financial distress, size is expected to have a negative relation, but due to positive scale effects and easy access to capital markets, larger firms tend to have positions in derivative instruments more than the degree with which small firms do (Bodnar et al., 1998; Wang and Fan, 2011).

[1] As examples of recent policy measures, the FX loans to be borrowed has been restricted to a certain level for the economic agents whose loan balance is below 15 million USD, via modifications in Decree 32. In particular, loans to be borrowed is determined to not to exceed the level of FX income originated from the operations in preceding three years. Moreover, FX-indexed loans are abolished for financing purposes. With further modifications in Decree 32, it is prohibited to establish contracts in FX terms. Central Bank of Turkey also aimed to contribute to the FX risk management activities by initiating Turkish Lira-Settled Forward Foreign Exchange Sale Auctions.

The problem of underinvestment is considered to influence the hedging tendencies of the firms. Froot et al. (1993) and Bessembinder (1991) argue that hedging mitigates underinvestment problem by reducing volatility in cash flows. Aretz and Bartram (2010) consider the argument that the underinvestment problem is more relevant for the firms with promising growth opportunities. Thus, as the growth potential of a firm increases, that firm is expected to use derivative instruments to avoid sub-optimal investment schemes. The variables that stand for this perspective are mainly market-to-book ratio and price-to-earnings. Lastly, from the perspective of agency conflict and managerial risk aversion, Smith and Stultz (1985) show that managers who are assumed to be risk averse, also tend to hedge more as their wealth becomes more sensitive to firm's future cash flows. Furthermore, managers find more optimal to use corporate risk management when hedging at the individual level is costly. Thus, option-based compensation is proposed to be a reducing factor for hedging incentive since being exposed to more risk, and higher price volatility raises the value of options.

While theoretical literature sets the framework of reasons for the use of derivative instruments, following empirical studies in the corporate finance literature propose further factors that might have explanatory power over the derivative use. One of the elements proposed in the literature is the liquidity buffers, which behaves as a substitute for derivative use. Triki (2005) argues that holding liquidity buffers can be an alternative way of coping with cash flow volatility, or firms might choose to accumulate such buffers by cutting the dividends distributed. Thus, short-term liquidity and dividend policy are considered to be possible factors affecting derivative use. Besides, operational exposure to FX currencies is considered as an important determinant for FX derivative use. Studies analyzing determinants of derivative use incorporate exports to sales ratio to proxy for operational exposure (Geczy et al., 1997; Allayannis and Ofek, 2001; Howton and Perfect, 1998).

Data and Methodology

The balanced panel data used in the study consists of 178 non-financial manufacturing and services firms quoted in BIST[2]. FX position data for both on and off-balance sheet is obtained from the disclosures of annual financial statements[3]. The detailed information about on and off-balance sheet FX positions of the firms are presented in the currency risk chapter in corresponding disclosures[4]. Since FX position data in the disclosures is regularly available from 2007, the sample period covers the period from 2007 to 2017. Regarding firm-specific and control variables, data is obtained from FINNET and Bloomberg database; then, relevant financial and operational ratios are identified[5]. Detailed definitions and sources are provided in Table 4 in the Appendix. Summary statistics are given in Table 5, also in the Appendix.

The empirical methodology followed in this note consists of two steps. In the first step, we construct the binary variable $USE_{i,t}$ which indicates whether the firm uses an FX derivative or not. This variable takes takes the value of 1 if a particular firm i in year t with off-balance sheet net FX position carries a balance different than zero; otherwise, it deems to be 0. Next, a probit model is estimated to identify the

[2] By the end of 2017, there is available data for 383 firms quoted in BIST. However, 109 of these firms are financial firms and 16 of them have different functional currency than Turkish lira. Hence, these firms are excluded from the sample. Firms which do not have annual report for any year in the sample period are also excluded.

[3] Data with annual frequency is chosen to have information from consolidated financial statements for all firms. Furthermore, issues such as tracking structural changes in firm-characteristics and avoiding seasonality impacts are other reasons behind the choice of annual data.

[4] Difference between FX assets and FX liabilities represents on-balance sheet FX position for the firm. When derivative instruments provide FX long position, they are recorded as off-balance sheet FX asset. Correspondingly, those that create short FX position are recorded as off-balance sheet FX liabilities. Data is obtained from Public Disclosure Platform (PDP) except the period before 2009, which relevant data is available at Borsa Istanbul Archive of Financial Statements for aforementioned period.

[5] The raw data is trimmed in order to exclude outlier observations. In this regard, for the ratios which can take only positive values, observations beyond 99th percentile are trimmed; as for rest, observations beyond 0.5th and 99.5th percentiles on both ends are excluded from the analysis.

determinants of the decision to use derivative contracts. Specifically, the estimation equation is formulated as follows[6]:

$$\begin{aligned}\Pr(USE_{i,t}=1) = \Phi(&\beta_0 + \beta_1 Size_{i,t-1} + \beta_2 Liquidity_{i,t-1} + \beta_3 Growth_{i,t-1} + \beta_4 Tangibility_{i,t-1} \\ &+ \beta_5 Leverage_{i,t-1} + \beta_6 Foreign_{i,t-1} + \beta_7 Dividend_{i,t-1} \\ &+ \beta_8 Profitability_{i,t-1} + \beta_9 Cost_{t-1} + \delta' NOBSP_{i,t-1} * X_{t-1})\end{aligned} \quad (1)$$

