

Interest rate risk management in public sector Bank of Bangladesh: With special reference to Sonali Bank Limited

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Abstract

Asset liability mismatch in balance sheet of Sonali Bank Limited, Bangladesh posed serious challenges as the bank was following the traditional methods of recording assets and liabilities at the book value. The liberalization process in the economy coupled with multifaceted global developments exposed banks for various kinds of risks viz. interest rate risk, liquidity risk, exchange risk, operational risk etc. which have direct impact on their operations, profitability and efficiency to compete with. The volatility in interest rate during the last decade has witnessed risk in earnings or capital due to movement of interest rates which has affected the overall profitability of banks. Hence, there is a need for accurate measurement and control of Interest Rate Risk associated with a bank's entire portfolio. This research paper makes an attempt to measure the Interest Rate Risk in Sonali Bank Limited by using Asset-Liability Mismatch, Relative Interest Sensitive Gap, Interest Sensitivity Ratio and Gap Analysis Technique. The findings revealed that Sonali Bank Limited, Bangladesh is greatly exposed to interest rate risk.

Keywords: asset-liability management, interest rate risk, asset-liability mismatch, sensitivity analysis, gap methods

1. Introduction

1.1 Background

Interest rate risk has become a major risk just next to credit risk. The last several years has seen an increased volatility in interest rates. Interest-rate risk can be defined as “a loss ensuing from an adverse change in cash flow and from an adverse change in the value of interest assets and liabilities, in consequence of a change in interest rates.

Banks are always aiming at maximizing profitability at the same time trying to ensure sufficient liquidity to repose confidence in the minds of the depositors on their ability in servicing the deposits by making timely payment of interest/returning them on due dates and meeting all other liability commitments as agreed upon. To achieve these objectives, it is essential that banks have to monitor, maintain and manage their assets and liabilities portfolios in a systematic manner taking into account the various risks involved in these areas. The technique of managing both assets and liabilities together has come into being as a strategic response of banks to inflationary pressure, volatility in interest rates and severe recessionary trends which marked the global economy

Banks constantly search for new products and opportunities to improve its operating performance. Innovative financial instruments such as, financial futures and option contracts, forward rate agreements, interest rate swaps, interest rate futures are few types of derivative that are actively used to manage interest rate risk.

Interest rate risk Management focuses on reducing interest rate risk associated with a bank's entire portfolio. Traditionally, interest rate risk analysis was done through GAP, earnings sensitivity analysis and duration gap. Interest rate risk analysis was managed through shifts in the composition and volume of bank assets and liabilities.

The following research attempts to measure interest rate risk in Bangladesh Public Sector Bank with Special Reference to Sonali Bank Limited. Various techniques to be used to measure interest rate risk are asset-liability mismatch, Gap analysis and sensitivity analysis, etc.

1.2 Research problem

The focus of this research has been organized to answers the following research questions:

- i) Are there any liquidity mismatches in the balance sheet of Sonali Bank Limited?
- ii) Is there any interest sensitive gap in the balance sheet of Sonali Bank Limited?
- iii) What about the relative interest sensitive gap in the balance sheet of Sonali Bank Limited?
- iv) What is the extent of interest sensitive ratio in the balance sheet of Sonali Bank Limited?
- v) Is there any residual maturity gap in the balance sheet of Sonali Bank Limited?
- vi) To what extent Sonali Bank Limited expose to the interest rate risk?

1.3 Research objectives

The present research has made an attempt to provide a comprehensive profile of Interest Rate Risk Management in Sonali Bank Limited, as a representative of Public Sector Bank in Bangladesh. Asset-Liability Mismatch, Gap and Sensitivity analysis methods have been used to measure Interest Rate Risk.

The specific objectives are:

- To find out the volume of liquidity mismatches in the balance sheet of Sonali Bank Limited. This will help to explain the liquidity crisis which banks face. Whether it was due to seasonal occasion or management problem or both.
- To determine interest sensitive gap in the balance sheet of Sonali Bank Limited. The IS GAP model attempts to measure how much interest rate risk a bank evidences at a fixed point in time by comparing the rate sensitivity of assets with the rate sensitivity of liabilities.
- To assess the relative interest sensitive gap that may exist in the balance sheet of Sonali Bank Limited. It can be used to measure the sensitivity of bank income to changes in interest rates.
- To determine interest sensitive ratio in the balance sheet of Sonali Bank Limited. It is an alternative method to the relative interest sensitive gap, which measures the sensitivity of bank income to changes in interest rates.
- To explore residual maturity gap in the balance sheet of Sonali Bank Limited. The funds mainly arising from maturity of liabilities and funds mainly arising from maturity of assets are grouped under different time buckets and behavioural pattern of such liabilities and assets. The statement of structural liquidity helps to quantify the liquidity risk.
- To measure the Sonali Bank Limited's exposure to the interest rate risk. That is, how much the bank's net interest income will change if interest rate goes up or down?

2. Literature review

Ahmed Anwer S., Beatty Anne and Carolyn Takeda (1997) provides evidence on the Interest Rate Risk Management activities of Commercial Banks and found that interest rate exposure is associated with a mismatch between assets and liabilities and can be measured by using traditional GAP and duration GAP analysis.

Li Yan (2002) used interest ratio and deviation rate to make an empirical study on the interest rate risk of China's commercial banks based on the data between 1996 and 1999, and pointed out that China's commercial banks faced the tremendous interest rate risk during this certain period.

Huang Jinlao (2001) stated that China's commercial banks face not only the permanent risk but also the periodical risk in the certain period of interest rate liberalization which is promoted gradually.

Chen Bo & Yao Jianli (2005) suggested applying two-stage strategy and duration technology into the interest rate risk management. The first stage is to establish an interest rate risk management system which relies on sensitive gap while takes duration gap as a secondary reliance, the second stage is to establish the system which relies on duration gap which takes the trade of financial derivatives as a secondary reliance.

Wang Heying (2008) contended that China's financial derivative market was in a primary stage, the simple product structure and imperfect function made it difficult for commercial banks to spread or transfer interest rate risk.

Wang Qiang (2010) analyzed four forms of interest rate risk and put forward the corresponding countermeasures and suggestions.

Deng Ran (2011) raised some suggestions for China's commercial banks about how to prevent interest rate risk based on the analysis of the tendency of interest rate risk in 2010.

Yao Yuan (2012) carried out an empirical research based on the date from 7 listed banks from 2007 to 2011, and pointed out that the more-than-one-year asset of China's commercial banks could not match the corresponding liability, the adjusting speed of interest gap was slower than the change of interest rate, which resulted in the long-term interest rate risk for commercial banks.

According to Hudson et al (2000) the risks now require increased attention and consideration due to very volatile nature of interest and exchange rate movements. In order to continue with profitable operations in the early 2000s, banks will have to take and manage higher risks (Hempel & Simonson 1999).

Galai et al. (1999) define risk as reduction in firm value due to changes in the business environment. For bank management, visibility and sensitivity to risks are important because banks are risk machine in the sense that they take risk, transform them and embed them in banking product and services (Bessis 2002).

According to Saunders (2000) bank are now faced with following fundamental risk: interest rate risk, market risk, credit risk, technology risk, operational risk, foreign exchange risk, country risk, liquidity risk, and insolvency risk.

Charumathi (2008) in her study on interest rate risk management concluded that balance sheet risks include interest rate and liquidity risks.

Vaidya and Shahi (2001) studies asset liability management in Indian banks. They suggested in particular that interest rate risk and liquidity risk are two key inputs in business planning process of banks.

Rajan and Nallari (2004) used canonical analysis to examine asset-liability management in Indian banks in the period 1992-2004. According to this study, SBI and associates had the best asset-liability management in the period 1992-2004. They also found that, other than foreign banks, all other banks could be said to be liability-managed. Private sector banks were found to be aggressive in profit generation, while nationalized banks were found to be excessively concerned about liquidity.

Dash and Pathak (2011) proposed a linear model for asset-liability assessment. They found that public sector banks have best asset liability management positions, maintaining profitability, satisfying the liquidity constraints, and reducing interest rate risk exposure.

