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F. DILVIN TAŞKIN

Yasar University, Department of Business Administration, Turkey

UFUK TUTAN

Yasar University, Department of Economics, Turkey

USE OF DERIVATIVES AND FINANCIAL STABILITY IN TURKISH BANKING SECTOR

Abstract:

The aim of this paper is to analyze the impact of derivatives use on the stability of the banks that are operating in Turkish banking system for the period between 2005 and 2014, which is the period after the establishment of Turkish Derivatives Exchange. The risk of a bank is defined as a probability of default and Z-index is calculated for each bank. The results show that derivative instruments significantly increase the risks of banks; on the other hand bank risk is not a significant determinant of derivative usage. Liquid assets also increase and interest revenues decrease the risk of banks. When the determinants of derivative portfolio is analyzed it is understood that larger banks and foreign banks and banks with larger loan portfolio and liquid assets hold more of derivative products and banks which have higher interest revenues to total assets are more likely to engage in traditional banking activities.

Keywords:

Bank risk, Z-index, derivative usage, Turkish banking sector

JEL Classification: G20

1. Introduction

The recent financial turmoil has showed that the risks of the banking system are of great significance. Any disturbance happened in the banking systems are reflected in the other players, individuals, companies and governments, in the economy. This case was clearly seen in the recent global financial turmoil. The collapse and near collapse of banks caused deep crises and recessions in many countries. The too-big-to-fail or too-interconnected-to-fail issues have been largely discussed. Besides the bubbles in housing prices, shadow banking and derivative instruments were blamed for deepening the crisis.

The use of derivatives by banks is not new. For about three decades, there has been a spectacular growth in the balance sheets of banks, which is the result of the growth in derivative markets and derivative holdings of the banks. When we scrutinize the aim for holding derivatives, it is seen that there are two motives. First, the banks may use the derivative instruments for hedging their risk (e.g., Koppenhaver, 1985). The banks may have a tendency to use derivatives to offset their interest rate risk, exchange rate risk, etc. On the other hand, banks are likely to buy these instruments for speculative purposes. In order to generate more revenues banks may prefer to hold derivative portfolios which will increase their risk exposures. Some authors note that off-balance sheet activities on average decrease the returns of a banks and increase the volatility of their operating revenues, which will further increase their systematic risk (Calmes and Theoret, 2010). Some papers relate some specific types of derivatives to systemic risk, like credit default swaps (Stulz, 2010) and some authors suggest that the hedging offered by derivatives will lead the banks to carry more risk and increase the instability of the industry (Instefjord, 2005).

Some papers also note no significant impact of derivatives on the risk holdings of banks. For instance; Yong et.al. (2009) mention no impact of derivatives on exchange rate risk on Asia-Pacific banks. Cyree et.al. (2012) analyzed the values of the banks and concluded that derivative instruments have no effect on bank values both in times of growth and in times of the global crisis. Hentschel and Kothari (2001) focus on corporations and conclude that they are neither increasing nor decreasing their risks with the use of derivatives. In our opinion, this is a naïve claim, when we consider many mishaps happened in the past (Barings Bank, Orange County, etc.).

The aim of this paper is to analyze the relationship between financial derivatives usage and risk in the banking sector of Turkey. Turkey is an emerging market with a newly established derivatives market, namely Turkish Derivatives Exchange (Turkdex hereafter) in 2005. The Turkish economy is a bank-based economy and the banking industry still did not reach the maturity which makes it appealing for foreign investors. Thus, many foreign banks entered the market through mergers and acquisitions especially after 2005. These facts make the Turkish banking market important and so a deeper analysis is needed to understand the risk and derivatives link. The paper analyzes the 2005-2014 period and also focus on the determinants of derivatives usage. In the second part a brief information about the Turkish banking system is presented, third section will provide a brief literature review, fourth and fifth sections will present the empirical model and the results and finally section 6 will conclude.