where $\Phi(.)$ is the cumulative density function of standard normal distribution. $Size$ is defined as the natural logarithm of total assets, which stands for the scope of the firm's operations. $Liquidity$ is termed as the ratio of current assets to current liabilities and represents to what extent non-financial firms possess liquid assets as buffers. $Growth$ and $Tangibility$ stand for growth opportunities and the degree to which firms hold fixed assets respectively. While the former is proxied by the market to book ratio, the latter is defined by the ratio of fixed assets to total assets. Additionally, $Leverage$ which stands for indebtedness is calculated by the ratio of financial debt to market value of equity. $Foreign$ corresponds to the ratio of foreign sales to total sales and it stands for the degree of firm operations' internationalization. $Dividend$ and $Profitability$ are dividend payout ratio and return on equity respectively. Lastly, $Cost$ represents the cost of FX hedging through derivative contracts and is proxied by the yearly average of forward implied yield with the maturity of 6 months and $NOBSP$ is a dummy variable which implies that firm carries a net on-balance sheet FX short position in that particular period. The composition of the dummy variable helps us to assess whether or not the impact of firm-level characteristics differs for the firms carrying short FX positions via interactions.. The stepwise estimation procedure involves with four specifications, one of which only includes stock variables; size, liquidity, growth opportunities, tangibility, and leverage. In the second step, the probit model is augmented by the addition of flow variables which are the degree of internationalization, dividend policy, and profitability. In the third specification, the cost of undertaking FX derivative contracts is also controlled. Lastly, interactions dummies are utilized.

After grasping the determinants of FX derivative use, in line with the literature, we attempt to model the firm-level characteristics that affect the extent of derivative use. To this end, the firm/year observations with non-zero off-balance sheet FX balances are used to form the dependent variable $Extent_{i,t}$. This variable defined as the ratio of off-balance sheet net FX position to the on-balance sheet net FX position[7]. Then the following panel regression is estimated with fixed effects:

$$\begin{aligned}Extent_{i,t} = \gamma_0 + \gamma_1 Size_{i,t-1} + \gamma_2 Liquidity_{i,t-1} + \gamma_3 Growth_{i,t-1} + \gamma_4 Tangibility_{i,t-1} + \\ \gamma_5 Leverage_{i,t-1} + \gamma_6 Foreign_{i,t-1} + \gamma_7 Dividend_{i,t-1} + \gamma_8 Profitability_{i,t-1} + \gamma_9 Cost_{t-1} + \\ \mu_i + \varepsilon_{i,t}\end{aligned} \quad (2)$$

where μ_i and $\varepsilon_{i,t}$ stand for firm-level fixed effects and random disturbance term.

[6] All explanatory variables are lagged one period to cope with possible simultaneity issue.

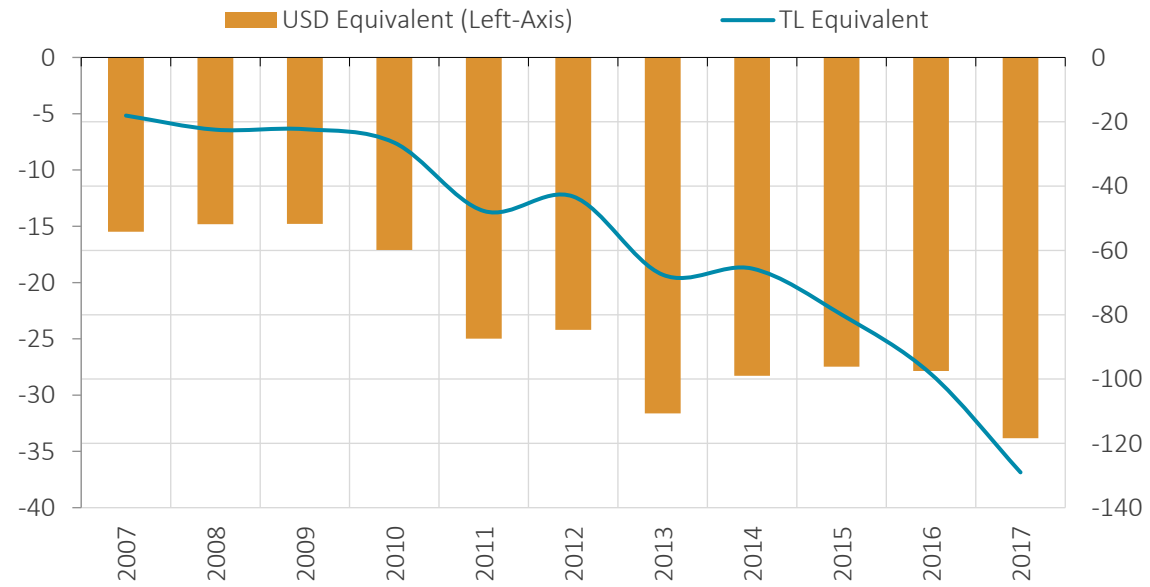
[7] We multiply this measure with -1.

Descriptive Findings for FX Positions and FX Derivatives Use

In this section, descriptive findings are presented to have an idea about on and off-balance sheet FX positions of sample firms. Chart 1 shows ongoing deterioration in the total net on-balance sheet FX short position. While respective deficit figure was around 15.5 billion USD (2% of GDP) at the beginning of the sample, net FX short position of sample firms have increased almost steadily to 33.8 billion USD (4.15% of GDP) as of 2017. This rise is associated with the increasing FX indebtedness as well as the stagnant formation of FX assets. Firm-level observations over time demonstrate the widespread worsening of FX short positions relative to market value of equity (Chart 2). This marked development points out that accumulated FX liabilities do not solely stem from firm growth. On the contrary, currency risk has become more pronounced. When we examine the currency decomposition of FX position in detail, it is found that FX short positions stemming from hard currencies like USD and EUR comprise almost 90 % of the total.