Dhanani A. (2007) found that Interest rate volatility, use of corporate debts, regulatory compliance determined Interest Rate Risk management. In order to manage volatility in profit and cash flow, lower financial distress, and to avoid underinvestment UK Companies hedge Interest Rate Risk.

Haslem et al. (1999) used canonical analysis and the interpretive framework of asset/liability management in order to identify and interpret the foreign and domestic balance sheet strategies of large U.S. banks in the context of the “crisis in lending to LDCs.” In their study it was revealed that the least profitable very large banks have the largest proportion of foreign loans, but they focus on asset/liability matching strategies.

Faulkender (2005) finds that firms alter the IRR exposure of new debt issues from fixed to floating by jointly entering into interest rate swaps when the yield curve is steep.

Vickery (2008) confirms these results for small bank-dependent firms that choose between fixed-rate and variable-rate loans. Credit constrained firms, however, are more likely to choose fixed-rate interest per se.

3. Data description and sources

As the matter of fact, the evidence used in analyzing the research topic is the secondary data. Secondary data will be utilized in managing the research. The meaning of this phrase has been explained in details below:

3.1 Secondary data

Secondary data are the data collected by others rather than the researcher himself. The information is collected for the purpose other than that of the researcher- in sense that the researcher becomes the secondary user of the data. According to Saunders, Lewis and Thornhill (2009), the secondary data can be categorized into documentary such as books, reports, articles,

voice and video recordings, etc.; survey-based data, and multiple sources (documentary combined with survey-based data).

Secondary data sources:

- Bangladesh Bank
- Annual Reports of Sonali Bank Limited
- Bangladesh Bureau of Statistics

It can be said that the secondary data take an extremely important role in this thesis's process. First of all, the knowledge from books and articles is the main sources to create theoretical literature part on which the researchers can easily design the research methods: how to collect the primary data as well as appoint the appropriate way to analyze the information obtained. Furthermore, in order to get success from this thesis, it is unacceptable to omit the support of the information provided by the bank in published annual reports, news and presenting regulation documents.

3.2 Limitations of the research

During the research about the thesis topic, there are some limitations that reduce the perfection of the study. Firstly, due to the data secrecy in the financial market, the researcher found difficult to collect all data relating the market interest rate and other relevant information needed for the evaluation.

Besides, some information of the bank is confidential. Hence it is forbidden to use as research data, so it would influence to the result.

Finally, the analysis skills and knowledge of the researcher associated with this topic are limited. Therefore, limitations are avoidable.

4. Research methodology

Importantly, the clearly defined problem and research objectives are the prerequisites that decide the most success of the research topic. In this research, the problem of the practice of interest rate risk management in Sonali Bank Limited and its implementation in reducing the risk of interest rate in banking business has been thoroughly identified at the beginning.

The following methods are used to measure Interest Rate Risk of Sonali Bank Limited.

4.1 Asset liability mismatch

On the basis of time frame, asset and liability of Sonali Bank Limited can be roughly classified into two categories, assets and liabilities for less than one year denoted as short term assets and liabilities and assets and liabilities for more than one year denoted as long term assets and liabilities. As the fluctuation of interest rate is more vital for short term rate of interest, the present study has focused short term asset and liability mismatch only.

A positive gap means that the assets are more than liabilities, while a negative gap means that the assets are less than liabilities.

4.2 Interest sensitive gap (IS GAP)

A simple gap analysis measures the difference between the amount of Rate Sensitive Assets (RSA) and Rate Sensitive Liabilities (RSL) that reprice in a particular time period.

$$\text{IS GAP} = \text{RSA} - \text{RSL}$$

A negative or liability-sensitive gap occurs when rate sensitive liabilities exceed rate sensitive assets for a specific or cumulative maturity period, that is, more liabilities are re-priced than assets. In this situation, a decrease in interest rates should improve the net interest rate spread in the short term, as deposits are rolled over at lower rates before the corresponding assets. On the other hand, an increase in interest rates lowers earnings by narrowing or eliminating the interest spread.

A positive or asset-sensitive gap occurs when rate sensitive assets exceed rate sensitive liabilities for a specific or cumulative maturity period, that is, more assets are re-priced than liabilities. In this situation, a decline in interest rates should lower or eliminate the net interest rate spread in the short term, as assets are rolled over at lower rates before the corresponding liabilities. An increase in interest rates should increase the net interest spread.

The IS GAP model attempts to measure how much interest rate risk a bank evidences at a fixed point in time by comparing the rate sensitivity of assets with the rate sensitivity of liabilities. The objective was typically to measure expected net interest income and then identify strategies to stabilize or improve it.

4.3 Relative IS Gap ratio

Relative interest sensitive gap ratio can be used to measure the sensitivity of bank income to changes in interest rates. This ratio is calculated as follows;

$$\text{Relative Interest-Sensitive Gap} = \frac{\text{IS GAP}}{\text{Bank Size}}$$

Relative IS GAP greater than zero means that the bank is asset sensitive, while a negative Relative IS GAP describes a liability sensitive bank.

Table 4.3: Impact of changing market interest rate on Net Interest Margin (NIM)

Relative IS GAP	Changes in Interest Rate	Net Interest Margin (NIM)
Relative IS GAP > 0	Rise	Increase
	Fall	Decrease
Relative IS GAP < 0	Rise	Decrease
	Fall	Increase
Relative IS GAP = 0	Rise	No Change
	Fall	No Change

4.4 Interest sensitivity ratio (ISR)

We can also measure the exposure of a bank's income to the change interest rate using ISR. ISR is determined as under;

$$\text{Interest Sensitivity Ratio (ISR)} = \frac{RSA}{RSL}$$

An ISR less than one (1) tell us that the bank is liability-sensitive bank, while an ISR greater than unity points to an asset-sensitive bank.

Table 4.4: Impact of changing market interest rate on Net Interest Margin (NIM)

Interest Sensitivity Ratio (ISR)	If Interest Rate	Net Interest Margin (NIM) will
Interest Sensitivity Ratio (ISR) >1	Rise	Increase
	Fall	Decrease
Interest Sensitivity Ratio (ISR) <1	Rise	Decrease
	Fall	Increase
Interest Sensitivity Ratio (ISR) = 1	Rise	No Change
	Fall	No Change

4.5 Net liquidity gap

Banks has suggested structuring their liquidity position, which gives a clear indication about funds mismatch based on historical data as on a particular date.

The funds mainly arising from maturity or crystallization of liabilities and funds mainly arising from maturity of assets are grouped under different time buckets and behavioural pattern of such liabilities and assets. Time buckets are up to 01-month maturity, 1-3 months maturity, 3-12 months maturity, 1-5 years maturity and more than 5 years maturity.

The difference between this total assets and liabilities is referred as net liquidity gap or mismatch. While the bank may not face serious problems with positive mismatch, the negative net liquidity gap situation the concerning issue for the banks to avoid liquidity crisis. The statement of structural liquidity helps to quantify the liquidity risk.

4.6 Exposure to interest rate risk

Here our goal is to determine the bank's sensitivity to the change in the market interest rate. That is, how much the bank's net interest income will change if interest rate goes up or down? This is calculated as follows:

$$\begin{aligned} \Delta NII &= (RSA \times \Delta i) - (RSL \times \Delta i) \\ &= (RSA - RSL) \times \Delta i \\ &= IS \text{ GAP} \times \Delta i \end{aligned}$$

Where, ΔNII is the change in Net Interest Income; RSA is the Rate Sensitive Asset; RSL is the Rate Sensitive Liabilities; Δi is the change in the Interest rate and IS GAP is the Interest Sensitive Gap.