2. Developments in Turkish Banking Sector and Derivatives Usage

The banking sector has a prominent role in the Turkish financial system. Most of the money and capital market transactions are carried out by banks. The banking system in Turkey make up approximately 80% of the whole financial system.

In 1980s a new structural program was introduced to liberalize Turkish economy. Turkish banking sector also had structural, legal and institutional and structural changes. Interest rate controls were eliminated, entry barriers in to the banking sector was relaxed to promote competition and increase efficiency (Denizer, 1998, 2).

After 1980s Turkish Banks started to operate in a highly competitive and volatile market. Turkish banks achieved important changes with restructuring Turkish economy and integration of world financial markets. On the other hand the system was still vulnerable. The volatile macroeconomic environments, the poor banking supervision, over-extended branches, dependence on government securities led Turkey to experience three economic and banking crises in years 1994, 1999 and 2001. These crises were indicators of higher foreign exchange risk and interest rates risks. In this highly integrated global financial environment the importance of the risk management especially for banking sector increased. By realizing the importance of risk management techniques, Turkish banks began to adopt some risk management

techniques which already existed in developed markets. Derivatives have been used as important tools in foreign exchange and interest rates risk management.

In Turkey Central Bank allowed the use of foreign exchange contracts in 1984. Currency swap contract transactions were allowed to be used by the banks in 1985. In that year, the Turkish Development Bank issued bonds amounting 10 billion yen, with a ten year maturity in Japanese capital markets. The bank would then swap its yen funds with the Central Bank in exchange for the Turkish Lira.

The first cross currency interest rate swap transaction between a bank and a non-financial organization in Turkey was arranged in June 1991. The Ankara Municipality raised 8.5 billion yen by issuing bonds for a five-year maturity, Then the Municipality swapped yen for US dollars using the Ziraatbank as counterparty (Akçaoğlu, 1998, 138).

Until 2005 there was no futures and options market in Turkey since ‘the Degree of Certain Revisions in Degree 32’ allowed execution of Transaction in Turkish Lira and foreign currencies in the international markets. (Akçaoğlu, 1998). Before 2005, banks performed derivatives transactions in international markets. With the establishment of the Turkish Derivative Exchange, derivative instruments are now easily accessible to all investors and banks. TurkDex now offers various kinds of instruments written on various underlying assets. Table 1 clearly shows the increase in derivatives usage by Turkish banks after the establishment of Turkdex.

Table 1. Use of Financial Derivatives by Turkish Banks (in USD Million)

	Derivative Assets Held for Trading	Derivative Assets Held for Hedging
2014	460,220	58,551
2013	454,170	46,600
2012	296,009	46,717
2011	261,253	38,298
2010	228,169	21,910
2009	153,690	11,842
2008	110,038	16,506
2007	134,995	1,222
2006	71,564	910

2005	41,612	1722
2004	29,165 (total)	
2003	24,604 (total)	
2002	15,505 (total)	
2001	24,711 (total)	

Source: Derived from the "Banks in Turkey Reports" of Turkish Banking Association

In Turkey, the total outstanding notional value of derivative contracts increased rapidly from 1991 to 2000 from 5.974 billion TL to 60.235.429 billion TL. In 2001, in the crisis year the total notional amount decreased to 40,519,446 billion TL with a sharp decrease, and also in 2002 there was a decline. But after the recovery of crises in 2003 and 2004 a gradual increase was achieved. An increase of more than 6524 % increase realized in 13 years. The increase from 2001 to 2014 is about 20 times of 2001 usage.

3. Literature Review

The story of derivative markets and products of financial markets, that amounted 270 billion USD at the USA's banking system in 2012 (Li and Marinc, 2014), started with the world-wide oil crisis of the 1970s. The collapse of the interventionist Keynesian economic policies was replaced with the liberal, monetarist Friedman's economic policies that regulatory but liberal reforms on financial markets and products spread out through the developed countries.

