How Dangerous is the Counterparty Risk of OTC Derivatives in Turkey?

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HOW DANGEROUS IS THE COUNTERPARTY RISK OF OTC DERIVATIVES IN TURKEY?*

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Abstract

Recent developments in Turkish derivatives markets demonstrate the increasing importance of risk management not only for individual banks but also for the entire system. In this context, this study analyzes the counterparty credit risk of OTC derivatives. The analysis is based on a hypothetical portfolio that is characterized by key aspects of the instruments banks hold. Thus, the portfolio consists of vanilla swaps, which dominate banks' transactions. By simulating market risk factors, we come up with proxy risk exposure figures for the whole banking system. After a proper adjustment, these figures have been compared with the risk weighted assets, which includes credit risk, as well as with the capital. Consequently, we observe that the counterparty credit risk resulting from the use of OTC derivatives is relatively small for the Turkish banking system. Nevertheless, in light of the new regulatory framework introduced by Basel III, the importance of credit and market liquidity risk for the OTC instruments in trading portfolios is expected to increase in the near future.

Keywords: Counterparty credit risk, OTC derivatives, swaps, Basel II, valuation.

JEL Codes: C15, E44, G21, G32

Türkiye'de Tergahüstü Piyasalardan Kaynaklı Karşı Taraf Riski

Özet

Türkiye'de tezgah üstü (OTC) türev piyasalarında yaşanan gelişmeler, risk yönetimini hem bankalar hem de sistemin bütünü için giderek daha önemli kılmaktadır. Buna paralel olarak, bu çalışmada OTC türevlerine ilişkin karşı taraf kredi riski analiz edilmektedir. Yapılan analiz bankaların portöyünde yer alan ürünlerin temel özelliklerini taşıyan varsayımsal bir portföye dayanmaktadır. Dolayısıyla, portföy, bankaların ağırlıklı olarak işlem yaptığı vanilla türü swaplardan oluşmaktadır. Çalışmada, piyasa risk faktörlerinin simüle edilmesiyle, bankacılık sektörünün tamamı için riske maruz pozisyon tutarları elde edilmiştir. Uygun dönüştürmelere tabi tutulan tutar kredi riskini içeren risk ağırlıklı aktifler ve sermaye ile karşılaştırılmıştır. Buna göre, OTC türevlerinden ileri gelen karşı taraf kredi riskinin Türk bankacılık sektörü için göreli olarak düşük olduğu gözlenmiştir. Buna karşın, kredi riski ve piyasa likiditesi riskinin önemi de dikkate alındığında, Basel III kapsamında gelen yeni uluslar arası düzenlemeler konunun önemini artırmaktadır.

Anahtar kelimeler: Karşı taraf kredi riski, OTC türevleri, swap, Basel II, değerleme.

JEL Kodları: C15, E44, G21, G32

* Opinions expressed in this study are of authors' and do not necessarily represent the institutions connected with the authors.

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INTRODUCTION

The recent global crisis has emphasized the necessity for better risk management, especially for banks. OTC derivatives are widely used for hedging risk; however, the risk involved in the use of OTC derivatives is vital as well. With the realization of this risk, there was a tendency to blame the financial models and derivatives for triggering the global financial crisis. As is mentioned in Derman (2011), overreliance on quantitative models could be fatal. No matter how good a quantitative model is, it is only a model, not the reality. On the other hand, data alone have no voice. Models and quantitative tools are helpful to benefit from the data. Hence it is important to combine the intuitive kind of knowledge with quantitative tools. As Gregory (2010) indicates, models tend to be viewed as either "good" or "bad" depending on the underlying market conditions; whereas in reality, models can be good or bad depending on how they are used. In parallel, we believe that derivatives and models can perform the role which they are mainly designed for only if they are used in the right way and the inherent risk is well-managed. Solely blaming the models and quantitative tools does not seem to be a solution.