5. Empirical results

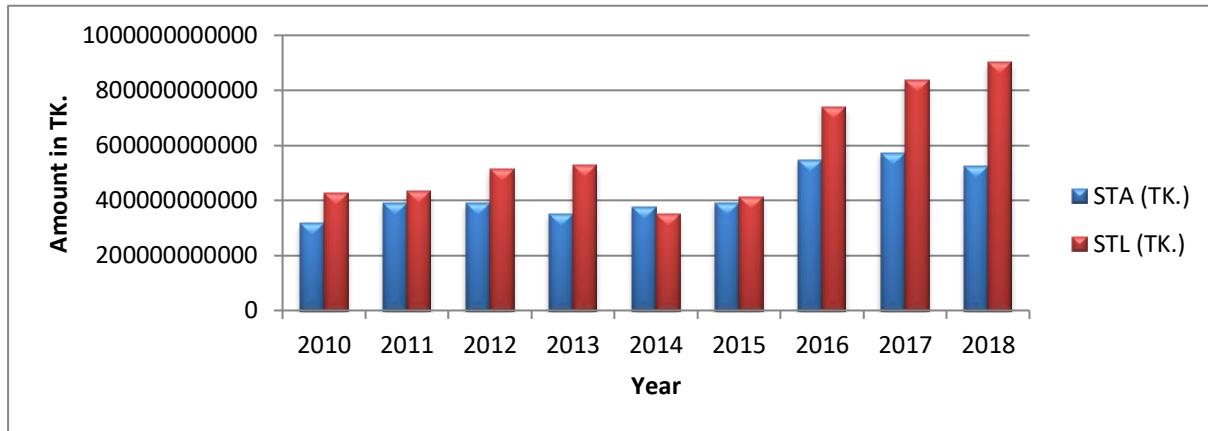
5.1 Asset - liability mismatch

This section assesses short term assets and short term liabilities pattern for study period of 2010 to 2018. Here the volume and also fluctuations of short term assets and short term liabilities have been presented.

Table 5.1: Short Term Asset-Liability in SBL

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
STA (TK.)	316,299, 191,457	390,910, 655,793	389,678, 709,739	350,548, 556,292	375,401, 340,160	392,981, 556,698	548,047, 613,596	570,961, 319,082	521,776, 434,046
STL (TK.)	427,986, 219,431	432,843, 439,211	511,784, 759,517	526,737, 183,185	350,422, 315,728	412,063, 963,304	739,255, 387,317	834,928, 584,137	902,008, 306,437

Graph 5.1: Short Term Asset-Liability of SBL



The above table 5.1 and graph 5.1 depicts that during the period of study short term assets (STA) are lower than short term liabilities (STL) in SBL except in year-2014. Short term assets and short term liabilities both are fluctuating during 2010 to 2018. Here STA are in increasing trend from 2010 to 2011 then it decreased mostly in 2013 is Tk.35, 054.8 Cr. After that it tends to rise. Again STL are in rising trend but fall in year-2014 at Tk. 35, 042.2 Cr. and then it continues to rise.

The gap between asset and liability remain negative for the period under study and positive only in year-2014. This asset shortage may render the bank economically insolvent when interest rate rises. This shows that any change in interest rate can adversely affect the banks position and under such circumstances the bank has used interest risk mitigation tool to hedge the risk. This asset-liability mismatch has directly affected the profitability of the bank and to

ensure proper functioning of the bank, this asset and liability mismatch needs to be avoided. Therefore, the bank has to adopted measures to mitigate the risk.

5.2 Interest sensitive gap (IS GAP)

The next step to assess interest-rate risk is to decide the assets and liabilities that are rate-sensitive, that is, which have interest rates that will be reset (reprised) within the year. Rate-sensitive assets or liabilities can have interest rates reprised within the year. The sensitivity of bank income to changes in interest rates can be measured more directly using gap analysis, in which the amount of rate-sensitive liabilities is subtracted from the amount of rate-sensitive assets. The GAP model measures how much interest rate risk a bank evidences at a fixed point in time by comparing the rate sensitivity of assets with the rate sensitivity of liabilities. GAP represents the magnitude of rate sensitive assets minus magnitude of rate sensitive liabilities over different time intervals.

Table 5.2: Interest Sensitive Gap in SBL

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
RSA (TK.)	316,299, 191,457	390,910, 655,793	389,678, 709,739	350,548, 556,292	375,401, 340,160	392,981, 556,698	548,047, 613,596	570,961, 319,082	521,776, 434,046
RSL (TK.)	427,986, 219,431	432,843, 439,211	511,784, 759,517	526,737, 183,185	350,422, 315,728	412,063, 963,304	739,255, 387,317	834,928, 584,137	902,008, 306,437
IS GAP	- 111,687, 027,974	- 41,932, 783,418	- 122,106, 049,778	- 176,188, 626,893	24,979, 024,432	- 19,082, 406,606	- 191,207, 773,721	- 263,967, 265,055	- 380,231, 872,391

Graph 5.2: Interest Sensitive Gap (IS GAP)

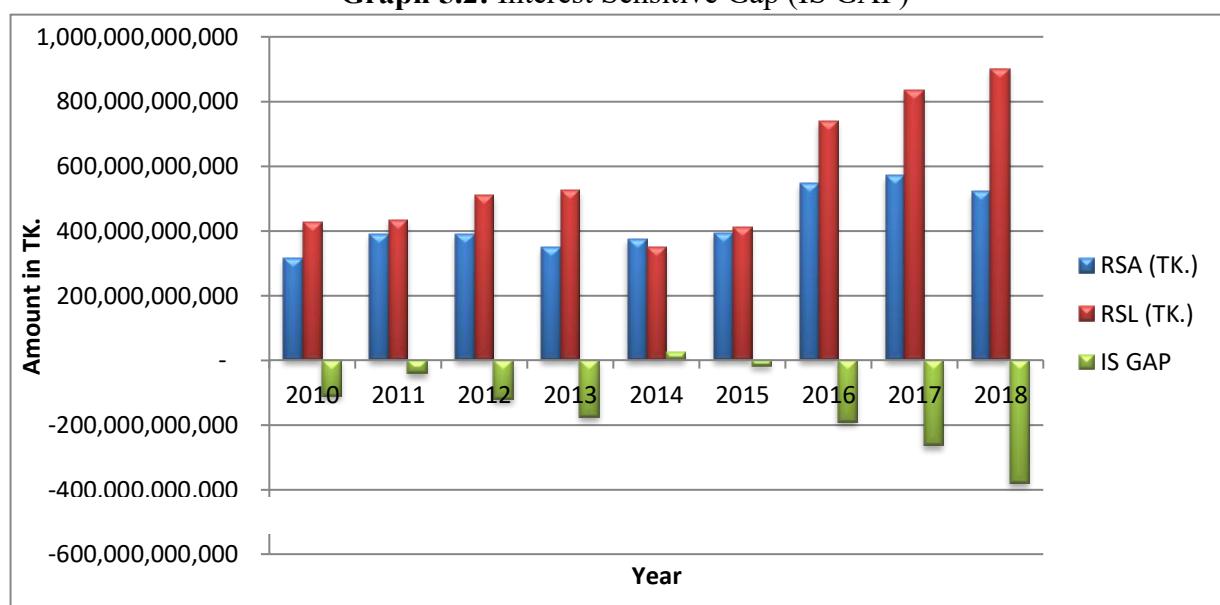


Table 5.2 as well as graph 5.2 presents the difference between the rate sensitive assets and liabilities in Sonali Bank Limited during 2010-18. During the study period of 2010 to 2018 interest sensitive gap (IS GAP) are fluctuating.

In Sonali Bank Limited, the IS gap squeezed from Tk. – 11,168.7 Cr. to Tk. – 4,193.2 Cr. in 2011, it starts to increase from Tk. – 12,210.6 Cr. in 2012 to Tk. – 17,618.8 Cr. in 2013. The gap reduced in 2014 to Tk. 2,497.9 Cr. and again increased to Tk. – 1,908.2 Cr. in 2015. Then the IS gap has continuously increased Tk. – 19,120.7 Cr. in 2016; Tk. – 26,396.7 Cr. and Tk. – 38,023.1 in 2018. As the bank has a negative Gap over the period of study, i.e. from 2010-18, except in 2014. The bank should adopt measures to manage interest rate risk.

5.3 Relative IS gap

This section describes the volatility of Sonali Bank Limited, Bangladesh during the period of 2010 to 2018 using the Relative IS GAP. The negative the Relative IS GAP is the higher the volatility of the bank.