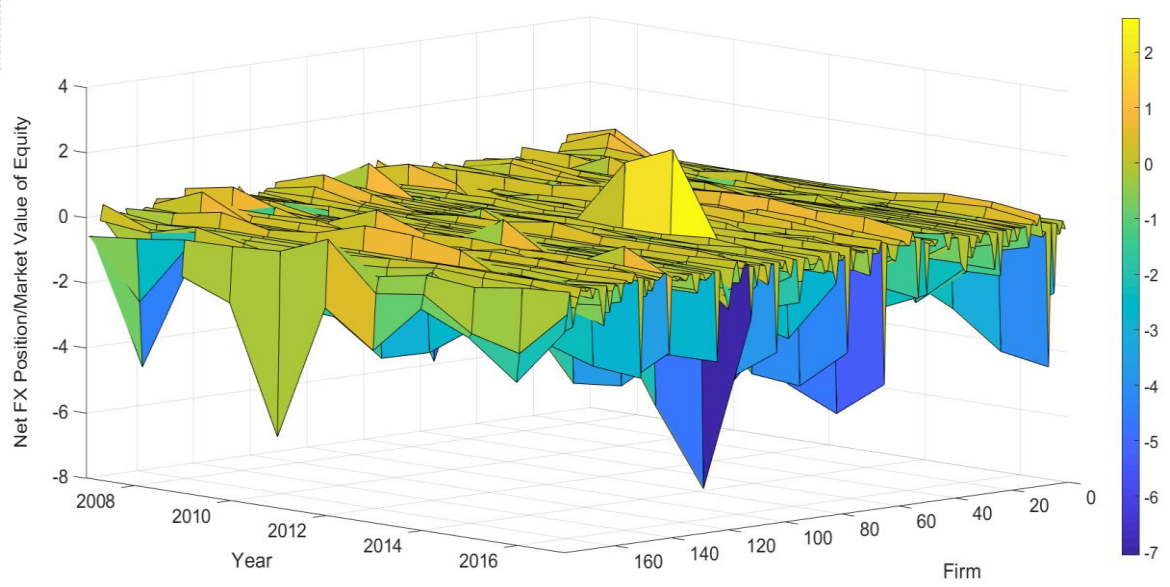
While firms face with net FX short positions from on-balance sheet activities, the historical data shows that they have net FX long position from derivative instruments. In fact, as of 2017, the aforementioned firms retain 14.4 billion USD net FX off-balance sheet position. Rising awareness about the implications of FX risks, enlarging liquidity of derivative instruments in domestic markets and risk management activities are all thought to contribute the increasing trend (Chart 3). The number of firms using currency derivatives tends to increase within the last decade (Chart 5). As a recent study, Çolak and Yılmaz (2017) examine the currency risk for non-financial firms in Turkey by utilizing combination of micro credit data as well as data belonging to smaller sample of BIST firms. They also identify that, on the aggregate level, long positions taken in derivative instruments (compared to on-balance sheet short positions) exhibit upward trend, especially since 2013. In terms of the currency breakdown, USD balances originated from off-balance sheet assets substantially outweighs EUR balances in the examined period. Hence net FX long off-balance sheet position is mostly stemming from USD transactions.

Chart 1: Total FX On-Balance Sheet Position of Sample Firms (In Billion Units)



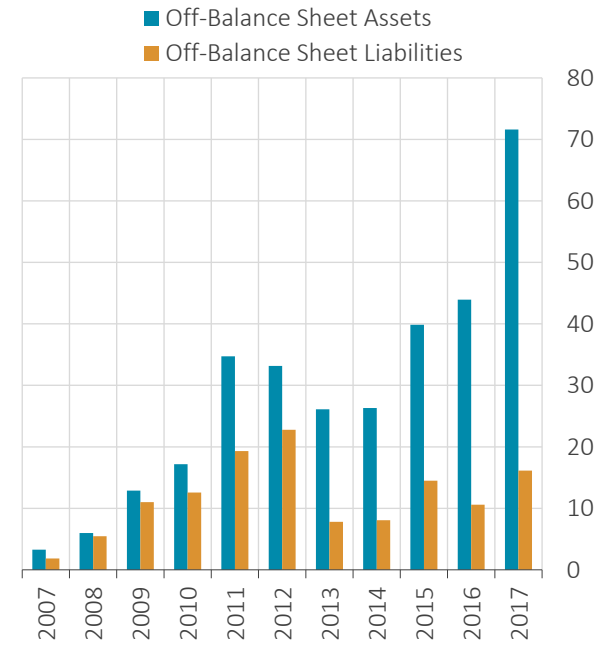
Source: PDP, BIST.

Chart 2: Net FX Position to Market Value of Equity Ratio



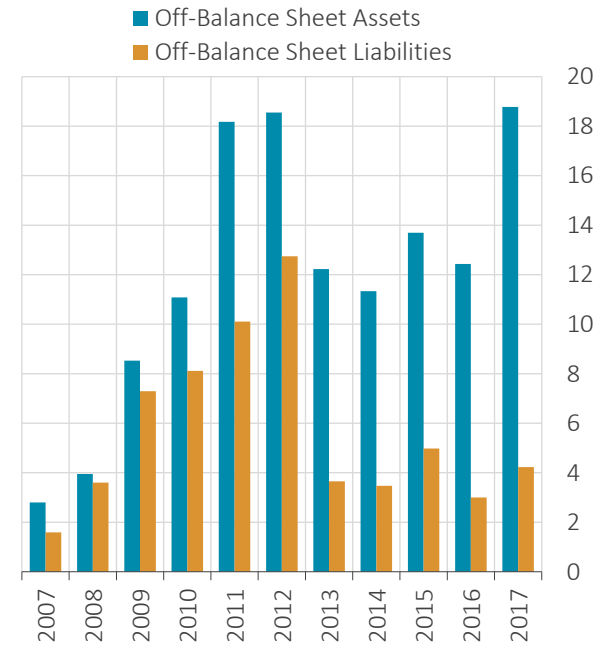
Source: PDP, BIST.