New regulations and the ongoing sovereign debt crisis in the Euro-zone are named as the key challenges for 2012 (Risk Magazine, 2012). Zooming in the former, this study elaborates the OTC derivatives with a particular emphasis on counterparty credit risk (CCR). Especially, since the onset of the recent global crisis, OTC derivatives' complex, opaque and bilateral nature has been under discussion. The ongoing regulatory actions intend to make OTC derivatives as much standard as possible and have them traded on exchanges/electronic platforms. In order to increase transparency, OTC transactions are to be reported to trade repositories (FSB, 2011). If the system works in the directions of the incentives brought by the regulations, then financial system and the real economy are very likely to benefit from the efforts underway. However, there are many facets of the new coming framework. And this mostly depends on how the markets will approach to the reforms. More transparency would contribute to market efficiency and risk management; however it may result in sub-optimal consequences (Coşkun, 2011). Finally, to mitigate the CCR, margin requirements and central counterparties are the focal point of the new regulations (IOSCO, 2011). The implications of these reforms for Turkey are closely monitored by the authorities (CBRT, 2011).

In this study the goal is to measure the CCR of banks operating in Turkey. The exposure at default figures are estimated on the built portfolio with the Monte-Carlo simulations. The results imply that the CCR is relatively small in Turkey. The rest of this study is organized as follows. Section II presents some key concepts on CCR. Section III provides certain aspects of OTC derivatives in the global markets and in Turkey. Section IV contains the data and the model used in the analysis. Section V includes the assessment of the results of the analysis. Finally, section VI sums up concluding remarks.

I. FRAMEWORK

IAIS (2004) defines credit risk as the risk of financial loss resulting from default or movement in the credit quality of issuers of securities, debtors, or counterparties and intermediaries, to whom the company has an exposure. Specifically, CCR is defined by BCBS (2005) as the bilateral credit risk of transactions with uncertain exposures that can vary over time with the movement of underlying market factors. CCR could arise from other transactions such as repos and reverse repos; however in this study, CCR coming from OTC derivatives is subject of concern. Unlike the traditional credit risk, CCR creates a bilateral risk of loss such that the market value of the transaction can be positive or negative to either counterparty. Banks' CCR exposures should be adequately capitalized. To determine the required capital for CCR, exposure at default is calculated based on different methods: (i) current exposure method (CEM), (ii) standard method (SM), and (iii) internal model method (IMM). The last method is evaluated to be the most risk sensitive one for quantifying CCR. At present, CEM is the commonly used method, where it is based on replacement cost (mark-to-market) of the transactions plus an add-on that is proxy for the potential future exposure (BCBS, 2005). The new international regulations tend to join CEM and SM under one frame and come up with a more risk sensitive standard method as an alternative to IMM.

In this study, under the Internal Models Method (IMM), the Monte Carlo (MC) simulation based approach is applied. The main steps in calculating the CCR, in line with Gregory (2010), and Pykhtin and Zhu (2007), are as follows:

(i) Relevant market risk factors are chosen. To do this, the underlying randomness behind the OTC instruments and the embedded inter-relation are considered. Commonly, spot interest rates and FX rates are used as risk factors.

(ii) Scenario generation is the next step. Generating market scenarios via simulation of these risk factors rests upon the stochastic processes of the risk factors. The parameters in the processes could be based on risk-neutral measure or the real measure. Generally, for the risk management purposes, the latter is preferred.

(iii) Under the generated scenarios, the instruments are revalued to see how their values evolve through time and accordingly the resultant risk for the counterparties are estimated.

(iv) Finally, the revalued figures are aggregated to find counterparty-level exposure by applying necessary netting rules. And the results are validated by necessary tools and intuition. The IMM method requires calculating the EAD (Exposure at Default) depending on the internal calibration of effective expected positive exposure.