As the new innovations on the financial instruments were introduced throughout the world, financial markets became more influential on various countries' macroeconomic policies, and financial sectors gained more weights in the countries' GDPs (Szunke, 2014). Such trends in financial markets via derivative products eventually resulted in deregulations and liberalization in financial sectors that many former restrictions on financial activities of banking sectors of many countries were abolished. Therefore, speculations on the new financial instruments burst out throughout the world-wide financial markets and various countries' financial sectors that such speculative activities increased banking sectors' risks of various countries in the world.

Some studies such as Gibson and Murawski, 2013; Apatachioae, 2014; Mayordomo et al, 2014; Buston, 2015) indicated that from the early 1990s to the recent world-wide financial crisis, excessively liberalized and deregulated financial markets

with continuously innovated products certainly created huge profits and contributed more amounts to the wealth of nations; however, the risks of banking sectors undertook systematically increased during the time period. Such risks were recognized and analyzed by many state and private institutions of various countries in the time period (Mayordomo et al, 2014) but, ignored by some of the well-known chief state bureaucrats of some countries (Li and Marinc, 2014). However, some researches insistently presented that between the late 1990s and late 2000s, there were highly, positively correlations between innovated financial products such as trading, hedging derivatives, and risks undertaken by banking sectors (Gibson and Murawski, 2013; Apatachioae, 2014; Mayordomo et al, 2014; Li and Marinc, 2014; Buston, 2015). Even some studies documented that some banks were unable to manage and determine the risks that they undertook because of the misleading information of some state bureaucrats and risk reporting institutions although such risks were certainly obvious for banking sectors of many countries at the dawn of the recent financial sectors (Li and Marinc, 2014; Apatachioae, 2014).

4. Empirical Model

The paper will first focus on the factors that affect the risks of the banks in the system. Thus, the risk of each bank is calculated first. Following Yeyati and Micco (2007) we defined the bank risk as the probability of default for a given bank. In order to measure the probability of default for a bank, or insolvency risk Chebishev inequality is used, such that

$$P \left(ROA_{i,t} \leq -\frac{EQ_{i,t}}{A_{i,t}} \right) \leq \frac{\sigma_{ROA_{i,t}}^2}{\left(\mu_{ROA_{i,t}} + \frac{EQ_{i,t}}{A_{i,t}} \right)^2} \equiv \frac{1}{Z^2}$$

where ROA represents the net income over total assets, EQ the total equity over total assets, A is the total assets, σ is the standard deviation of ROA over the last 8 quarters and μ is the average of ROAs of bank i at time t . The smaller Z values stand for a larger risk exposure and points to narrower returns or larger return volatility or high financial leverage.

The first model assumes Z as the dependent variable, and analyzes its determinants:

$$Z_{i,t} = \alpha_i + \beta_{i,t}DER_{i,t} + \gamma_{i,t}Size_{i,t} + \delta_{i,t}INTR_{i,t} + \theta_{i,t}Loan_{i,t} + \tau_{i,t}LIQ_{i,t} + \rho_{i,t}DFor_{i,t} + \varepsilon_{i,t} \quad (1)$$

where *DER* is the ratio of derivatives portfolio to total assets, *Size* is the natural logarithm of total assets, *INTR* is the net interest revenues over total assets, *Loan* is the ratio of total loans in total assets, *LIQ* is the amount of liquid assets over total assets and *DFor* is the dummy variable that takes the value of 1 if the bank is a foreign-owned bank or 0 otherwise. The amount of loans point to the level of traditional banking activities at a bank, but still we are not sure about its effect on bank risks.

In the second model, determinants of derivative usage is investigated. We are specifically interested whether the risk of the bank measured as *Z* has a significant impact on the amount of derivatives usage. The second model is thus:

$$DER_{i,t} = \alpha_i + \beta_{i,t}Z_{i,t} + \gamma_{i,t}Size_{i,t} + \delta_{i,t}INTR_{i,t} + \theta_{i,t}Loan_{i,t} + \tau_{i,t}LIQ_{i,t} + \rho_{i,t}DFor_{i,t} + \varepsilon_{i,t} \quad (2)$$

Using these models the paper will adopt a panel regression, and the decision of the fixed effect or random effect model will be based on the Hausman test statistics.