Chart 3: FX Off-Balance Sheet Positions of Sample Firms
(TL Equivalent, Billion TL)



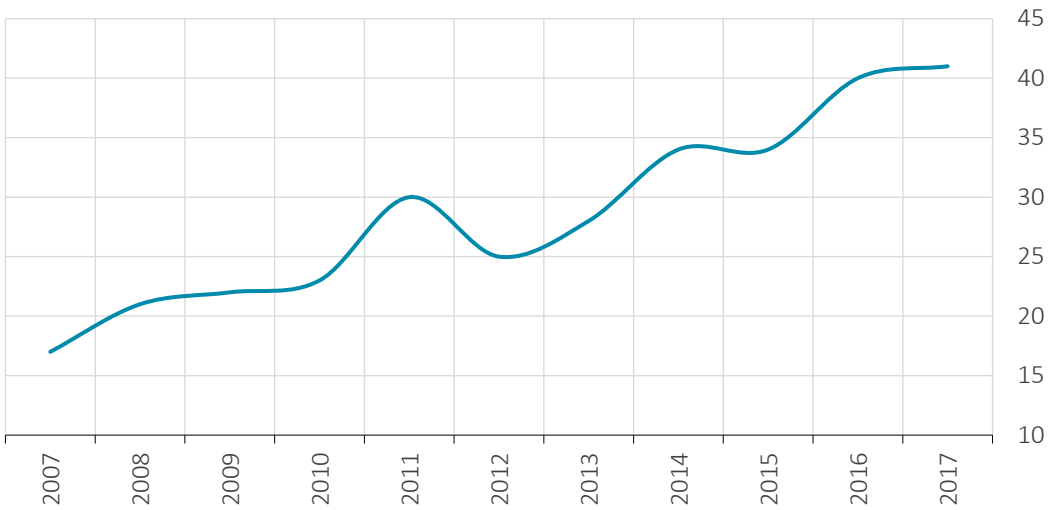
Source: PDP, BIST.

Chart 4: FX Off-Balance Sheet Positions of Sample Firms
(USD Equivalent, Billion USD)



Source: PDP, BIST.

Chart 5: Number of Firms Using Currency Derivatives in the Sample



Source: PDP, BIST.

The examination of the recent data for 2017 in terms of whether or not firms have FX long or short positions (on and off-balance sheet) indicates heterogeneity in the use of derivatives across firms (Table 1). As of 2017, 41 out of 178 firms appear to have an FX position in off-balance sheet items, whereas remaining 137 firms do not engage in such transactions. As it is mentioned above, the central tendency of non-financial firms is to have FX short and long positions in on and off-balance sheet transactions in respective order, which are observed in 26 firms. Besides this, three firms are found to maintain FX long positions on both fronts. On the other hand, nine firms have net FX short positions both on and off balance sheet accounts.

Table 1: Distribution of Firms According to FX Positions (As of 2017)

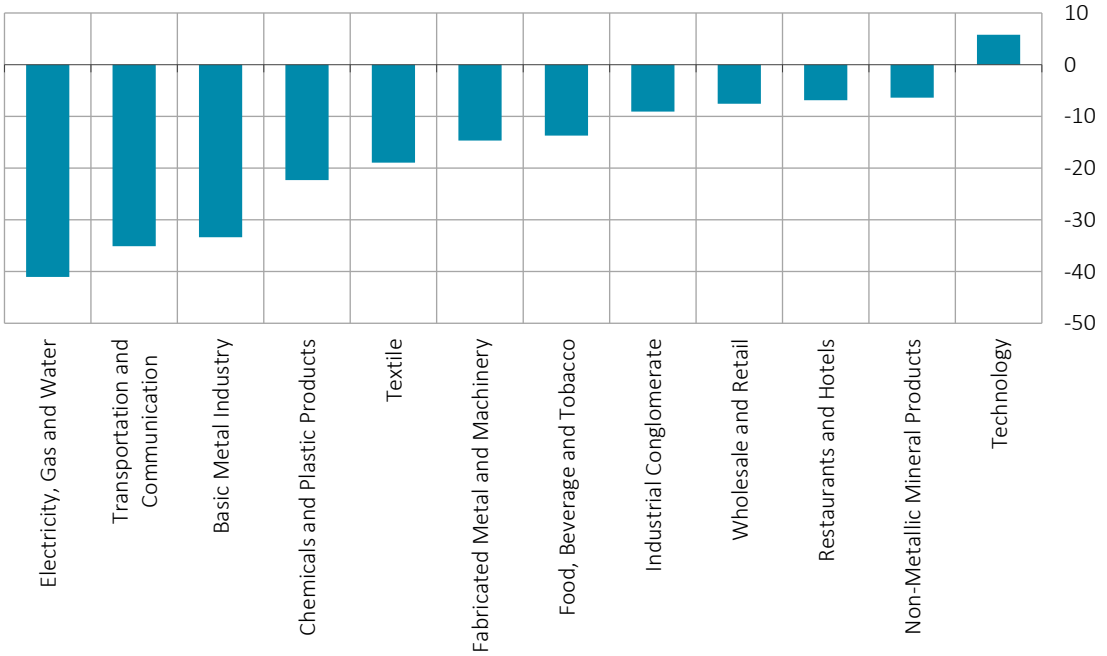
		On-Balance Sheet	
		Long	Short
Off-Balance Sheet	No Balance	46	91
	Long	3	26
	Short	3	9

Source: PDP, BIST.

