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ASSESSING INTEREST RATE RISK USING INCOME GAP ANALYSIS

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ABSTRACT

In an ever-changing environment, banks are exposed to different types of risks such as market, operational and financial risks. Fluctuation in interest rate is one of the major financial risks that the banking sector faces. This paper addresses the problem of measuring and managing interest rate risk in UAE commercial banks. The main objective of the study is to come up with a suitable measure of interest rate risk, to investigate variations in interest rate risk prior to, during and subsequent to the financial crisis period, and to suggest possible methods by which bank managers could manage interest rate risk. The application of income gap analysis helps to forecast the banks' financial position and performance. To achieve the objectives of the study, secondary data have been collected from published financial statements of the selected banks. Incomer gap analysis model is used to measure the interest rate risk for the period 2005 to 2012 in order to test two hypotheses: ***H1:*** *There is a significant relationship between UAE banks' profitability and interest rate risk measured by the gap sensitivity.* ***H2:*** *There is a significant relationship between interest rate risk and the profitability of banks in the context of the financial crisis. SPSS correlation and regression techniques have been applied to test the hypotheses. It is found that there is a significant correlation between income gap and net income of the UAE banking sector. Also there is a positive and significant correlation between income gap and profitability prior, during, and post to financial crisis.*

KEYWORDS: *Interest rate risk, income gap analysis, financial crisis, UAE commercial banks.*

INTRODUCTION

Risk is defined as anything that can create obstacles in the way of achievement of certain objectives. It can be because of either internal or external factors, depending upon the type of risk that exists within a particular situation. Exposure to that risk can make a situation more critical. A better way to deal with such a situation is to take certain proactive measures to identify any kind of risk that can result in undesirable outcomes. In simple terms, it can be said that managing a risk in advance is far better than waiting for its occurrence. In the context of the banking sector, risk assessment process involves the identification, evaluation and management of risks that significantly impact the achievement of the bank's objectives. This is a continuous process requiring regular review as and when internal and external changes influence the bank's strategies and objectives.

Banks earn returns by accepting and managing risk, including the risk that borrowers may default or that changes in interest rates may narrow the interest spread between assets and liabilities. Due to the continuous

environmental and financial rapid changes as well as the growing competition in financial services, the perception among many observers is that interest rate risk in commercial banking has significantly increased.

Interest-rate risk can be defined as a loss ensuing from an adverse change in cash flow, an adverse change in the value of interest-rate sensitive assets and liabilities, in consequence of a change in interest rates. Whether the change in interest rates is favorable or unfavorable depends on the presence of certain components, or sources of interest-rate risk in the balance sheet and off-balance sheet accounts of the bank.

There are many techniques for assessing interest rate risk. Some focus on the earnings impact of interest rate risk. Others focus on the market value impact. Accordingly, the choice of tools will be motivated by one's perspective. Investors with a book value perspective tend to address interest rate risk with the tools of asset-liability management—cash matching, gap analysis, earnings simulation, earnings at risk and duration. Those with an economic perspective use some of these especially gap analysis and duration but they also use tools that focus on economic value and value-at-risk. Gap analysis and duration are interesting because they can be used to assess interest rate risk from either perspective.

The use of various methods of measuring interest rate risk is closely linked to the bank's possibilities to evaluate the impact of interest rate changes upon it. The impact of interest rate changes is most frequently evaluated in banks on interest-rate financial flows. This evaluation of the impact, which is most frequently connected with gap analysis, provides the bank a short-term view of its interest-rate risk. Therefore, the critical role of interest rate risk in determining the efficiency of bank operations and in turn its profitability cannot be overemphasized.

OBJECTIVES AND IMPORTANCE OF THE STUDY

The main purpose of this study is to measure whether the interest rate risk (IRR) preparedness levels of the UAE banks has improved after the financial crisis and to explore the actual risk response measures taken. More specifically the state of preparedness of the UAE banking sector to face the 2008-'09 financial crisis, the risk-response and the aftermath are examined. To determine such a state of preparedness, this study will investigate the relationship between variations in IRR and banks' profitability prior to, during, and after the crisis. Banking and finance literature point to the high likelihood of a fiscal crisis in the Gulf States in the long run (Anon., 2012). This study emphasizes that the first step to effective risk management is scientific risk monitoring and measurement. The study will investigate the relationships between variations in IRR and the banks' profitability.