Table 5.3: Relative IS Gap in SBL

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
IS GAP	- 111,687, 027,974	- 41,932, 783,418	- 122,106, 049,778	- 176,188, 626,893	24,979, 024,432	- 19,082, 406,606	- 191,207, 773,721	- 263,967, 265,055	- 380,231, 872,391
TA (TK.)	649,267, 923,086	695,192, 109,076	753,949, 685,755	852,223, 550,362	943,592, 315,146	1,026,108, 505,771	1,200,589, 972,325	1,240,332, 168,260	1,306,842, 319,895
Relative IS GAP	-0.172	-0.060	-0.162	-0.207	0.026	-0.019	-0.159	-0.213	-0.291

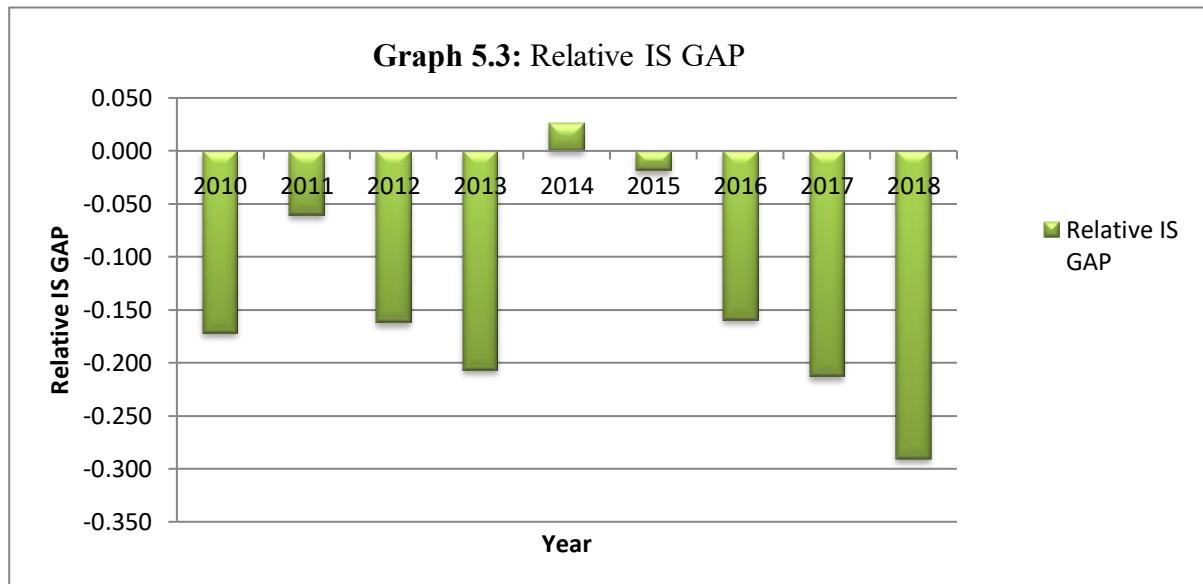


Table 5.3 and graph 5.3 above illustrates that there is negative relative IS GAP during the period of 2010 to 2013, then positive in year-2014. Again, it was negative for the period 2015 to 2018.

In year 2010 the Relative IS GAP was – 0.172 then it decreased to – 0.060 in years 2011. It continues to rise at - 0.162 in 2012 and – 0.207 in 2013. But it favourably increased to 0.026 in 2014. Further it tends to increase for the rest of the year as - 0.019 in 2015; - 0.159 in 2016, - 0.213 in 2017 and - 0.291 in 2018.

The bank in a volatile position because of its negative relative IS GAP for most of the period and this bank should take proper measure to mitigate the interest rate risk.

5.4 Interest sensitivity (IS) ratio

The measure of Interest Sensitivity Ratio(ISR) used to describe the exposure of the SBL. Here ISR has been presented for the duration of 2010 to 2018. The IS ratio greater than unity is the expected goal but less than unity describe the riskiness of the bank to the rising interest rate.

Table 5.4: IS Ratio of SBL

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
RSA (TK.)	316,299, 191,457	390,910, 655,793	389,678, 709,739	350,548, 556,292	375,401, 340,160	392,981, 556,698	548,047, 613,596	570,961, 319,082	521,776, 434,046
RSL (TK.)	427,986, 219,431	432,843, 439,211	511,784, 759,517	526,737, 183,185	350,422, 315,728	412,063, 963,304	739,255, 387,317	834,928, 584,137	902,008, 306,437
IS Ratio	0.7390	0.9031	0.7614	0.6655	1.0713	0.9537	0.7414	0.6838	0.5785

Graph 5.4: IS Ratio

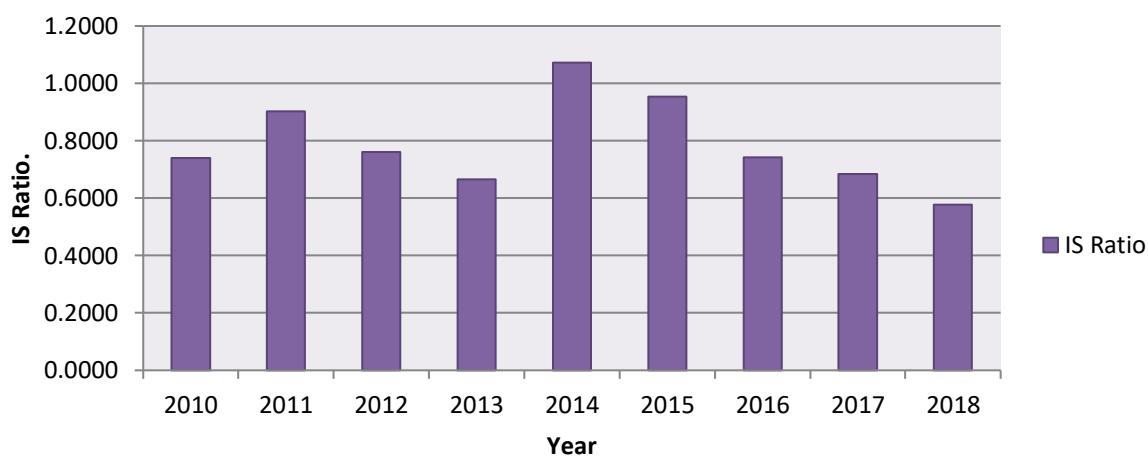


Table 5.4 and graph 5.4 depicts that IS ratios were greater than unity only in year 2014 but less than unity for the other period. This is unexpected for the bank to keep the steadiness of the performance.

Interest sensitivity ratio widened from 0.7390 in 2010 to 0.9031 in 2011, and then decreased from 0.7614 in 2012 to 0.6655 in 2013. Expectedly IS ratio was 1.0713 in 2014 which is greater than unity. But, after that IS ratios were continuously gone to fall as 0.9537 in 2015, 0.7414 in 2016, 0.6838 in 2017 and 0.5785 in 2018.

The bank is in a sensitive position to the rising interest rate as because it's IS ratios were less than unity for the most of period between 2010 and 2018.

5.5 Net liquidity gap

Net liquidity gap is used to understand the liquidity crisis of Sonali Bank Limited, Bangladesh over the period of 2010 to 2018. While the bank may not face serious problems with positive mismatch, the negative net liquidity gap situation the concerning issue for the banks to avoid liquidity crisis.