To understand the steps of the model, it is important to clarify the concepts used in CCR framework. The concepts associated to CCR are as in Table 1:

Table 1: CounterParty Credit Risk Concepts

Concept	Definition
Counterparty Exposure	Larger of zero and the market value of the portfolio of derivative positions with a counterparty that would be lost if the counterparty were to default and there were zero recovery.
Current Exposure (CE)	Current value of the exposure to a counterparty. The amount at risk should the counterparty defaults now and is normally assumed to be the mark-to-market (MtM) value of that trade.
Marked-to-Market (MtM) Value	MtM represents replacement cost, which defines the enrty point into an equivalent transaction(s) with another counterparty, under assumption of no transaction costs. Expected MtM is the forward or expected value of a transaction at some point in the future
Potential Future Exposure (PFE)	Maximum exposure estimated to occur on a future date at a high degree of statistical confidence. PFE has a stochastic nature.
Expected Exposure (EE)	Probability-weighted average exposure estimated to exist on a future date.
Expected Positive Exposure (EPE)	Time-weighted average of individual EEs estimated for given forecasting horizons.
Effective EE	Constrained EE which is non-decreasing for maturities below one year.
Effective EPE	Average of effective EE. Maximum PFE is the highest PFE value over a given time interval.
CVA/DVA	CVA (Credit Valuation Adjustment) is defined as the difference between the value of a derivative assumming the counterparty is default-risk free and the value reflecting default risk of the counterparty. DVA (Debit Valuation Adjustment) is the difference between the value of the derivative assuming the bank is default-risk free and the value reflecting default risk of the bank. Changes in bank's own credit risk result in changes in the DVA component of the valuation of the banks' derivatives.
Right way/Wrong way Exposures	Positively/negatively correlated exposures with the credit quality of the counterparty. In other words, a significant unfavorable correlation between the value of a derivative contract and the likelihood of default of a counterparty.
Credit Risk Mitigants	There are many ways to mitigate or limit counterparty credit risk. Trading with high-quality coun terparties, diversification, netting, collateralisation, and hedging (i.e. with credit derivatives). A centralised clearing house is also an important risk mitigant provided that the clearing house itself is default-remote.

Source: BCBS (2005), BCBS (2011), Canabarro and Duffie (2003), Pykhtin and Zhu (2006), and Gregory (2010).

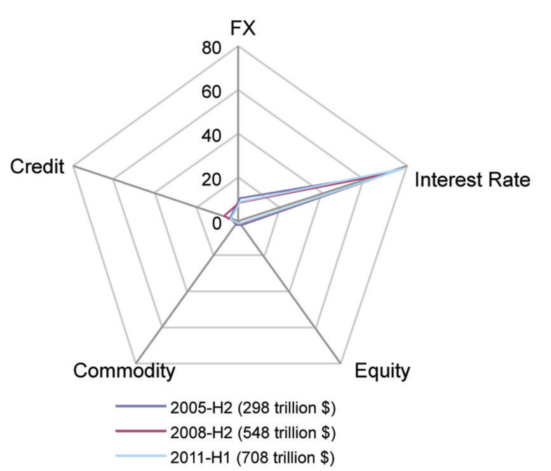
Basel III brings capital charges for banks' counterparty exposures to CCPs, where under Basel II, transactions with the CCPs were not capitalized at all. The methods to calibrate CCR are under re-construction. As for non-centrally cleared OTC derivatives, margining requirements are underway. Basel III brings additional capital charge connected to market risk component of CCR, namely credit value adjustment (CVA). CVA is designed for the bilateral transactions and does not cover the centrally-cleared derivatives. Another important new coming issue is the market liquidity of the OTC derivatives.

II. OTC DERIVATIVES MARKETS: FACTS AND FIGURES

Why are the OTC derivatives this much subject of concern? The increasing tendency and the high amount of the OTC transactions account for the rising interest in OTC derivatives. Globally, according to the BIS (2011), the OTC derivatives market reached $708 trillion in total notional outstanding amounts and $20 trillion in gross market value as of September 2011. Among the OTC derivatives interest rate derivatives constitute the largest portion (Chart 1). In Turkey, as of June 2012, the banking sector balance sheet size is around ₺1.5 trillion, where the total off balance sheet items amount to ₺1.2 trillion. Approximately, a half of the off-balance sheet amount corresponds to OTC derivatives. However, since both legs of the derivatives transactions are included in the off-balance sheet figures, the below chart presents half of the amounts. As for the composition, currency swaps dominate the system (Chart 2).