This study is important because early detection could help prevent losses, or at the least, control the extent of the loss. Banking and finance literature clearly point out that implementing a suitable risk architecture is not only a response to risk but rather an organizational paradigm shift such that an enterprise organizes itself for change management, assigns accountability, builds risk management as a core competency and implements continuous, real-time risk management (Cooper, 1999).

The significance of the study is derived from the fact that no previous studies conducted in the measurement of IRR and its implications. The relevant areas covered by previous researchers were Shaima Alhussiny (2008) in a study on the overall risk management techniques adopted by the UAE Banks. Al- Tamimi (2007) examined the nature and types of risks facing UAE banks. Ibrahim Ahmed (2007) investigated the capital adequacy of UAE Islamic banks. No study considered the impact of interest rate risk.

REVIEW OF LITERATURE

The European Banking Authority defines market risk as the risk of losses in on and off-balance sheet positions arising from adverse movements in market prices. Market risks therefore, include interest rate risk, foreign exchange rate risk, and equity prices risk. Interest rate risk (IRR) is the riskiness of earnings and returns associated with changes in interest rates. In the 1980s, increased volatility of interest rates caused financial institutions to be more exposed to interest rate risk. In the last two decades of the twentieth century, IRR became front page news following the series of failures of savings and loan associations. With the increased volatility of interest rates that occurred in the 1980s, financial institution managers became more concerned about their exposure to IRR, and the riskiness of earnings and returns that is associated with changes in interest rates (Mishkin, 2012).

The practice of Risk Management is a measure that is used for identifying, analyzing and then responding to a particular risk. It is a process that is continuous in nature and a helpful tool in decision making process. Risk Assessment is not just used for ensuring the reduction of the probability of bad happenings but it also covers the increase in likeliness of occurring good things. Risk exists as a part of an environment in which various organizations operate. Banking is a business mostly associated with risk

because of its large exposure to uncertainty and huge considerations. Risk assessment is one of the most important practices to be used especially in banks, for getting assurance about the reliability of the operations and procedures being followed.

The primary forms of interest rate risk include re-pricing risk, yield curve risk, basis risk and optionality. The first is maturities mismatching of balance sheet and off-balance sheet items, which we can define as a non-alignment in the maturity and revaluation of assets, liabilities and off-balance sheet instruments. The second is the basis value risk, which is connected with the imperfect correlation in the adaptation of interest rates to assets and liabilities with otherwise similar maturities and revaluation. The third is the yield curve risk, which arises when changes in the values, slope and shape of the yield curve have an adverse impact on the financial flows and value of the bank. The last is the optionality or the existence of inserted options in the assets, liabilities and off-balance sheet instruments. The risk lies in the fact that through the use of inserted options the expected financial flows from financial instruments change, which subsequently has an impact on the size of the interest-rate risk.

The 'Sensitivity' analysis which is the sixth element in the CAMELS rating system is mainly composed of IRR analysis. When a bank scores a poor CAMELS rating investors' funds are at risk and top management is held to task for the condition. This is especially relevant during a financial crisis central banks step in to attempt to avert the adverse effects on the financial markets and on the economy, by adjusting interest rates. These changes directly impact banks' primary operations namely, lending and borrowing activities and consequently their profit position. The interest rate risk exposure of banks is so critical that both Basel I and FDICIA require banks to apply a capital charge against this exposure in order to boost their regulatory capital positions.

The financial crisis of the last decade brought to the forefront some important weaknesses of the banking sector and left an even wider expectations gap. The community was paying (and is still paying) the price for the excessive risk appetite of the industry which was supposed to have 'served' it. The list of failed banks worldwide is ample proof of this. In the US some of the major irregularities that came to light during the financial crisis had to do with bank risk management, regulation and CEO compensation (Handorf, 2015). Banks in the US remained highly sensitive to changes in short-and long-term interest rates and foreign exchanges rates throughout the period, before, during and following the crisis (McIntosh, 2011). Notwithstanding, some studies show that even banks with low capital levels can still be less sensitive to interest rate risk as long as bank managers are competent, effective immunization strategies are employed, and the bank's financial position is effectively monitored (Staikouras, 2006).

Lauren (2008) argues that an effective risk management system in even one of the players could have prevented the extent of damage that destabilized the global economy. There are examples of large banks that had not heeded earning warning signals generated by the simplistic systems such as ratios that were in place. Over dependence on credit rating agencies is cited as one of the major causes of the disaster. He quotes Ed Grau from Accenture who states that regulators will need to have tools that generate stress in predictable scenarios, to evaluate the different types of risk exposures.