Table 5.5: Net Liquidity Gap of SBL

Year	Up to 01 month maturity	01-3 months maturity	3-12 months maturity	01-5 years maturity	More than 5 years maturity
2010	-103666734386	-5632813672	-2387479916	11,026,796,779	146,434,090,492
2011	-81,532,482,743	-38884531106	78,484,230,431	-69,477,585,534	167,502,671,856
2012	-101,021,242,185	-42,195,803,382	21,110,995,789	-11,835,416,029	156,331,465,769
2013	-74,564,441,329	-57,151,577,175	-44,472,608,389	36,661,030,194	189,536,282,420
2014	6,410,838,120	24,022,872,846	-5,454,686,534	17,193,330,742	17,406,688,791
2015	3,862,025,013	3,910,348,909	-26,854,780,528	34,129,705,954	43,334,857,512
2016	-135,151,322,008	86,976,247,473	-143,032,699,186	87,512,150,681	171,070,379,216
2017	-218,835,198,364	83,512,775,126	-128,644,841,817	84,003,693,889	246,051,030,772
2018	-244,525,406,567	-4,099,099,762	-131,607,366,062	194,587,067,130	255,781,676,441

Graph 5.5.1: Year Wise Net Liquidity Gap as per Time Bucket

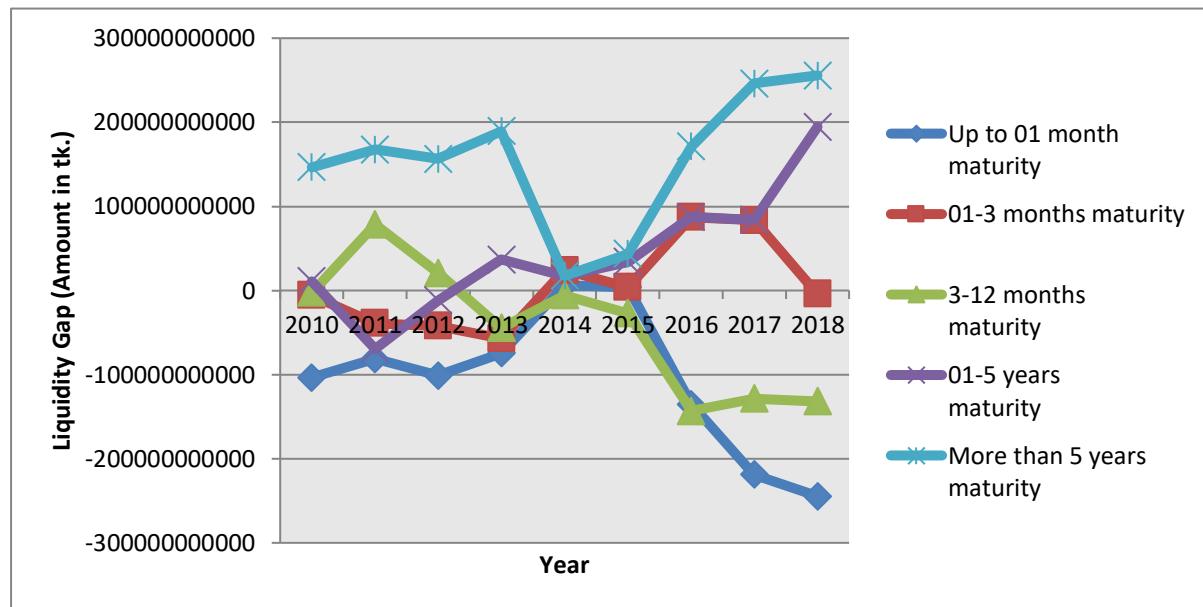
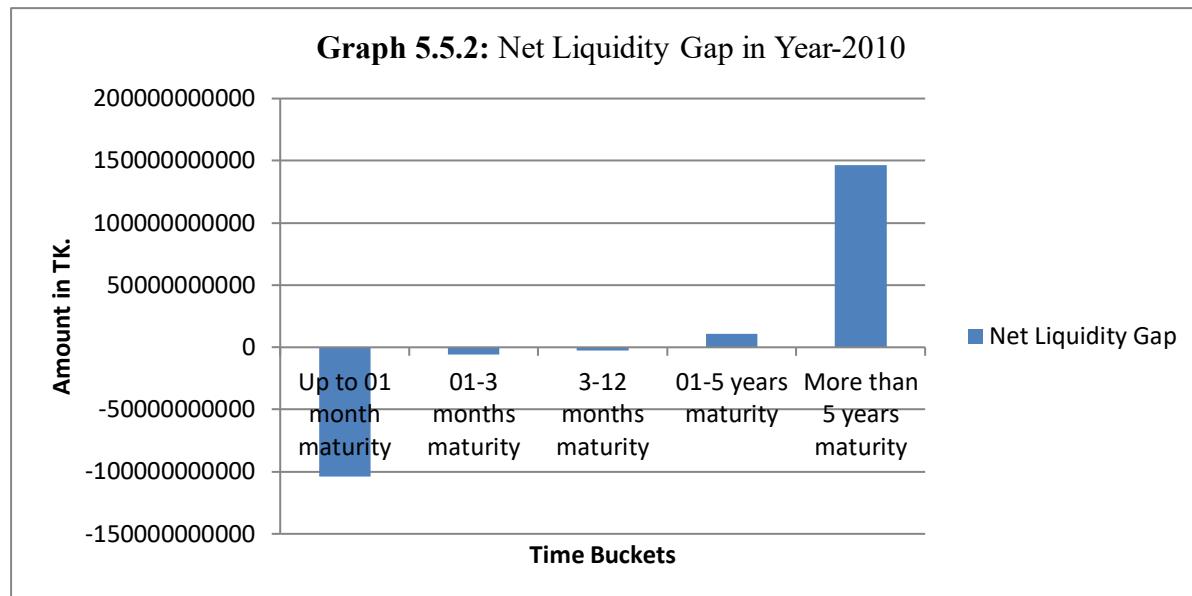
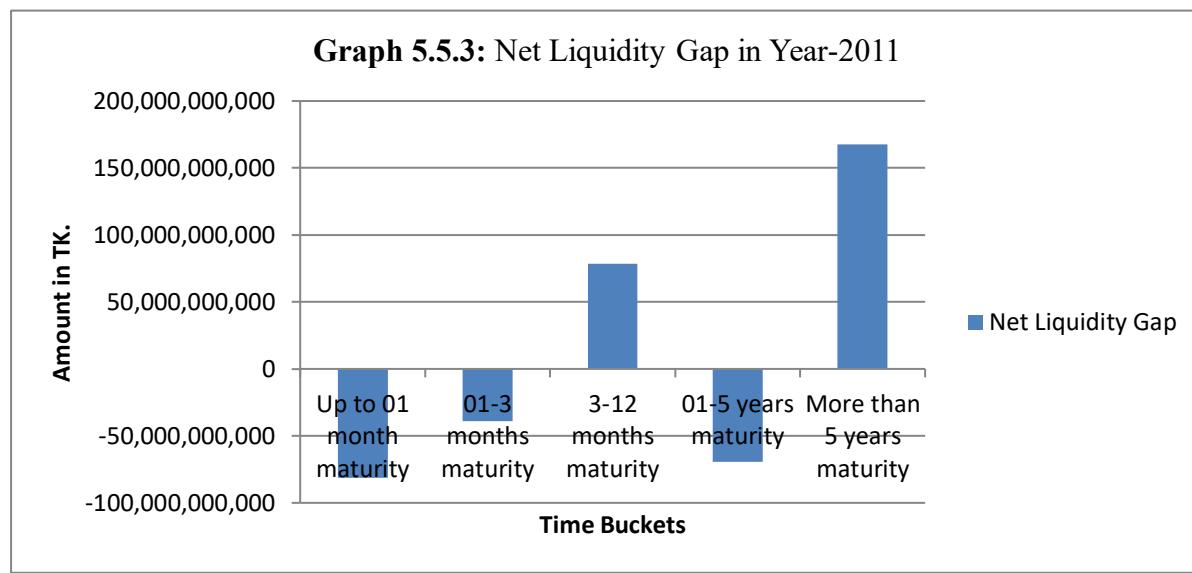


Table 5.5 and graph 5.5.1 illustrates that bucket-wise break-up of ALM and showing the bank has the highest ALM positive gap in the bucket more than 5 years maturity followed by 1-5 years and 1-3 months maturity. And the bank has highest liquidity crisis in the bucket up to 1-month maturity followed by 3-12 months maturity.

