Bank Capital Adequacy under Basel II: An Application on Three Real Turkish Banks

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Abstract

This emprical research paper applies proposed Basel II standards in computation of capital adequacy ratios of three real Turkish banks. Basel II proposal first defines and adds operational risks of banks in capital adequacy ratio calculation. Moreover, Basel II redifines credit risk and allows use of various risk sensitive methodologies for measuring credit and market risks. This study employs standard and internal ratings base approaches in measurement of credit risks; standard, parametric VaR, historical VaR and Monte Carlo simulations in measurement of market risks; and basic indicator and stardardized approaches in measurement of operational risk. The results show that the application of Basel II standards may lower the capital adequacy ratios of Turkish Banks around 40%. Therefore, banks need to recompute their capital adequacy ratios under Basel II and take actions to lower their risk posizitons or plan to add fresh capital to continue operations.

Keywords: *bank capital adequacy, credit risk, market risk, operational risk, internal ratings base approach, parametric VaR, historical VaR, Monte Carlo simulation, basic indicator approach, stardized approach.*

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1. Introduction

1988 Basel I agreement first set the risk weighted capital standards for banks operating internationally. Overtime, Basel I has accepted as a world banking standard and then largely applied to all local and international banks. Nevertheless, the agreement has recently deeply critisezed for its deficiencies in shortsightness and insensitivity in risk measurement. Afterwords, the Basel Commetee proposed a new capital adequacy standard for banks (named Basel II) in 1999. The new proposal first time included identification and measurement of operational risk, and redifined the measurements of credit risk and market risk for computing bank capital adequacy. Since then the proposal revised a number of times and expected to be in force only for international banks located in developed countries ending year 2007. However, it is expected that the Basel II fastly becomes a new world banking standard. The overview of Basel II indicates that it is much more than a simple calculations of some numerical amounts for defined risks and holding sufficient amount of capital for these computed figures. The Basel II encourogeous all banks to define, measure and manage their financial risk compositions as a whole under the supervision of regulatory authorities and market dicipline. Therefore, the application of Basel II is expected to have a strong pressure on capacity of debt and cost of debt of nations, banks and corporations. Accordingly, it is expected that the Basel II is to rearrange the rules, policies and regulations in financial and nonfinancial sectors worldwide.

This study first examines Basel I standards measuring banks'capital adequacy requirement, and Basel II standards covering deficiencies of Basel I and improving banking risks measurements in terms of number of different models and types of banking risks. Next section explains the data sets and various technical methods used for measurments of risks. Then, the methodolgy of each technical method used in the study is defined. The following compares and evaluates the results of computations. The last section summarizes the study and comments on the findings.

2. Data Analysis

This empirical research considers to measure credit, market and operational risks of three large real Turkish banks under Basel II and recompute theie capital adequacy ratios.

Various risk measurement approaches are applied to compute the magnitute of each risk type. Standard, historical VaR, Monte Carlo simulation, and parametric VaR models are employed for market risk measurement; standard and internal ratings base models are used for credit risk measurement; and finally basic indicator and standard approaches are utilized for operational risk measurement. Detailed annual data on three real Turkish banks are obtained for a period of 2002-2003. The names of the banks under investigation can not be disclosed because of secrecy and privacy of information. Table 1 presentes reclassified balance sheets of banks for the year 2002 and 2003. Comparative balance sheets of the banks are reclassifed as interest bearing / non-interest bearing assets/liabilites. Table 2 shows comparative income statements and foreign currency prositons of banks. Table 3 breaks down marketable securities portfolio into three parts; held-to-maturity, investment securities and trading securities. The portfolios of banks are included only bonds denominated in euro, US dollars and Turkish currency. Table 4 presents the forward contracts currency pozitions of the banks. All these classified data tables are needed to determine which accounts are subject to credit, market and operational risks.