In addition to firm-level heterogeneity, industries as sub-groups also display significant differences in terms of economic FX exposure and hedging tendencies. In this context, we use Public Disclosure Platform (PDP) industry definitions to classify 178 firms into 17 industry aggregates. Chart 6 depicts the ratio of net FX on-balance sheet positions to total assets for various sectors. It can be inferred that firms belonging to sectors such as utilities, transportation/communication, basic metal industry, and chemicals contain substantial short FX positions relative to their size. Although sectoral classification is different, it seems that Çolak and Yılmaz (2017) are also identifying sectors such as utilities, transportation/communication and manufacturing as the ones with sizeable rising FX deficits. Apart from the degree with which how economic FX exposure is distributed among sectors, the overall analysis also requires examining to what extent currency derivatives are used to cover this risk. Hedging ratios defined

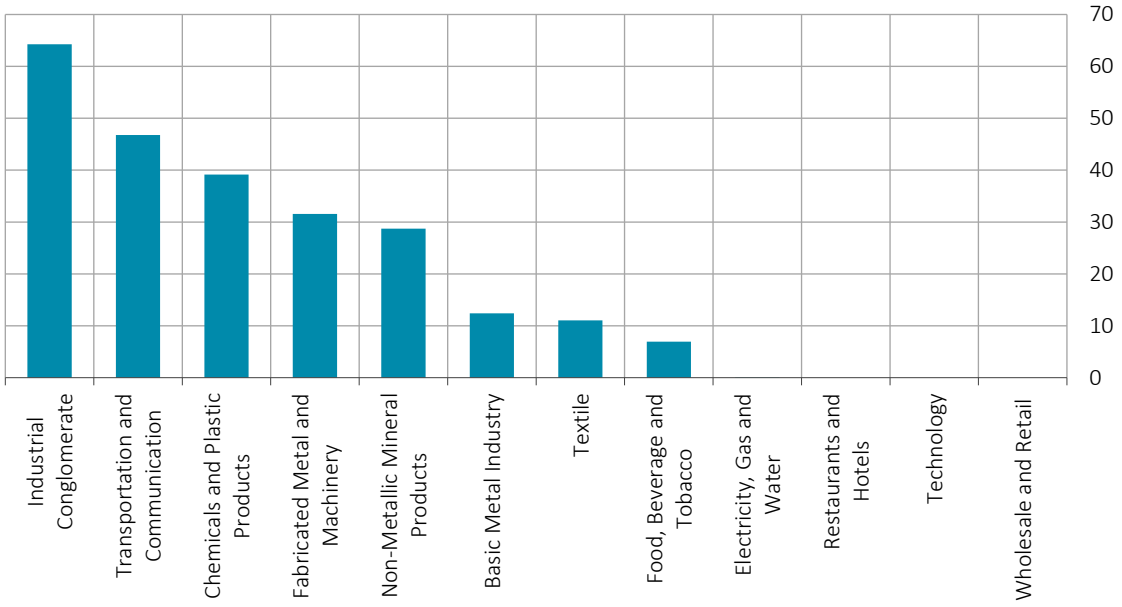
as the ratio of off-balance sheet positions to on-balance sheet ones (attached a minus sign as well) shows that industrial conglomerates, transportation/communication, chemicals and fabricated metal products tend to perform relatively well in terms of diminishing FX risks (Chart 7). In particular, industrial conglomerates appear to be the leading sector characterized by low FX risk well covered with the use of currency derivatives. Moreover, transportation/communication and chemicals are among the sectors which manage the on-balance sheet short positions with FX derivatives.

Chart 6: Net FX On-Balance Sheet Position to Total Assets (Percentage, As of 2017)



Source: PDP, BIST.

Chart 7: Hedging Ratio (Percentage, As of 2017)



Source: PDP, BIST.

Empirical Results

In this section, we firstly provide the results of the analysis to identify firm-level determinants of the decision to hedge through a multivariate probit model. Then, only for the firm/year observations corresponding to non-zero FX positions in off-balance sheet, we estimate fixed-effects panel regression model to investigate determinants of the extent of derivatives, once firms engage in currency derivative transactions.

Probit Model Results

Probit model specified in Section 2 is utilized to assess the firms' decision to engage in FX derivative contracts[8]. The coefficients estimates and marginal effects of the first specification (containing only stock explanatory variables) are provided in the second and third columns of Table 2. Results belonging to the second specification where flow variables are combined with stock variables are given in fourth and fifth columns respectively. In the third step, the specification involving the cost of hedging proxy is presented. Lastly, results of the model incorporating interaction dummies are given in the remaining columns.

Under all specifications, firm size is found to have a positive and statistically significant coefficient. Marginal effects[9] also indicate that relatively larger firms are more inclined to engage in derivative contracts. There appear to be minor alterations in the magnitude of coefficients and marginal effects over different specifications. This finding is compatible with the arguments in the literature claiming that firm size stands as an important determinant of derivative activities since markets for derivatives display substantial scale economies taking transaction costs into account. Large firms with well-established risk management programs also have talents equipped with know-how about financial engineering and closer ties to capital markets. These firms are the ones which find it easier to implement cost-efficient hedging strategies (Bodnar et al., 1998; Wang and Fan, 2011). Berkman and Bradbury (1996) also show that larger firms have more sophisticated financial management practices and are therefore more likely to use derivative contracts.

Liquidity is also found to be a significant determinant. Marginal effects show that non-financial firms with buffers in the form of liquid assets are less likely to participate in derivative transactions. In this context, previous studies also find out a negative relation provided that carrying liquidity buffers is a part of alternative methods to risk management activities with derivatives. Findings of Nguyen and Faff (2002) and Clark et al. (2006) are also in line with this finding.