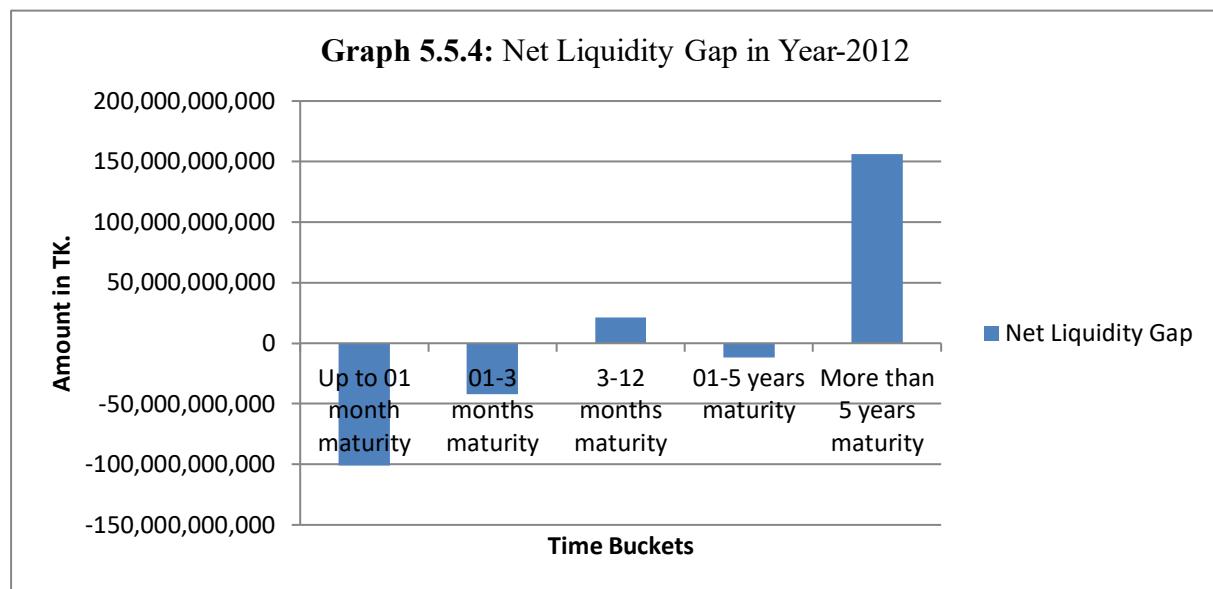
Year-wise net liquidity gap is presented in the following few graphs for the period of 2010 to 2018.



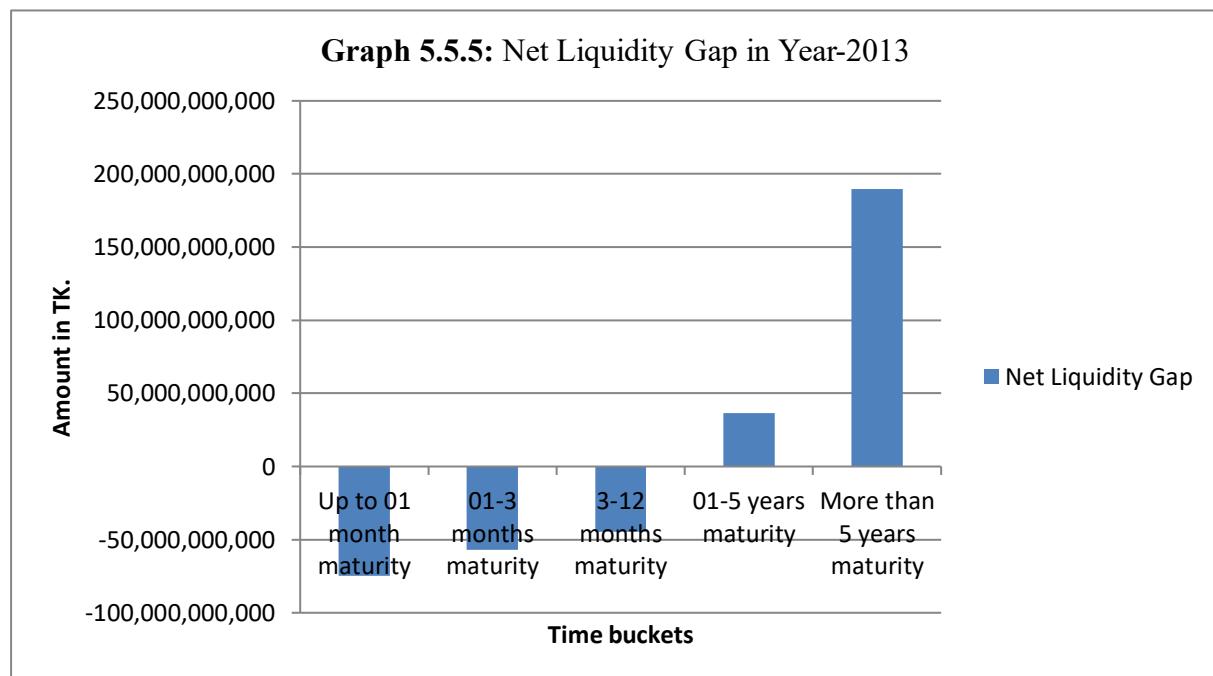
Above Graph 5.5.2, which contains net liquidity gap covering a period from up to 1-month maturity to more than 5 years for the year 2010, it is revealed that the time buckets of up to 01-month maturity, 01-03months maturity and 03-12 months maturity are vulnerable paving way to negative net liquidity gaps of high volumes.



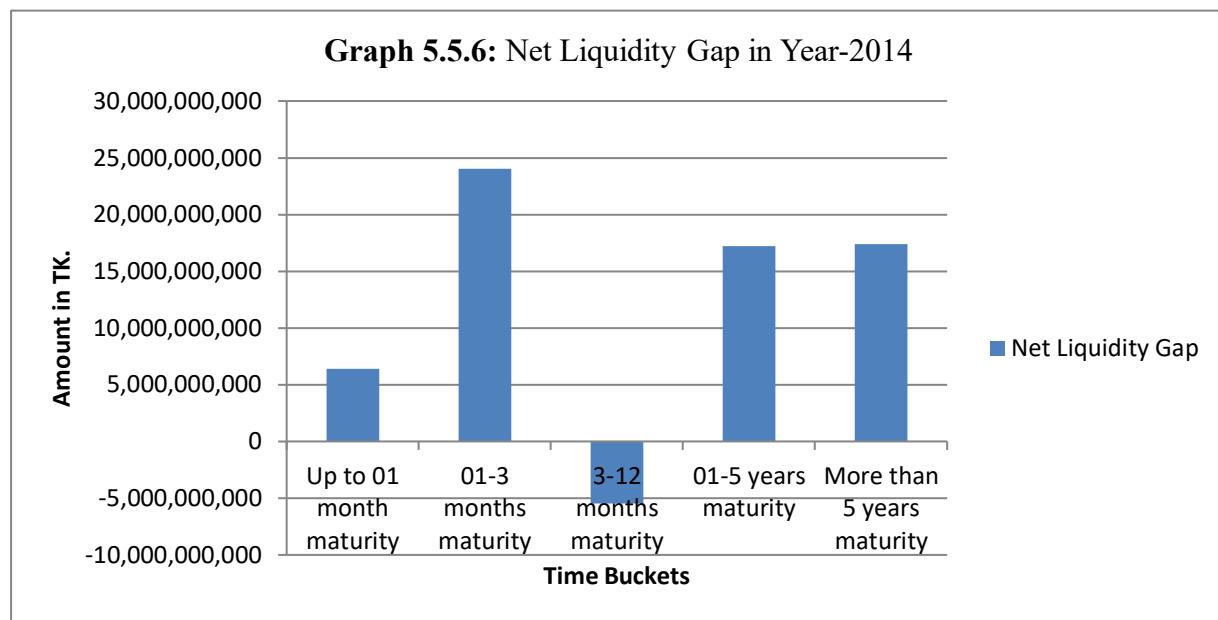
Graph 5.5.3, which contains net liquidity gap covering a period from up to 1-month maturity to more than 5 years for the year 2011, it is revealed that the time buckets of up to 01-month maturity, 01-03months maturity and 01-05 years maturity are vulnerable paving way to negative net liquidity gaps of high volumes.