Tusiime, J. (2008), made a study "Risk Management on the profitability of financial institutions". The purpose of the study was to establish the effect of risk management on profitability in Stanbic bank-Wandegeya branch and the objectives were to evaluate the techniques of risk management used in financial institutions, to establish the profitability indicators of financial institutions and to establish the relationship between risk management and profitability in financial institutions.

Studies (McIntosh, 2011) have pointed out that banks reduced their exposure to credit, capital, total, and unsystematic risks, and increased their exposure to liquidity, portfolio, off-balance sheet and (accounting) foreign exchange risks, from 2003 to 2006. A complete reversal of this trend was observed during the 2008-2009 financial crises.

Shaima Alhussiny (2007) studied the risk management techniques adopted by the UAE Banks. It is concluded that UAE banks focus on the relatively blunt tools of risk mitigation and risk elimination, rather than taking a more advanced strategic approach.

As the UAE is currently in something of a transitional period, with Basel III in the process of being implemented, the study should be repeated once implementation is complete. This will help produce a better understanding of the impact of Basel III on the UAE, as well as demonstrating how the implementation of the Basel III agreement has changed risk management practices in general.

Depending upon the risk propensity of an institution, risk can be controlled using a variety of techniques that can be classified into direct and synthetic

methods. The direct method of restructuring the balance sheet relies on changing the contractual characteristics of assets and liabilities to achieve a particular duration or maturity GAP. On the other hand, the synthetic method relies on the use of instruments such as interest rate swaps, futures, options and customized agreements to alter the balance sheet risk exposure. Since direct restructuring may not always be possible, the availability of synthetic methods adds a certain degree of flexibility to the asset-liability GAP management process. In addition, the process of securitization and financial engineering can also be used to create assets with wide investor appeal in order to adjust asset-liability GAPs.

Al- Tamimi (2007) examined the scale of risk management techniques used by banks in the UAE to manage different types of risk. This study focused on four different types of risk identifications: inspection by the bank risk manager; audits or physical inspection; financial statement analysis; and risk surveys.

THE HYPOTHESES

Changes in interest rates can have adverse effects both on a bank's earnings and its economic value. From the earnings perspective, the focus of analyses is the impact of changes in interest rates on earnings. Variation in earnings (NI) is an important focal point for interest rate risk analysis because reduced interest earnings will threaten the financial performance of an institution. Variation in market interest rates can also affect the economic value of a bank's assets, liabilities, and Off Balance Sheet positions.

The income gap analysis model is used to measure the interest rate risk for the period 2005 to 2012 in order to test two hypotheses:

H1: There is a significant relationship between UAE banks' profitability and interest rate risk measured by the gap sensitivity.

H2: There is a significant relationship between interest rate risk and the profitability of banks in the context of the financial crisis.

THE METHODOLOGY AND ANALYSIS

The UAE banking sector is a combination of national and foreign banks. In UAE there are 24 national banks out of which 6 are Islamic banks and the remaining are conventional banks. The study covered 12 out of the 18 banks given that Islamic banks are not subject to the interest rate risk and the other 6 conventional banks have been excluded because of non-availability of data. The secondary data are collected from the published financial statements of the sample banks for the period starting 2005 to 2012 in order to have a sufficient period covering prior to financial crisis, during, and after crisis for the purpose of general findings that represent all phases and banks.

In the literature, the most common methods applied to assess interest rate risk are the gap analysis, duration analysis, the basis point value method, and simulation methods. Income gap analysis is very popular in banks and is often used mainly due to its simplicity. This method was created at the end of the Sixties in the USA.

This study applies the income gap analysis as an analytical assessment model to measure interest rate risk. This approach is used to obtain a picture of whether there has been a mismatch or not in the UAE banking sector. This is applied by comparing the results of the grouping assets and liabilities into "rate sensitive assets (RSA) and" rate sensitive liabilities "(RSL), then it will be known whether the difference between RSA and RSL showed positive or negative. If negative mismatch occur which means RSA is smaller than RSL or in other words there has been an excess funds which should be rotated into the financing. Conversely, if there is a positive mismatch which means RSA is greater than RSL or in other words the excess uses of fund.

This model measures the direction and extent of asset-liability mismatch through a funding or maturity GAP (or, simply, GAP). Assets and liabilities are grouped in this method into time buckets according to maturity or the time until the first possible resetting of interest rates. For each time bucket the GAP equals the difference between the interest rate sensitive assets (RSAs) and the interest rate sensitive liabilities (RSLs).