Growth opportunities are found to be significantly associated with the use of derivatives. However, the direction of the relation is not in line with the theoretical predictions and empirical findings in this field. As argued by Froot et al. (1993), firms would be more likely to pursue suboptimal investments without the existence of proper hedging practices. Hence, risk management activities through derivative contracts can mitigate underinvestment issue if firms have more growth opportunities (and if they are financial constrained). However, the findings for the Turkish non-financial firms do not support this argument robustly. Another outcome of the probit estimation is that tangibility is negatively related to the probability of derivative use. Hence, firms with more tangible assets are found to less likely to engage in derivative transactions.

Leverage ratio representing the indebtedness and financial stress level of firms is determined to be significantly and positively related to the probability of having positions in derivative contracts. Assuming that the cost of implementing the risk management programme is lower than the present value of the costs of financial distress, risk management might lead to an increase in firm value. This channel works

[8] Similar analysis is repeated with logistic regression model as well. Results appear to be robust across different choice of modelling for binary outcomes.

[9] Marginal effects represent the extent of which the conditional probability of outcome variable is altered in response to the changes in the value of one particular regressor. In obtaining the marginal effects, we follow the procedure in which other variables are kept constant at their respective means.

through alleviating indirect and direct costs such as expenses of legal processes and administrative fees, ineffectiveness in supply-chain relations, loss of reputation and rising risk premium reflected in the employee and management compensations. Considering this feature of corporate risk management, non-financial firms with more probability of facing financial distress issue are, at the same time, expected to engage in hedging practices more.

Another factor contributing to derivative use is the degree of internationalization of firm operations. The level of FX exposure stemming from foreign operations is included in the empirical analysis of Geczy et al. (1997) through the utilization of share of foreign sales in total sales. Our explanatory variable derived with the same approach seems to have a significant and positive impact on probability to engage in risk management activities with derivative contracts. Marginal effects stay similar when we control for the stock variables and cost of hedging in the second and third specifications respectively. The relation between profitability and derivative use is ascertained to be positive in the second and third columns, although it is not statistically insignificant. While it is in contrast with the results of other studies in the literature, such a finding might be related to the fact that firms being larger in size are also comparably more profitable and widely use derivative instruments.

From the interaction variables, it can be seen that the higher tendency of larger firms to undertake hedging practices is more pronounced if there exists on-balance sheet short positions for these entities as the coefficient is positive. On the other hand, the negative coefficient of the interaction variable for liquidity indicates that firms with on-balance sheet FX deficits appear to consider liquidity buffers as hedging substitutes more than those which have no deficit. While no statistically significant impact is observed in baseline specifications, profitability seems to play a role in driving derivative use tendencies of firms when interaction variables are controlled. For firms which do not face with FX deficits, profits act as a buffer against possible losses stemmed from currency fluctuations. The negative relation in this context is expected as seen in the literature given the hedging substitute nature of profit buffers[10]. However, once we move to the side of firms with FX deficits, the coefficient turns out to be positive pointing out the fact that profitability buffers lose their status of hedging substitutes.

In addition to the results, predictive abilities of abovementioned specifications in the probit model are evaluated by employing Receiver Operating Characteristic (ROC) curve analysis (see Appendix, Chart 8). Since the ROC curve for a model without any predictive power is represented by 45^0 line, as the area beneath the ROC curve enlarges, more predictive power is obtained. For the specification with only stock variables, area under the curve is calculated as 0.8289, while it turns out to be 0.8371 for the most general specification containing flow variables and proxy for the cost of using derivative contracts as well. This shows the improvement of utilizing the latter specification over the former in terms of robustness. Furthermore, the ROC curve being above the 45^0 line points out that our modeling approach performs better than random guessing.

[10] Please see the Appendix for expected signs of variables from theroetical and empirical literature.

Table 2: Probit Model Results

Dependent Variable: Derivatives Dummy	(1)		(2)		(3)		(4)	
	Coefficients	Marginal Effects (dy/dx)	Coefficients	Marginal Effects (dy/dx)	Coefficients	Marginal Effects (dy/dx)	Coefficients	Marginal Effects (dy/dx)
Firm Size$_{i, t-1}$	0.4086*** (0.0281)	0.0678	0.4069*** (0.0295)	0.0641	0.4074*** (0.0295)	0.0642	0.3824*** (0.0331)	0.0584
Liquidity$_{i, t-1}$	-0.0831** (0.0326)	-0.0138	-0.0689* (0.0265)	-0.0108	-0.0688* (0.0352)	-0.0108	-0.0624** (0.0293)	-0.0095
Growth Opportunities$_{i, t-1}$	-0.0598** (0.0235)	-0.0099	-0.0569** (0.0265)	-0.0089	-0.0563** (0.0265)	-0.0088	-0.0591 (0.0427)	-0.0094
Tangibility$_{i, t-1}$	-1.8346*** (0.2285)	-0.3047	-1.6589*** (0.2419)	-0.2615	-1.6590*** (0.2422)	-0.2615	-2.0367*** (0.6343)	-0.3111
Leverage$_{i, t-1}$	0.1784*** (0.0438)	0.0296	0.2068*** (0.0496)	0.0326	0.2069*** (0.0495)	0.0326	0.6181*** (0.2088)	0.0944
Foreign Sales/Total Sales$_{i, t-1}$			1.0171*** (0.1827)	0.1603	1.0187*** (0.1823)	0.1606	0.7466*** (0.3201)	0.1140
Dividend Payout$_{i, t-1}$			0.0460 (0.1361)	0.0072	0.0436 (0.1362)	0.0068	0.4199* (0.2382)	0.0641
Profitability$_{i, t-1}$			0.2270 (0.1953)	0.0358	0.2273 (0.1952)	0.0358	-0.7757* (0.4411)	-0.1185
Forward Implied Yield $_{t-1}$					-0.0506 (0.1872)	-0.0079	-0.0341 (0.1893)	-0.0052
NOBSP*Firm Size$_{i, t-1}$							0.0471** (0.0187)	0.0072
NOBSP*Liquidity$_{i, t-1}$							-0.1778*** (0.0634)	-0.0271
NOBSP* Growth Opportunities$_{i, t-1}$							-0.0685 (0.0559)	-0.0104
NOBSP*Tangibility$_{i, t-1}$							0.2592 (0.6901)	0.0396
NOBSP*Leverage$_{i, t-1}$							-0.4660** (0.2157)	-0.0712
NOBSP*Foreign Sales/Total Sales$_{i, t-1}$							0.3069 (0.3843)	0.0469
NOBSP*Dividend Payout$_{i, t-1}$							-0.5319* (0.2947)	-0.0812
NOBSP*Profitability$_{i, t-1}$							1.2177** (0.4876)	0.1860
Number of Observations	1679		1624		1624		1624	
Adjusted McFadden R^2	0.225		0.249		0.252		0.274	