3. Methodology of Technical Models

Three types of banking risks are identifed in Basel II regulations computing capital adequacy ratio of banks, namely; credit risk, market risk and operational risk. The previous standard (Basel I) defined only credit risk using a standard risk measurement which is insensitive to risk taking activities. All types of banks (local/international, small/large, commercial/noncomercial) and all countries (developed/less developed, OECD/nonOECD, high credit rating/low credit rating) are required to apply the same credit risk weights in four different risk categories for all banking activities (on/off balance sheet); 0%, 20%, 50% and 100%. Basel I is deeply critisezed for not distinguishing risky activities among banks with different quality ratings. However, Basel II standards tend to cover the deficiencies of Basel I in credit risk risk measurement by allowing quality ratings reflected on more detailed credit risk categories (0%, 35%, 50%,75%,100%,150%).

Although Basel I had initially no consideration about the market risks banks face, many countries adopted markets risk measurement in capital adequacy computations since late 1990’s. This frontliner market risk method known as standard approach did not answer the needs of banks daily risk taking activities because the model does not respond changes in the market conditions which create market risks for banks. The financial crises observed in the world since 1998 cost many bank failuries and economic demages because of not

measuring markets risks at all or adequately. Therefore, some other market risk measurement methods possesing more flexibiliy in measurement and usefulness in risk management are needed. Parametric VaR, historical simulation and Monte Carlo simulation methods have been used in market risk measurement since late 1990's although the regulatory authorities do not mostly allow the use of these models. However, Basel II encourages banks to use more advanced, flexible and convinient models in risk management.

Basel II, on the other hand, first recognizes operational risks of banks and requires its inclusion in the capital adequacy ratio computation. The financial literature sites number of cases that large banking losses had to be recorded because of one person mistaken activities (Daiwa Bank, Bearings Bank, etc.). Therefore, banks figure out which banking activities, processes and personel cause operational risks, and how much is the dollar value of it, and how much economic capital is needed to cover it.

The following section explains the methods used to measure the Basel II banking risks.

3.1. Credit Risk

Credit risk is simply defined as probability of default not meeting the obligations against the other party. Almost all banking activities include some form of credit risk. However, credit risk is measured only on banking loan portfolio, participations, fixed assets and off balance sheet activities. The credit risk methods used in this study are standard measurement and internal ratings base approach.

Standard method simply assigns risk weightes to all on/off-balance sheet activities. The method is based upon external ratings for all banking activities. Lower quality ratings require higher risk weights while higher quality ratings require lower risk weights. Therefore, risky activities and counter parties are distinguished from less risky ones. The method penalizes risky transaction by requiring more capital allocation.

Internal ratings base (IRB) method defines some parameters to be used in measurement of credit risk, namely; probablity of default (PD), loss given default (LGD), exposure at default (EAD), maturity (M), expected loss (EL) and unexpected loss (UL). Foundametal IRB requires banks internally estimate their own PD while authorities provide all other parameters. Advanced IRB requires banks internally estimate all parameters in the model.

It is widely expected that the standard method is initially employed by most banks. However, Basel II encourages all banks eventually to estimate all parameters internally.

3.2. Market Risk

Market risk is defined as expected losses in bank's trading portfolio because of variations in interest rates, exchange rates and commodity prices. In recent years the magnitute of banks'trading portfolio has become consideable compared to total assets. Therefore, variations in markets risk factors may result recognition of large losses on trading portfolio. The Turkish bank capital adequacy ratio regulation did not include market risk until end of year 2002. The Turkish financial crises in year 2000 caused many banking bankruptcies in a couple of months due to large increases in market interest rates and exchange rates. Basel II considers inclusion of market risk in capital adequacy ratio and use of advance statistical methods for computations. The methods used in measurement of market risks in this study are standard measurement, parametric VaR, historical VaR and Monte Carlo simulations.

The use of standard measurement method for market is required by the Turkish Banking Supervisory Authority. This method is applied by filling out number of excell tables for calculating interest risk, exchange risk and specific risk. This approach is based upon short and long positions on each maturity gap and each account subject to market risk computations. Interest rate risk is computed for each currency by short and long position differences in each maturity gap on trading securities portfolio, repurchase agreements and forward contracts. Exchange rate risk is computed by converting all short/long and on/off balance sheet FX positions into dollars and allocating capital on the short or long position whichever is greater. Specific risk is computed on the holding of trading securities portfolio considering time to maturity and private/public issues. Finally, all three subgroups of risks are simlpy added.