In symbols:

GAP = RSAs – RSLs

When interest rates change, the bank's NII changes based on the following interrelationships:

$\Delta NII = (RSAs - RSLs) \times \Delta r$

$\Delta NII = GAP \times \Delta r$

To test the stated hypotheses, SPSS Pearson correlation has been used to analyze the data to test the correlation between the income gap on one hand and the net income reported by the banks on the other hand. The correlation between the income gap values corresponding to the three stages of the financial crisis covered by the study has been tested to investigate whether banks' profitability moved in tandem with the phases of the financial crisis or not.

The value of the correlation co-efficient (0.418) indicates that the relationship between Income Gap and Net Income is positive. However, this relationship is statistically highly significant because the estimated probability value (P-Value) of zero is far less than the conventional statistical significance level of 0.01. This indicates that the observed relationship between Income Gap and Net Income is systematic or real but may be fairly weak. Table 1 below explains this relationship.

Table 1: Correlation between Income Gap and Net Income

Correlations

		Income.Gap	Net.Income
Income.Gap	Pearson Correlation	1	.418**
	Sig. (2-tailed)		.000
	N	96	96
Net.Income	Pearson Correlation	.418**	1
	Sig. (2-tailed)	.000	
	N	96	96

**. Correlation is significant at the 0.01 level (2-tailed).

The relationship between income gap and net income within the period context have been analyzed over three different stages, which are pre-financial crisis (2005-2007), during crisis (2008-2009), and post financial crisis (2010-2012). The analysis of the relationship between the income gap and profitability reveals that there a significant correlation between the two variables with the financial crisis.

Based on the statistical analysis, the first hypotheses (There is a significant relationship between UAE banks' profitability and interest rate risk measured by the gap sensitivity) is accepted as the results proved that there is a significant and positive relationship between the income gap and the net income of the UAE banking sector.

First, regarding the impact of pre-financial crisis on the relationship between the two variables, the value of the correlation co-efficient (0.497) indicates that the relationship between Income Gap and Net Income is positive. This relationship is statistically highly significant because the estimated probability value (P-Value) of .002 is less than the conventional statistical significance level of 0.01. This indicates that the observed relationship between Income Gap and Net Income is positively systematic. Table 2-1 explains this result.

Second, the relationship between both variables has been investigated during the financial crisis. It is found that there is a positive correlation between the variables during the crisis period as explained by the correlation co-efficient (0.462), which proves a significant relationship at P-Value of 0.023 less than 0.05 significant levels. This indicates that the observed relationship is systematic or real. The results are on Table 2-2.

Third, the relationship between income gap and net income has been investigated post-. It is found that there is a positive correlation between the variables post crisis period as explained by the correlation co-efficient (0.372), which proves a significant relationship at P-Value of 0.026 less than 0.05 significant levels. This indicates that the observed relationship is systematic or real but may be considered as weak relationship. The relationship is explained on Table 2-3.

Table 2-1: The Correlation between Income Gap and Net Income Prior to Financial Crisis

Correlations

		Gap.Pre	Net.Pre
Gap.Pre	Pearson Correlation	1	.497**
	Sig. (2-tailed)		.002
	N	36	36
Net.Pre	Pearson Correlation	.497**	1
	Sig. (2-tailed)	.002	
	N	36	36

**. Correlation is significant at the 0.01 level

Table 2-2: The Correlation between Income Gap and Net Income during Financial Crisis

Correlations

		Gap.Crisis	Net.Crisis
Gap.Crisis	Pearson Correlation	1	.462*
	Sig. (2-tailed)		.023
	N	24	24
Net.Crisis	Pearson Correlation	.462*	1
	Sig. (2-tailed)	.023	
	N	24	24

*. Correlation is significant at the 0.05 level (2-tailed).

Table 2-3: The Correlation between Income Gap and Net Income Post- Financial Crisis

Correlations

		Gap.Post	Net.Post
Gap.Post	Pearson Correlation	1	.372*
	Sig. (2-tailed)		.026
	N	36	36
Net.Post	Pearson Correlation	.372*	1
	Sig. (2-tailed)	.026	
	N	36	36

*. Correlation is significant at the 0.05 level (2-tailed).

The analysis indicates that there is a significant relationship between the income gap and the period context as the regression indicates that the variable depends 96% on the period of time. The coefficient of pre-financial crisis is more significant as compared to post crisis or to the during crisis period, which is less significant as explained by the lowest co-efficient. The following tables give more explanations to the findings.