*, ** and *** display statistical significance at 10%, 5% and 1% significance levels respectively. Robust standart errors are provided in parantheses. Constant terms are included in the estimations.

Fixed-Effects Panel Regression Results

Similar to Allayannis and Ofek (2001), Dolde and Mishra (2002), Nguyen and Faff (2003) and Allayannis et al. (2004) among many others, in this note, we also try to elaborate on the determinants of the extent of derivative use as another strategic choice in addition to the decision to take positions in derivatives contracts. To this end, we apply fixed effects panel estimations on the dependent variable constructed as described in Section 2. In this case, we only include the firm/year observations corresponding to non-zero balances taken in terms of FX off-balance sheet position. Firm fixed effects are incorporated into estimations to account for heterogeneity in the derivatives positioning among firms.

Results are given in Table 3 for three specifications, similar to probit models. Results show that firm size turns out to be a significant factor for the extent of derivative use. It is seen that as firm size grows, hedging ratio is increased implying broader and more effective use of off-balance sheet instruments for FX risk. Firm size preserves its significance under all specifications, and the magnitude of the coefficient is not subject to significant alterations. Moreover, the impact of tangibility is pronounced in all specifications indicating that for those firms which use derivative contracts, the extent of derivative use is positively associated with the ratio of tangible asset to total asset.

Lastly, the ratio of foreign sales to total sales is found to be significantly and negatively associated with the extent of derivative use. As presented in Section 4.1, this ratio can be used as a proxy for the degree of internationalization and is found to enhance the decision to take derivative positions. However, in terms of the determinants of the extent of derivative use, the direction of the relation is inverse. Here, it could be inferred that once a firm decides to engage in risk management activities (possible due to more sophisticated and pronounced FX exposure accompanying the diversification of operational activities), natural hedging impact might kick-in. In other words, to what extent the FX short on-balance sheet positions are covered with off-balance sheet items also depends on the natural hedging derived from foreign income. In fact, the ratio of foreign sales to total sales can also be interpreted as an indicator of this[11].

Table 3: Fixed-Effects Panel Regression Results

Dependent Variable: Extent of Derivatives Use	(1)	(2)	(3)
	Coefficients	Coefficients	Coefficients
Firm Size$_{i, t-1}$	0.1914*** (0.0597)	0.1970*** (0.0485)	0.1899*** (0.0496)
Liquidity$_{i, t-1}$	-0.0634 (0.0700)	-0.0444 (0.0697)	-0.0467 (0.0714)
Growth Opportunities$_{i, t-1}$	0.0246 (0.0156)	0.01863 (0.0117)	0.0182 (0.0115)
Tangibility$_{i, t-1}$	0.7338* (0.4220)	0.9227** (0.3888)	0.9364** (0.3800)
Leverage$_{i, t-1}$	-0.0386 (0.0298)	-0.0248 (0.0251)	-0.0234 (0.0258)
Foreign Sales/Total Sales$_{i, t-1}$		-0.6397*** (0.2340)	-0.6384*** (0.2324)
Dividend Payout$_{i, t-1}$		-0.0134 (0.0690)	-0.0061 (0.0737)
Profitability$_{i, t-1}$		0.0817 (0.0926)	0.0889 (0.0919)
Forward Implied Yield$_{t-1}$			0.0501 (0.1006)
Firm Fixed Effects	Yes	Yes	Yes
Number of Observations	240	231	231
Adjusted R^2	0.102	0.180	0.183

*, ** and *** display statistical significance at 10%, 5% and 1% significance levels respectively. Robust standart errors are provided in parantheses. Constant terms are included in the estimations.

[11] It should be noted that the samples used in the probit regressions and fixed-effects panel regressions are different from each other in terms of scope and coverage. Moreover, the status of the firms regarding being net exporter or importer might also play a role in determining the impact of degree of internationalization on the choice and the extent of derivative use. We thank the anonymous referee for emphasizing these important points.

Conclusion

The growing foreign currency debt in emerging market corporates has considered being an important risk factor in the last years. The exchange rate fluctuations affect firms' operations and prospects by altering the value of assets and liabilities and by reducing profitability, which might create contagion effects on the overall economy. Therefore, limiting the FX exposure and FX risks stands as one of the most important policy goals for emerging markets with sizeable FX indebtedness.

Thanks to innovations in financial products and growing markets recently, FX derivatives have become a valuable tool to contain FX risks. However, there seems to be heterogeneity across the derivative use of the firms. Therefore, this note investigates the firm-specific factors determining the derivative use and the extent of it using a data set belonging to BIST non-financial firms.