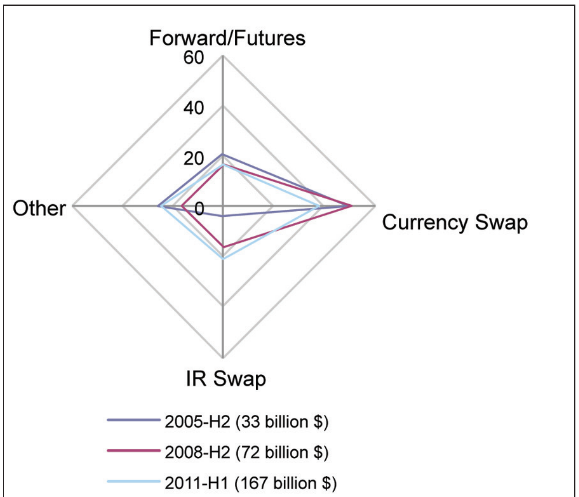
The figures in banks' off-balance sheets are in nominal terms. According to current regulations of BRSA and also market practices, derivatives are recorded to off-balance sheet accounts at their purchase costs involving transaction costs. Subsequently, the derivative transactions are valued at their fair values and the changes in their fair values are recorded on balance sheet under the sub-accounts named as "derivative financial assets/liabilities held for trading". In accordance with the Turkish accounting standard no. 39, "Financial Instruments: Recognition and Measurement", derivatives are classified based on the nature/purpose of the transaction as "hedging" or "trading". Derivatives held for trading purposes are measured at fair value in the statement of financial position. Changes in the fair value of derivatives that are designated and qualify as trading purposes are recognized in income immediately. Although OTC derivative trades are commonly for hedging, due to complex accounting treatments, banks tend to report them as trading purposes. This makes the market risk component of CCR highly important for the banks due to the adjustments by marking to market.

Chart 1. OTC Derivatives-Global (%)



Source: BIS

Chart 2.OTC Derivatives-Turkey (%)



Source: BRSA.

III. DATA AND MODEL

This study depends on a simple hypothetical swap portfolio S= $\{S_{\$}^{IRS}, S_{€}^{IRS}, S_{₺}^{IRS}, S_{\$}^{CS}, S_{€}^{CS}\}$, where IRS and CS stand for interest rate and currency swaps, respectively. Based on the common characteristics of the swaps in banks' portfolios (BRSA, 2011), this study focuses on 5-year IRS and 1-year CS with different currency types. Building the portfolios is followed by the construction of the scenarios for the market risk factors. In terms of the general analytical approach, this study is in parallel to Heller and Vause (2012)[5]. The data and the methodology used in the model are briefly described below:

Table 2: Data and Methodology

Stage	Explanation
Factors	Interest rates and FX rates are the relevant risk factors for the hypothetical swap portfolio. For both the IRS and CS, we use the relevant Libor and Swap rates for various maturities on ($, €, ₺) which are compiled from Bloomberg. The missing maturities are acquired by interpolation. As for the FX rates, ₺:$ and ₺:€ effective rates are used.
Scenarios	The scenarios for the market risk factors are acquired by Monte-Carlo simulation. To do this, the random number generation based on the M-dimensional multivariate diffusion process of the form is used; $dX_t = (A - BX_t)d_t + \eta_t$; where X_t is an M dimensional continuous time process, A and B are M x M and M x 1 matrices, and η_t is a vector random process with uncorrelated increments and covariance matrix Σdt. More specifically, within this multidimensional system, we assume that (i) (i) short term interest rates evolve according to Cox-Ingersoll-Ross (CIR) model: $dr_t = \kappa(\alpha - r_t)dt + \sigma_r\sqrt{r_t}dW_t^r$, (ii) (ii) FX returns follow Geometric Brownian Motion (GBM): $\frac{dS_t}{S_t} = \mu dt + \sigma_{FX} dWt^{FX}$, (iii) where κ is the speed of adjustment, α is the long run mean of short rate (i.e., the level), dW_t is the increment of Wiener process, μ is the mean of returns on currencies, finally $\sigma_r\sqrt{r_t}$ is the volatility of the short rate.
Valuation	A swap's price is its fixed rate. To find the fixed rate $\forall S_i^j \in S$, the main formula used is: $FS(0, n,m) = \frac{\mathbf{1-B_0(h_n)}}{\sum_j^n B_0(h_j)}$, where FS is the fixed rate and the interest payments occur on days h_j such that $j \in \{1,2,..n\}$. The time interval between payments is m days. Finally, $B_0(h_j)$ is the present value factor on a zero-coupon instrument paying 1$, ₺ or € at its maturity date (CFA Level II, Derivatives and Portfolio Management, Volume 6, 2012). Based on the generated scenarios, we revalue the individual positions at each point in time in the future. At the start of a swap, the market value is zero (please see the illustration on the next page).
Aggregation	The portfolio weights w= $\{W_{\$}^{IRS}, W_{€}^{IRS}, W_{₺}^{IRS}, W_{\$}^{CS}\ W_{€}^{CS}\}$ are set proportionately to the share of each of the relevant swap type in the total swap portfolio of the Turkish banking sector, based on the off-balance sheet figures. Thus, $\{W^{IRS} = 1/3\ \&\ W^{CS} = 2/3\}$, whereas in terms of currency type, the allocation is equally distributed within each type, IRS and CS. The resultant EAD values are aggregated with their absolute values so it is assumed that $\nexists$ mitigation effects, i.e. netting and collateralization.

To illustrate the valuation process, the following generic swaps are presented as examples:

(i) 5-year IRS on $1 notional, pay fixed and receive floating with semiannual payments,

(ii) 1-year CS on 1$ notional, pay floating on ₺, and receive fixed on $, with semiannual payments.

[5] In the mentioned study, Heller and Vause (2012) estimate the amount of collateral that central counterparties should demand to clear safely all interest rate swap and credit deafult swap positions of the major derivatives dealers. Their estimates are based on potential lossess on a set of hypothetical dealer portfolios that capture the key characteristics of the actual portfolios. Further, they found the changes in market values of the portfolios based on joint probability distributions. The analogy between this study and our study comes from the fact that both rely on a hypothetical portfolio as a proxy for the actual ones.