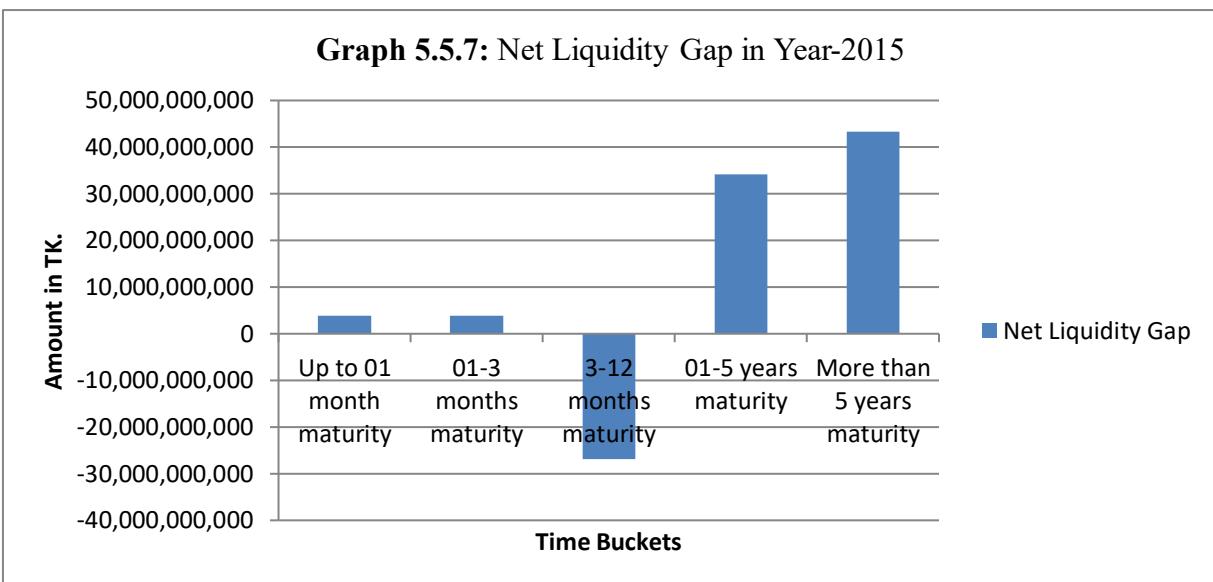
Graph 5.5.4, which contains net liquidity gap covering a period from up to 01-month maturity to more than 5 years for the year 2012, it is revealed that the time buckets of up to 01-month maturity, 01-03months maturity and 01-05 years maturity are vulnerable paving way to negative net liquidity gaps of high volumes.



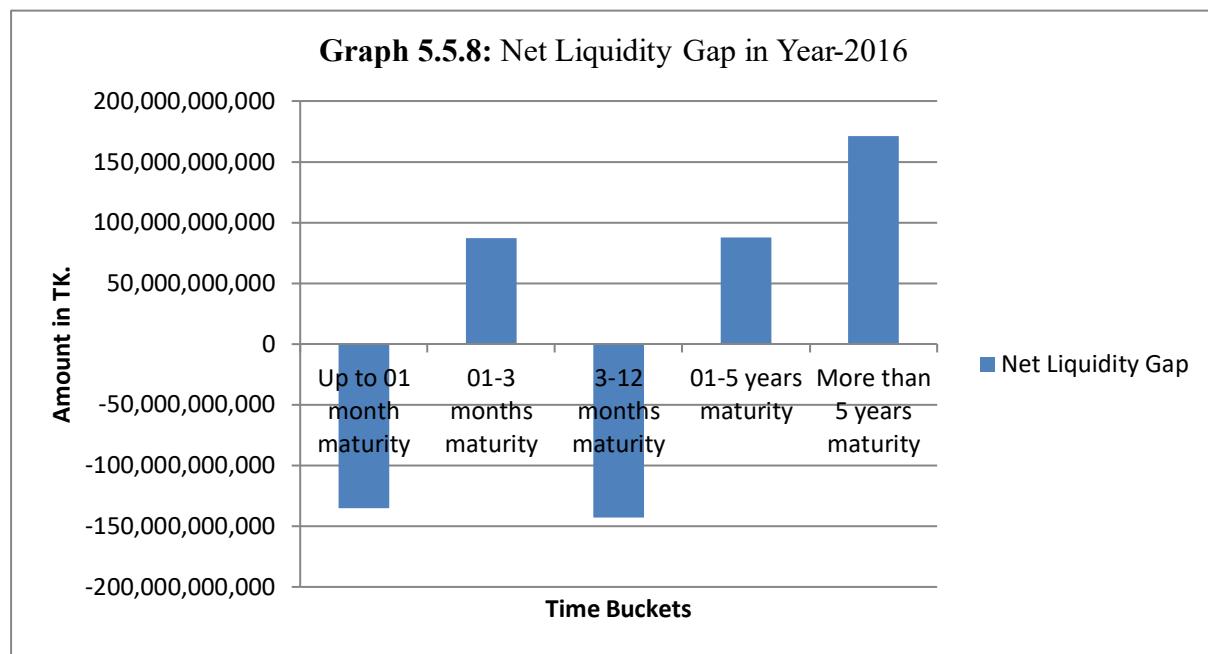
Above Graph 5.5.5, which contains net liquidity gap covering a period from up to 1-month maturity to more than 5 years for the year 2013, it is revealed that the time buckets of up to 01-month maturity, 01-03months maturity and 03-12 months maturity are vulnerable paving way to negative net liquidity gaps of high volumes.



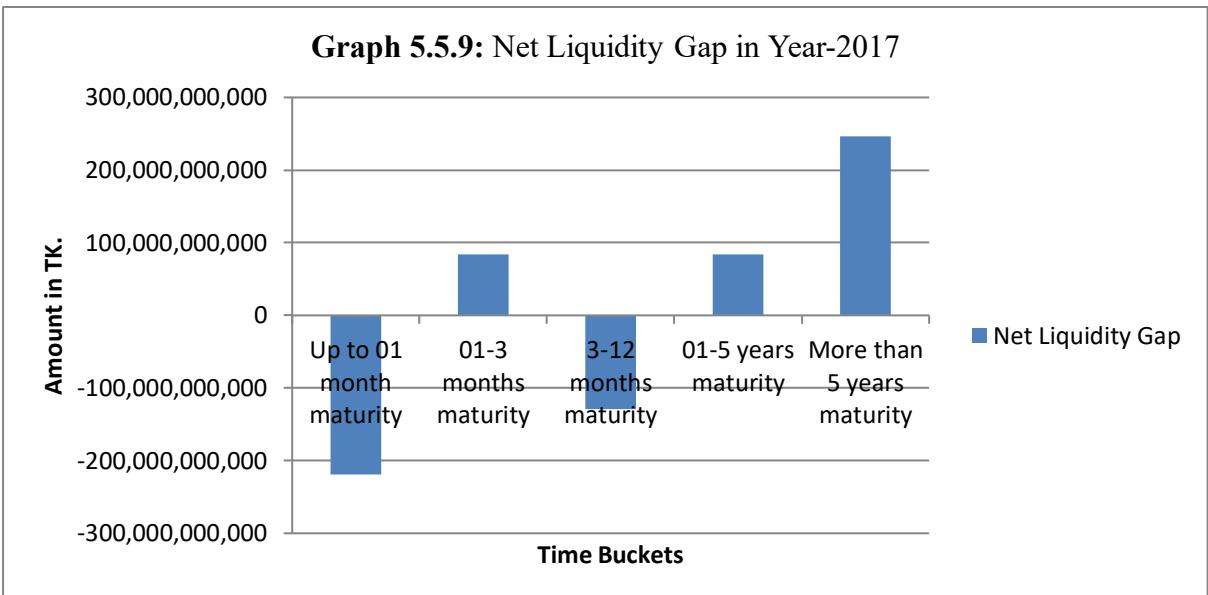
Above Graph 5.5.6, which contains net liquidity gap covering a period from up to 1-month maturity to more than 5 years for the year 2014, it is revealed that the time buckets of only 03-12 months maturity are vulnerable paving way to negative net liquidity gaps of high volumes. In this fiscal year Sonali Bank Limited is in more stable in liquidity position.