5. Data and Empirical Results

The data for the study is collected from the financial statements of the banks that are available in the website of Turkish Banking Association (TBA). The analysis covers the period from 2005, the year when the Turkish Derivatives Exchange market was established, to 2014. The banks that are operating as deposit banks and have a minimum 3 years of operation during the analysis period are adopted* and the banks which do not meet these criteria are omitted from the study. The number of banks covered in the paper is 35. Table 2 presents the descriptive statistics for the data.

Table 2. Descriptive Statistics

	DERIV	DFor	INTREV	LIQ	LOANS	SIZE	Z
Mean	0.641	0.475	0.041	0.401	0.493	8.890	2.266
Median	0.419	0.000	0.037	0.327	0.558	8.920	0.101
Maximum	6.075	1.000	0.272	0.987	0.777	12.419	71.480
Minimum	0.000	0.00	-0.085	0.085	0.002	3.241	0.006
Std. Dev.	0.793	0.500	0.026	0.207	0.193	2.139	9.358
Skewness	3.003	0.097	3.223	1.099	-0.813	-0.286	5.133
Kurtosis	16.77	1.009	30.74	3.327	2.666	2.291	31.034

* In order to calculate the Z values minimum 9 quarters of data are required, thus minimum 3 years of operation is a must in order to be qualified for the analysis.

Jarque-Bera	2513.6	44.50	9026.1	55.016	30.671	9.233	9916.5
Probability	0.000	0.000	0.000	0.000	0.000	0.009	0.000
Sum	171.26	127.00	10.975	107.149	131.853	2373.68	605.055
Sum Sq. Dev.	167.53	66.591	0.184	11.397	9.957	1217.28	23294.6
Obs	267	267	267	267	267	267	267

The descriptives show that average bank uses derivative instruments that are equal to about 64% of total assets. Based on their magnitude of usage, analysis of the possible effects of derivatives on the bank risk is of crucial significance. The DFor has a mean of 47.5%, which shows that the foreign banks have as equal amount of dominance in the market as their domestic counterparts. The interest revenues to total assets for an average bank is about 4%. This shows the importance of the analysis of derivative instruments considering their ratio to total assets.

Both of the Hausman test statistics point to fixed effects model. The result of the first regression is presented in Table 3. The coefficient for the derivatives is negative, implying that the use of financial derivatives decreases the Z value and hence increases the failure probability. Liquidity is another factor that increases the risk of a bank at 1% significance level. Despite the general expectation that liquidity decrease the bank risk, here the liquidity has a deteriorating effect on bank stability. Since we defined the stability of a bank as the probability that the banks equity will not be enough to cover the losses, it is evident that the liquid assets decrease the profitability of a bank, thus increase the risk. Interest revenues on the other hand decrease the risk, by increasing the net income of the bank which will buffer against insolvency.

Table 3. The Regression Results for Model 1

Dependent Variable:Z		
	Coefficient	t-stat
DERIV	-0.051***	-4.789
INTREV	0.663**	2.1529
Dfor	-0.001	-0.043
LIQ	-0.245***	-2.0178
Size	0.011	1.391
Loans	0.241	1.437
C	2.154***	16.538
R-Squared		0.833719
Adjusted R-Squared		0.804289
Prob		0.000

Note: *DERIV*, *INTREV*, *DFOR*, *LIQ*, *Size*, *Loans* and *C* represent derivatives portfolio to total assets, interest revenues to total assets, dummy variable which takes the value of 1 for foreign bank, liquid assets to total assets, natural logarithm of total assets, loans to total assets and constant variable, respectively.