Table3: Valuation of IRS and CS

Today	%$	%₺	10-d Later	%$	%₺	Elaborations for Today$	Elaborations for 10-d Later$
180-d Libor	4.00	9	170-d Libor	4.01	9.1	$D(180)=\frac{1}{1+(\frac{4}{100})X\frac{180}{360}}=0.9804$	$D(170)=\frac{1}{1+(\frac{4.01}{100})X\frac{170}{360}}=0.9814$
360-d Libor	4.05	9.1	350-d Libor	4.06	9.2	$D(360)=\frac{1}{1+(\frac{4.06}{100})X\frac{360}{360}}=0.9611$	$D(350)=\frac{1}{1+(\frac{4.06}{100})X\frac{350}{360}}=0.9620$
540-d Libor	4.06		530-d Libor	4.07		$D(540)=\frac{1}{1+(\frac{4.06}{100})X\frac{540}{360}}=0.9426$	$D(530)=\frac{1}{1+(\frac{4.07}{100})X\frac{530}{360}}=0.9435$
720-d Libor	4.07		710-d Libor	4.08		$D(720)=\frac{1}{1+(\frac{4.07}{100})X\frac{720}{360}}=0.9247$	$D(710)=\frac{1}{1+(\frac{4.08}{100})X\frac{710}{360}}=0.9255$
900-d Libor	4.07		890-d Libor	4.08		$D(900)=\frac{1}{1+(\frac{4.07}{100})X\frac{900}{360}}=0.9076$	$D(890)=\frac{1}{1+(\frac{4.08}{100})X\frac{890}{360}}=0.9084$
1080-d Libor	4.07		1070-d Libor	4.08		$D(1080)=\frac{1}{1+(\frac{4.08}{100})X\frac{1080}{360}}=0.8912$	$D(1070)=\frac{1}{1+(\frac{4.08}{100})X\frac{1070}{360}}=0.8918$
1260-d Libor	4.08		1250-d Libor	4.09		$D(1260)=\frac{1}{1+(\frac{4.08}{100})X\frac{1060}{360}}=0.8750$	$D(1250)=\frac{1}{1+(\frac{4.09}{100})X\frac{1250}{360}}=0.8756$
1440-d Libor	4.08		1430-d Libor	4.10		$D(1440)=\frac{1}{1+(\frac{4.08}{100})X\frac{1440}{360}}=0.8597$	$D(1430)=\frac{1}{1+(\frac{4.10}{100})X\frac{1430}{360}}=0.8599$
1620-d Libor	4.09		1610-d Libor	4.11		$D(1620)=\frac{1}{1+(\frac{4.09}{100})X\frac{1620}{360}}=0.8446$	$D(1610)=\frac{1}{1+(\frac{4.11}{100})X\frac{1620}{360}}=0.8447$
1800-d Libor	4.09		1790-d Libor	4.12		$D(1800)=\frac{1}{1+(\frac{4.09}{100})X\frac{1800}{360}}=0.8302$	$D(1790)=\frac{1}{1+(\frac{4.12}{100})X\frac{1800}{360}}=0.8300$

The figures are just for illustrative purposes. Since the currency swap has 1 year maturity, the table includes only the rates on for the 1 year.

-For the IRS, the fixed rate $= \frac{1-0.8302}{0.9804+0.9611+0.9426+0.9247+0.9076+0.8912+0.8750+0.8597+0.8446+0.8302} = 0.0188$,

so the annualized rate is around 3.77%.

After pricing the IRS, 10-days later the swap value with new rates:

Fixed$= \frac{3.77}{1.00} \text{ x } \frac{1}{2} \text{ x } (0.9814+0.9620+0.9435+0.9255+0.9084+0.8918+0.8756+0.8599+0.8447+0.8300)+1\text{x}0.8300 = 0.9999$.

Floating$=(1+ \frac{1}{2} \text{ x } \frac{4.00}{2.00}) \text{ x } 0.9814=1.001$. Market value of the swap to the fixed payer: 1.001-0.9999=0.0012 for $1 notional.

-For the CS, $ side the fixed rate $= \frac{1-0.9611}{0.9804+0.9611} \text{ x } 2 = 4\%$.

10-d later fixed$= \frac{4}{100} \text{ x } \frac{1}{2} \text{ x } (0.9814+0.9620)+1\text{x}0.9620 =1.0009$.

After 10 days, floating side on ₺ equals to $(1+ \frac{1}{2} \text{ x } \frac{9}{100}) \text{ x } 0.9588=1.0019$.

We assume that the spot FX rate is $1 = ₺1.5, and 10-d later the rate increases to $1 = ₺1.6. Thus, floating notional= ₺1.5 and 10-d later equals to (1.5x1.0019/1.6)= $0.9393. Finally, net value to the floating payer is 1.0009-0.9393 = 0.0616$ for $1 notional.