We can conclude that the second hypothesis (there is a significant relationship between interest rate risk and the profitability of banks in the context of the financial crisis) is also accepted based on the above and the following results.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.096[a]	.009	-.084	18241.71664	1.914

a. Predictors: (Constant), dur.period, post.period, pre.period

b. Dependent Variable: Income.Gap

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	98886558	3	32962186.09	.099	.960[a]
	Residual	1E+010	32	332760226.0		
	Total	1E+010	35			

a. Predictors: (Constant), dur.period, post.period, pre.period

b. Dependent Variable: Income.Gap

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1216.500	12898.842		.094	.925
	pre.period	5337.500	13855.578	.148	.385	.703
	post.period	7342.167	13932.341	.200	.527	.602
	dur.period	5616.722	14260.206	.141	.394	.696

a. Dependent Variable: Income.Gap

The main findings are: First, there is a positive and significant correlation between income gap and net income of the UAE banking sector. Second, there is a positive significant relationship between income gap and profitability over the time horizon with minor differences regarding pre-financial crisis, during, and post financial crisis.

It has been observed through this study that the UAE banks use different approaches to measure interest rate risk. The Income Gap approach is frequently applied by many banks. A zero GAP will be the best choice either if the bank is unable to speculate interest rates accurately or if its capacity to absorb risk is close to zero. With a zero GAP, the bank is fully protected against both increases and decreases in interest rates as its NI will not change in both cases.

CONCLUSION AND RECOMMENDATIONS

The correlation between GAP and profitability has been observed clearly in the entire period under analysis. With reference to the stages of the financial crisis, the correlation between the two variables is weaker in the third stage namely the post-crisis period as compared to the pre-crisis and the crisis stages. This finding points out that the banking sector in the UAE is aware of and alert to the market risks it faces, specifically interest rate risk. Many banks have been actively managing this risk category. However, the tools used vary in sophistication and consistency. Some banks have also been more proactive than others.

Market risk is the risk to a financial institution's condition resulting from adverse movements in market 'rates', that is to say prices such as interest rates or foreign exchange rates. Interest rate risk can be either short term or long term or both. It has been observed that banks generally focus on credit risk and liquidity risk because of their immediacy. Some of the techniques used include managing relationships and rationing credit. However, the silent killer of profits, profitability and net worth could be the interest rate risk.

When an economy is facing pressures of a slowdown, loan demand is usually slack and interest rates are held at relatively low levels. The Central Bank makes plenty of money available into the system. On the other hand, as the economy moves into a growth phase, the primary tool it uses to manage the changing scenario is lending rates. Interest rates are moved to a higher level

and are held there as loan demand increases rapidly and inflation catches up. The central bank now needs to restrict money supply to prevent overheating of the economy.

Given the changing economic conditions and their consequences in terms of monetary policy, banks are constantly in the firing line. For them, complete immunization to interest rate risk, i.e. setting duration gap to zero is an option in periods of extreme risk. However, in favorable conditions banks would need to take on more risks to maximize earnings potentials. Since the transition of an economy between different economic periods is gradual and businesses may not be able to predict the exact onset of a financial crisis. Hence, interest rate risk needs to be managed continuously and proactively. Financial simulation tools need to be used by all banks to regularly measure and monitor interest rate risk.

As a tool for managing interest rate risk, GAP management suffers from three limitations:

- Financial institutions in the normal course are incapable of out-predicting the markets, hence maintain the zero GAP.
- It assumes that banks can flexibly adjust assets and liabilities to attain the desired GAP.
- It focuses only on the current interest sensitivity of the assets and liabilities, and ignores the effect of interest rate movements on the value of bank assets and liabilities.
- Hence other more sophisticated tools may be needed to be used by all banks together with a GAP analysis.

Though interest rates are currently at a low level, changes are anticipated as a boost to the economy occurs due to the massive business and trade opportunities that the country has such as the EXPO 2020 and others.

Comprehensive risk management in terms of scientific monitoring and managing all types of risks would be greatly benefit to UAE financial institutions, as the economy stand on the verge of an economic upheaval, especially in the context of the current lower energy prices, and the steps that are being taken to progress towards target growth rates in spite of this setback. Needless to say, concerted action on the part of all banks would support the central bank and in turn strengthen the hands of the banks themselves to grow and increase profitability.

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