***, ** and * denotes 1%, 5% and 10% significance, respectively.

The regression results for the determinants of derivative usage is presented in Table 4. The results show that there is no significant explanatory power of bank risk on derivative usage. Foreign banks are more likely to use derivatives, which is not a very surprising finding, since it is evident that foreign banks have more opportunities to participate both in national and international derivative markets. Size is also another factor that is significantly explaining derivatives usage at 1% statistical significance. Bigger banks have more tendency to use derivative instruments. The banks with higher liquid assets and more loans have more derivative holdings.

Table 4. The Regression Results for Model 2

Dependent Variable: DERIV		
	Coefficient	t-stat
Z	0.0011	0.479
INTREV	-1.283**	-2.334
DFor	0.479***	7.783
LIQ	0.124**	2.154
SIZE	0.097***	3.901
LOANS	0.205**	2.017
C	-0.557***	-2.927
R-squared		0.897
Adjusted R-squared		0.879
Prob		0.000

Note: *Z*, *INTREV*, *DFOR*, *LIQ*, *Size*, *Loans* and *C* represent Z-index (bank risk), interest revenues to total assets, dummy variable which takes the value of 1 for foreign bank, liquid assets to total assets, natural logarithm of total assets, loans to total assets and constant variable, respectively.

***, ** and * denotes 1%, 5% and 10% significance, respectively.

6. Conclusion

For many countries banking sector is the main catalyzer for the stable functioning and growth of the economy. Banks channel the funds that have excess of it to those who lack it. Thus savings are created and transferred to bigger projects which will increase the economic growth. The mentioned process refers to the core activities of banks, but recently banks all around the world are more focused on non-traditional banking activities. Off-balance sheet activities and non-interest income became number one source of revenues for banks. The tendency to use the derivative instruments either for hedging and for speculative purposes have become another issue.

The literature notes different impacts of derivatives on bank risk. If the banks are using the derivative instruments to offset their exposures to various kinds of risks, the derivative instruments may have a decreasing effect on the systemic risk of banks. On the other hand, the outburst of the global financial crisis drew attention to the derivative instruments especially credit default swaps, which were considered the number one foe for the crisis. Most papers consider financialization or the financial architecture or so called financial engineering as the main sources of instability for the banking system.

The lack of consensus in the literature about the derivatives use and their impact on risk directed our analysis at this concept. The aim of this paper is to analyze the relationship between the risk of banks and derivatives usage in Turkish Banking Sector. Turkey is one of the emerging economies, with a banking sector that still has not reached its maturity stage, thus an attraction for international banks. The analysis is also important in the way that Turkish Derivatives Exchange is a newly established and a growing market both in terms of market capitalization and product diversity. It is clear that the establishment of a derivative market in 2005 increased the derivative usage of the Turkish banks. Thus, the paper analyzes the period between 2005 and 2014. Using the balance sheet data of banks, fixed effect panel regressions are run in order to understand the possible effects of derivatives usage on bank risk, which is defined as the probability of bank default. Further, the determinants of derivative usage are analyzed in a second model and see if bank risk is a significant determinant of derivative usage.

The results of the analysis show that derivatives portfolio has a significant and a negative effect on Z-index at 1% level and thus increases the possibility of default for a bank. Interest revenues significantly decreases the bank risk with a high coefficient and the liquid assets increase the bank risk by keeping the funds idle and decreasing the net income of banks.

When we look at the determinants of derivative usage Z-index was found as an insignificant parameter. Larger banks and foreign banks use derivative products more. The loan portfolio and liquid assets of a bank also increase the derivative usage. Interest revenues on the other hand are inversely related to derivative usage, meaning that banks who can earn with traditional banking activities are less likely to hold derivatives.

The results lead us to two important conclusions. The banks in Turkey are less likely to use derivative instruments for hedging purposes and keeping the derivatives portfolio increases their vulnerability. The authorities should be aware of this fact and should take some measures to control the increasing risks of banks due to their derivative holdings. Another important finding is that the use of derivatives is more common for large and foreign banks. This result points to the importance of existence of a local derivative market in emerging economies. If the policy makers make these tools available for every financial institution and provide sound regulations, these instruments can lead to a more stable industry.

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