In the above valuation process, when we simulate the interest rate term structures and the FX rates, we come up with a distribution for the MtM values of swaps. These acquired distributions allow us to conduct statistical inference from the theoretical aspects of the replicated portfolio and help to quantify CCR. Calibration of IMM depends on EAD = α x EEPE, where the EEPE (the effective EPE), is the average of effective expected exposure that is derived from the simulated MtM values. For regulatory capital calculation purposes, EPE should be multiplied by alpha. Under IMM, alpha is fixed at a level of 1.4, where banks can calculate different alpha upon the approval from the authorities. According to BCBS (2005), banks often use PFE when measuring CCR exposure against counterparty limits. We use PFE as well and apply the same alpha parameter to $\forall s_i^j$ w/o distinguishing the counterparties. However, due to the simple nature of the portfolio, a penalty factor Ω is applied to EAD of the eventual portfolio in order to capture the risk of other types of instruments not only for their complexity but also for the additional amount. The acquired EAD is adjusted to reflect the system by applying the total swap portfolio amount in banks' portfolios as notional. Eventually, we acquire the course of potential future exposure (PFE) and the EE. Based on PFE, we can be 95 % certain that the exposure to one counterparty will not exceed certain $ amount in a given time period where the trading portfolio of the counterparty is static.

In our model all the swap instruments are assumed to be in the trading portfolio. That is to say, speculative accounting treatment is applied. The implication of that is the marking to market adjustments coming from the swap revaluation is completely assumed to be reflected in profit and loss account. We are aware of the fact that the risk profile can change with the specification of the cash flows. Apart from that, to be conservative, while quantifying the CCR, we impose a credit risk penalty with assumed default probability. This default probability factor is integrated to the counterparty credit risk analysis as in $\frac{1+\text{discount rate}}{1-\text{default probability}}$ while revaluing the swaps. Hence the discount rates become larger with the credit risk adjustment. While analyzing the whole system, we aggregate the exposures with their absolute values to eliminate any mitigation effect from the netting. Finally, the capital charge, which is calculated as EAD x Counterparty RW x 8% is calculated. RW is a function of the credit quality of the counterparty, expected recovery and effective maturity. Also, recoveries with collaterals are not considered under our conservative approach, so we assume LGD as 100%. For each simulation we assumed different default probabilities, however, we report the ones only for 5 percent. For simplicity, we assume no transaction cost. As for now, wrong way risk and CVA are left for further study. Model validation is mostly done through comparing the resulted exposures to the banks' capital and risk weighted asset reporting based on SM. The CCR is reported in the credit RWA after being converted to credits with appropriate pre-set conversion factors. For the IRS, we take the said factor as 4%, whereas for the CS we use the factor 2%. In the analysis we assume the risk weights for the products as 100 %.

IV. RESULTS

As seen from Table 4, the total loan equivalent value is $16 billion. This is considerably small portion of the total credit RWA, which is around $445 billion, where the total RWA is around $521 billion as of January 2012 according to the BRSA's Interactive Monthly Bulletin-February 2012. Although the OTC transactions tend to increase, currently the vanilla nature and low amount of OTC products in banks' off-balance sheet imply that CCR stemming from the OTC derivatives does not constitute a fatal risk for the banking system in Turkey. It is clear that as the credit conversion factors are increased, the loan equivalent values will be higher thus CCR will have bigger portion in total RWA. The output for the simulations and the IIM is below.

Chart 3. Term Structure-Euro (%)

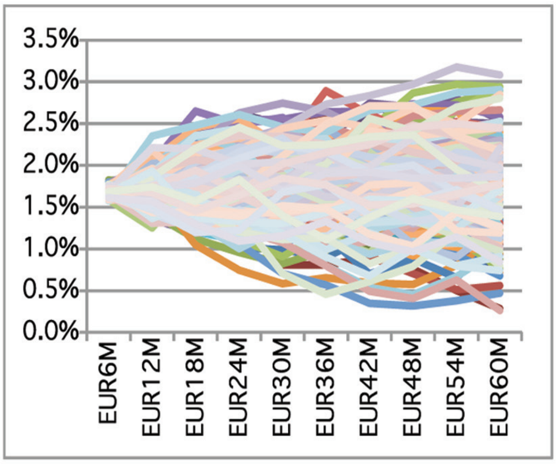


Chart 4. Term Structure -Dollar (%)