Firstly, we present a descriptive analysis of the movements in FX on-and-off-balance sheet positions. The numbers show that although the FX on-balance sheet short position has increased after the global financial crisis, off-balance sheet instruments mainly FX derivatives tend to increase over time. Sectors such as industrial conglomerates, transportation/communication, and chemicals appear to have higher hedging ratios.

Secondly, a probit model is estimated for the identification of common characteristics of non-financial firms which are inclined to use FX derivative instruments. It is found that firms with larger size and higher leverage ratios tend to utilize FX derivatives more. Moreover, firms having considerably ample liquidity buffers and higher tangible assets ratio are determined to use off-balance sheet instruments to a lesser degree. Besides, derivative use is significantly affected by the degree of internationalization of firms' operations. Then, the extent of derivative use is investigated with fixed effects panel regressions. From this, it is inferred that firm size, tangibility ratio and degree of internationalization are found to be significant determinants of the extent of derivative use.

Empirical results of this note provide a piece of comprehensive information about the trends and dynamics of hedging practices of BIST non-financial firms. It should be emphasized that policies to be designed to safeguard the financial stability, by encouraging firms to engage in more sophisticated risk management activities, should take these dynamics and heterogeneities into account. Given the fact that firms are pretty much diverse in terms of hedging tendencies, steps taken to enhance financial deepening and stability should better be customized in the case of this fragmentation.

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Appendix

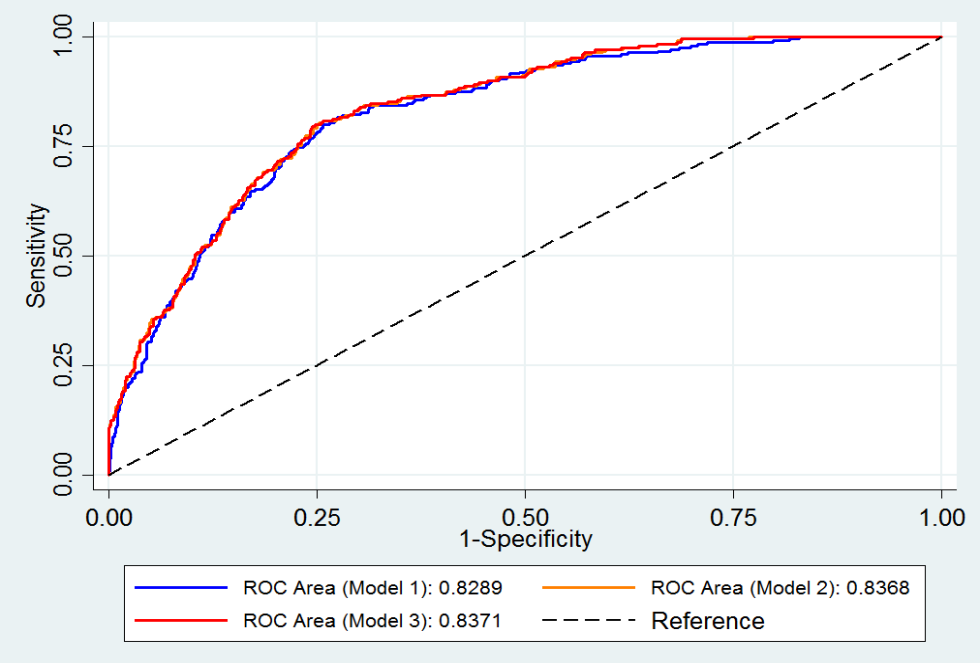
Table 4: Definition of Independent Variables

Independent Variable	Variable Derivation	Predicted Sign	Sources
Firm Size	Natural logarithm of total assets	+,-	FINNET, Authors' Own Calculations
Liquidity	Current ratio	-	FINNET, Authors' Own Calculations
Growth Opportunities	Ratio of market value of equity to book value of equity	+	FINNET, Bloomberg, Authors' Own Calculations
Tangibility	Ratio of fixed assets to total assets	-	FINNET, Authors' Own Calculations
Leverage	Ratio of financial debt to market value of equity	+	FINNET, Bloomberg, Authors' Own Calculations
Foreign Sales/Total Sales	Ratio of export sales to total sales	+	FINNET
Dividend Payout	Dividend payout ratio	+,-	Bloomberg
Profitability	Return on equity	-	FINNET, Authors' Own Calculations
Forward Implied Yield	Change in 6 Months Forward Implied Yield	-	Bloomberg

Table 5: Definition of Independent Variables

Independent Variable	Mean	Standard Deviation	Min	Max	25th Percentile	50th Percentile	75th Percentile
Firm Size	19.6912	1.7105	15.0585	24.8127	18.4724	19.5543	20.8492
Liquidity	2.1406	2.2612	0.0028	19.1161	0.9999	1.4768	2.3079
Growth Opportunities	1.8576	1.9409	0.0000	14.1506	0.7470	1.3006	2.1777
Tangibility	0.5119	0.2063	0.0055	0.9682	0.3509	0.5108	0.6758
Leverage	0.6184	0.9255	0.0000	7.8272	0.0281	0.3002	0.8112
Foreign Sales/Total Sales	0.1950	0.2161	0.0000	0.8471	0.0018	0.1141	0.3189
Dividend Payout	0.1516	0.3153	0.0000	2.1023	0.0000	0.0139	0.1244
Profitability	0.0404	0.2630	-1.9188	0.7897	-0.0154	0.0652	0.1605
Forward Implied Yield	-0.0002	0.2361	-0.4622	0.4759	-0.1226	0.0241	0.1269

Chart 8: ROC Curve for Probit Model Estimations



Source: Authors' Own Calculations.

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