Parametic VaR model assumes that the returns of risk factors are normally distributed, returns and maturities have lineer relations and portfolio incures no options. The model produces a market risk value by the following formula;

$$VaR_p = (V_p)\ (\sigma_p)\ (\sqrt{t})\ (c)$$

Where V_p is the value of the portfolio, σ_p is the risk of the portfolio, t is the holding peoriod (10-day) and c is the confidence level (99%).

Historical VaR model is applied by repricing the current portfolio at one of the past days's returns. Simulated daily gains/losses on the current portfolio are listed form best to worst and at 99% confidence level the worst loss is read as the market risk.

Monte Carlo simulation model is applied by first determining the past behaviour of the risk factors, then simulating the expected future prices of the risk factors based upon their past behavior. Using simulated future prices the current portfolio is repriced and expected gains/losses on the portfolio are compted then listed from best to worst. The worst loss at 99% level is read as the market risk.

3.3. Operational Risk

Operation risk is defined as the probable losses due to malfunction of the computer systems, human errors, deficient processes and external factors. The methods used in this study for measurement of operational risk are basic indicator approach and standard approach.

Basic indicator approach is applied by taking 15% of the redefined gross income of last three years. The gross income is computed by adding the net interest income and net noninterest income, not considering the effects of any provisions and extraordinary gains/losses.

Standard approach initialy distributes gross income into eight different business areas, then multiplies gross income of each business area by a preditermined risk percentages.

4. Computational Findings

The computational results are shown on Table 5 through 11. Table 5 presents the capital adequacy ratios (CARs) of Bank X, Y and Z under Basel I standards. The CAR for Bank X is about 17%, for Bank Y is about 31% and for Bank Z is about 40% in year 2002 and 52% in year 2003. The CARs of all three banks considerably decrease after inclusion of market risk. The new CARs are about 14% for Bank X, 27% for Bank Y and 31% (2002) and 41% (2003) for Bank Z.

Table 6 shows the results of credit risk computations of three banks under proposed measurements by Basel II and Basel I. The amounts of credit risk computations under Basel I appear to be much lower than either standard or IRB method under Basel II for all banks. An easy explanation for this could be the use of higher credit risk weights for risky transactions.

Table 7 presents the market risk compuations unders four different models. The results show that the standard measurement tend to compute higher amounts of market risks. In addition, all models except standartd measurement tend to adopt changing conditions in the market by calculating much lower amounts of market risks for year 2003 where the Turkish economy performed better compared to year 2002.

Operational risks measurement results appear on Table 8. The application of basic indicator approach for all banks report lower amount of operational risk for both years compared to the standard method. The allocated portion of gross income into business areas at higher than 15% risk weights seems the main reason for reporting higher operational risks under standard method. Table 9 show the details of allocation of gross income and total assets into business areas.

Table 10 summarizes all computational findings in measurement of various risks under number of different models and for all banks. Table 11 shows the various senarios of application of different risk measurement methods under Basel II and translates the results of these senarios into CARs. The general overview of CARs indicates that the application of Basel II standards will lower the CARs of all banks. The CARs of Bank X move from about 14% to about 10%. The CARs of Bank Y decrease from about 27% to about 20%, and the CARs of Bank Z falls from about 31% (2002) to about 18% and from about 41% (2003) to about 21%.

5. Conluding Remarks

The capital adequacy ratios of three real Turkish banks are computed by applying prosposed Basel II risk measurements for a period of year 2002-2003. The Basel II results are then compred to the existing capital adequacy ratios computed by Basel I of the Turkish banks. The computational results show that the application of Basel II may lower CAR of Turkish Banks by 25 to 50% depending on the models used. It appears that the use of standard methods in measurement of all three types of banking risks has more stress on the reduction of banks'CARs. Therefore, it could be more advantages for banks using more advance and statistical methods in computing banking risks and CARs.

This empirical study may be a pioneer research for academic world and practitioners. This paper may help to understand the applications of complicated risk measurement models and the effects on banks'capital adequacy.

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