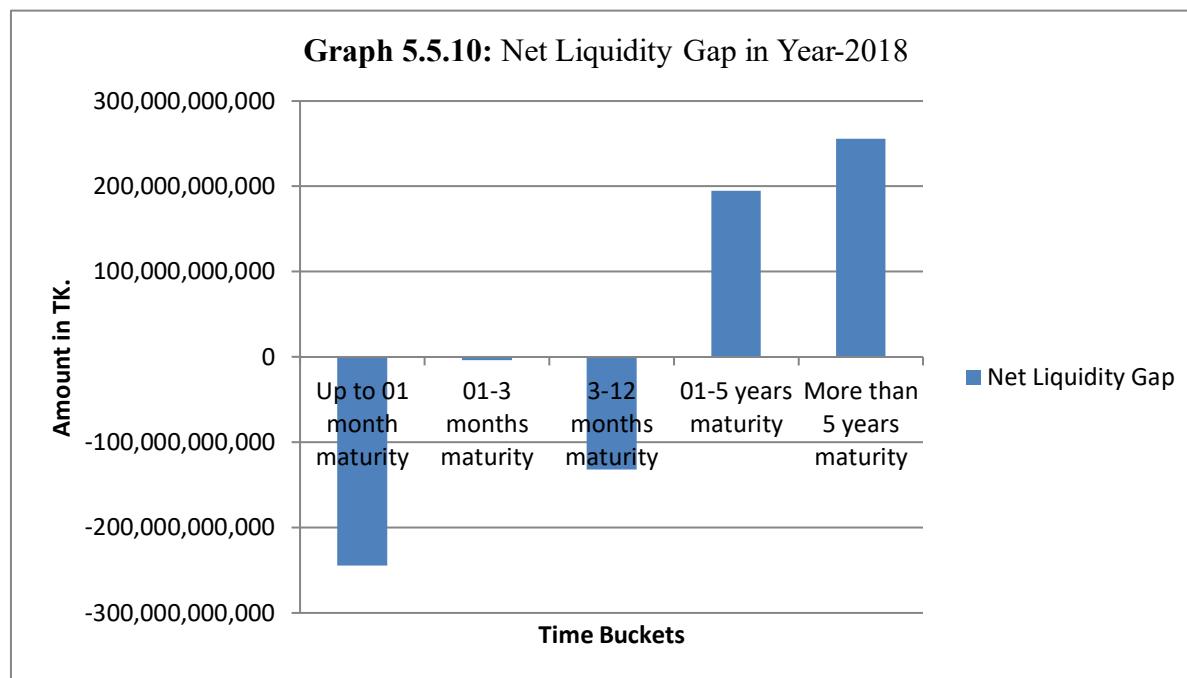
Above Graph 5.5.7, which contains net liquidity gap covering a period from up to 1-month maturity to more than 5 years for the year 2015, it is revealed that the time buckets of only 03-12 months maturity are vulnerable paving way to negative net liquidity gaps of high volumes. Also in fiscal year 2015, Sonali Bank Limited is in more stable in liquidity position.



Graph 5.5.8, which contains net liquidity gap covering a period from up to 1-month maturity to more than 5 years for the year 2016, it is revealed that the time buckets of up to 01-month maturity and 03-12months maturity are vulnerable paving way to negative net liquidity gaps of high volumes.



Graph 5.5.9, which contains net liquidity gap covering a period from up to 1-month maturity to more than 5 years for the year 2017, it is revealed that the time buckets of up to 01-month maturity and 03-12months maturity are vulnerable paving way to negative net liquidity gaps of high volumes.



Graph 5.5.10, which contains net liquidity gap covering a period from up to 1-month maturity to more than 5 years for the year 2018, it is revealed that the time buckets of up to 01-month maturity, 01-03 months maturity and 03-12months maturity are vulnerable paving way to negative net liquidity gaps of high volumes.

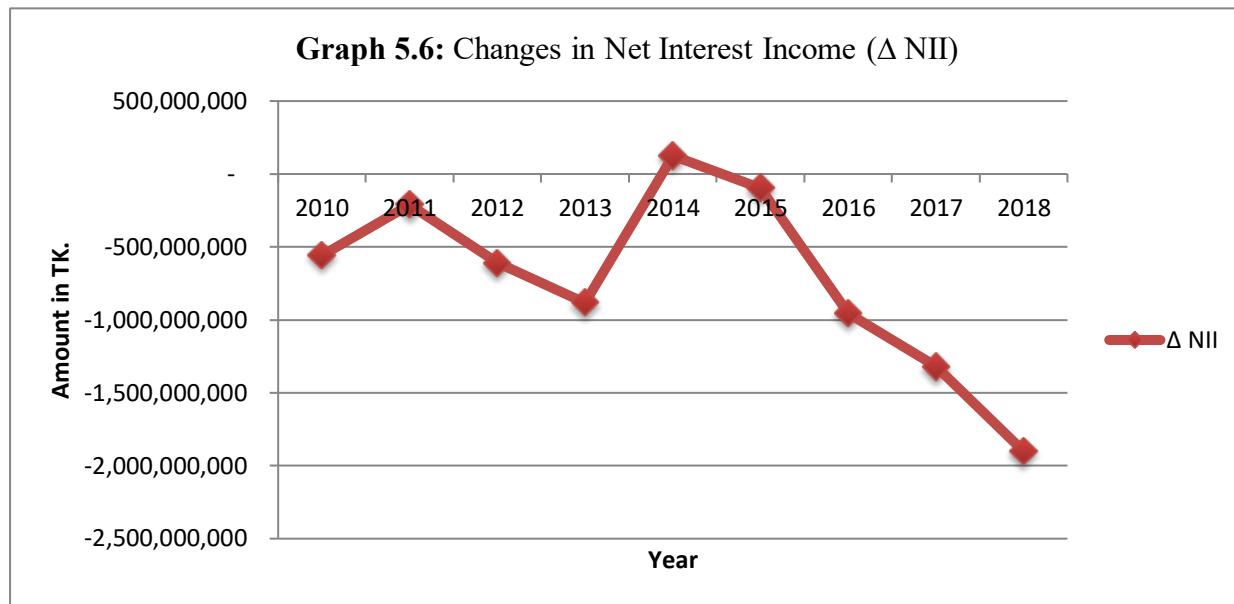
This trend may lead to call money borrowing to fill in the liquidity gap and may reduce the interest margin substantially in the increasing interest rate scenario. Thus, it is concluded that the bank is exposed to interest rate risk.

5.6 Exposure to interest rate risk

The following table calculates the amount of net interest income will change if interest rate increases by 0.5% for the period of 2010 to 2018. If the bank has negative IS gap, then net interest income will decrease if interest rate increased. On the other hand, if the bank has positive IS gap then net interest income will increase if interest rate increased.

Table 5.6: Exposure to Interest Rate Risk

Year	If interest rate increases by 0.5% ($\Delta i=0.005$) then Δ NII will be;								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
RSA (Tk.)	316,299,191,457	390,910,655,793	389,678,709,739	350,548,556,292	375,401,340,160	392,981,556,698	548,047,613,596	570,961,319,082	521,776,434,046
RSL (Tk.)	427,986,219,431	432,843,439,211	511,784,759,517	526,737,183,185	350,422,315,728	412,063,963,304	739,255,387,317	834,928,584,137	902,008,306,437
IS GAP	- 111,687,027,974	- 41,932,783,418	- 122,106,049,778	- 176,188,626,893	24,979,024,432	- 19,082,406,606	- 191,207,773,721	- 263,967,265,055	- 380,231,872,391
Δ NII	- 558,435,140	- 209,663,917	- 610,530,249	- 880,943,134	124,895,122	- 95,412,033	- 956,038,869	- 1,319,836,325	- 1,901,159,362



Above table 5.6 and graph 5.6 describes that if for some reasons interest rate rises by 0.5%, then net interest income goes down for the year 2010, 2011, 2012, 2013, 2015, 2016, 2017 and 2018. Because in those year IS Gap of SBL was negative. But only in the year 2014 net interest income were positive, as because of positive IS Gap.

6. Conclusion

Sonali Bank Limited's balance sheet risks include interest rate risk and liquidity risks. The regular monitoring and managing is the need of the hour. The Bank should use the information about these risks as key input in their strategic business planning process. While increasing the size of the balance sheet, the degree of asset liability mismatch should be kept in control. Because, the excessive mismatch would result in volatility in earnings. Banks can also use sensitivity analysis for risk management purpose. This study used gap analysis for measuring the interest rate risk under the assumptions such as introduction of negative and positive interest rate shock. It is found that the bank is exposed to interest rate risk.

The study suggests much scope for the bank to improve profitability by monitoring and reducing short term liquidity. To fill the short term liquidity gap, banks resort to market borrowings at higher rate of interest which reduces interest margin and profitability of the bank. The bank has greater scope to manage interest rate risk through various techniques.

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