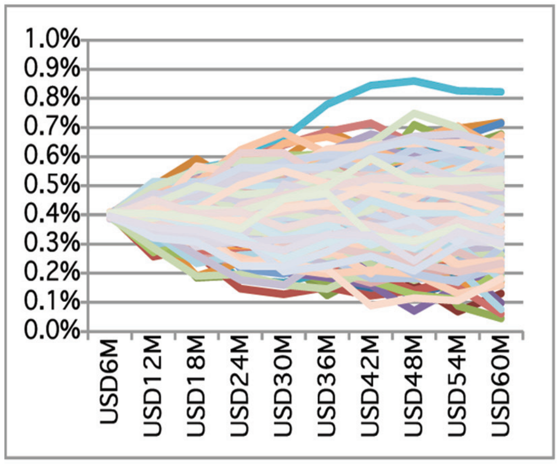


Chart 5. Term Structure -TL (%)

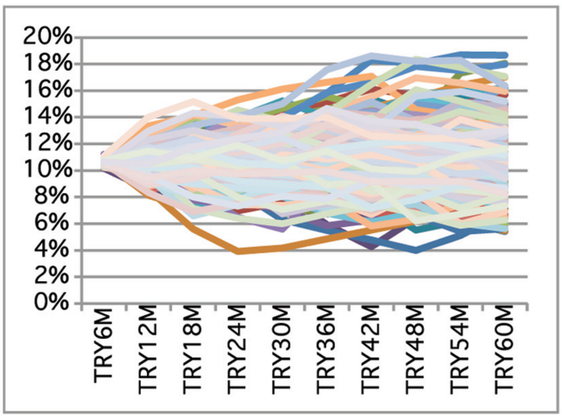


Table4: The IMM results for CCR

Swap	PFE ($)
$S_{\$}^{IRS}$	2.509.911.177
$S_{€}^{IRS}$	2.465.906.166
$S_{₺}^{IRS}$	2.861.772.610
Total IRS	**7.837.589.953**
$S_{\$}^{CS}$	18.820.294.723
$S_{€}^{CS}$	45.629.512.474
Total CS	**64.449.807.197**
Grand Total	**72.287.397.150**
Total EAD	**1.012.023.560.102**
Loan Equivalent Value	**16.024.997.421**

- The figures are our own elaborations.
- Since the credit RWA is by far the highest RWA type among the total RWA and the capital adequacy ratios are high, comparing the calculated RWA of CCR to the total credit RWA provides intuition about how dangerous is the CCR for the banks operating in Turkey.
- In the analysis, we mainly assume that the banks use swaps to hedge themselves against the floating rate loans, so for the currency swaps, banks pay floating rate on TL and receive fixed rate on foreign currency. However, to be conservative, we take the negative exposure as the ones belonging to the banks operating in Turkey.
- Default rate is taken as 5 %. -The figures for TL swaps are higher due to the extra shock to TL yield curve.

CONCLUDING REMARKS

Counterparty credit risk generally refers to the bilateral credit risk of transactions with uncertain exposures that can vary over time with the movement of underlying market factors. OTC derivatives have played a major role during the 2008 global financial crisis. The risks attached to these products have proved to be vital not only for the financial institutions but also for the system as a whole. However, Turkey is one of the countries, which were decoupled from the advanced economies during the crisis. This is mostly due to the relatively small amount of OTC derivatives transactions and their vanilla nature. In this study, we show that counterparty credit risk arising from the OTC derivatives for the banks does not constitute fatal risk compared to the total credit risk in Turkey. However, the increasing tendency of OTC derivatives in Turkey and the new coming regulations urge more elaborated risk assessment process in this area. Also, it should be noted that bank-by-bank analysis could lead significant risk for some banks due to their relatively larger derivatives portfolio and the correlations between the assets are of great importance as well. Further study could include other types of derivatives in the portfolio while taking into account the CVA and liquidity risk as part of the market risk component of OTC derivatives.

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