AN ANALYSIS OF ASSET-LIABILITY MANAGEMENT IN INDIAN BANKS

Mihir Dash[1]
K.A. Venkatesh
Bhargav B.D.

Introduction

Asset-Liability Management (ALM) is concerned with strategic management of assets (uses of funds) and liabilities (sources of funds) of banks, against risks caused by changes in the liquidity position of the bank, interest rates, and exchange rates, and against credit risk and contingency risk.

ALM has gained significance in the financial services sector in recent years due to the dramatic changes that have occurred in the post-liberalization period. There has been a vast shift in the borrowers' profile, the industry profile and the exposure limits for the same, interest rate structure for deposits and advances, and so on. This has been accompanied by increased volatility of markets, diversification of bank product profiles, and intensified competition between banks on a global scale, all adding to the risk exposure of banks. Thus, banks increasingly need to match the maturities of the assets and liabilities, balancing the objectives of profitability, liquidity, and risk. To this end, the Bank of International Settlements (BIS) has suggested a framework for the banks to tackle the market risks that may arise due to rate fluctuations and excessive credit risk. The Reserve Bank of India (RBI) has implemented the Basel II norms for the regulation of Indian banks, providing a framework for banks to develop ALM policies.

At the macro-level, ALM leads to the formulation of critical business policies, efficient allocation of capital, and designing of products with appropriate pricing strategies, while at the micro-level, the objective of the ALM is two-fold: it aims at profitability through price matching while ensuring liquidity by means of maturity matching.

Price matching basically aims to maintain spreads by ensuring that the deployment of liabilities will be at a rate higher than the costs. Working towards this end, banks generally maintain profitability/spreads by borrowing short (lower costs) and lending long (higher yields). Though price matching can be done well within the risk/exposure levels set for rate fluctuations, it may, however, place the bank in a potentially illiquid position. Liquidity is ensured by grouping the assets/liabilities based on their maturing profiles. The gap is then assessed to identify the future financing requirements to ensure liquidity. The inter-linkage between the interest rate risk and the liquidity of the firm highlights the need for maturity matching. The underlying threat of this inter-linkage is that rate fluctuations may lead to defaults severely affecting the asset-liability position, and, in a highly volatile situation, it may lead to a liquidity crisis forcing the closure of the bank.

Thus, price matching should be coupled with proper maturity matching. However, maintaining profitability by matching prices and ensuring liquidity by matching the maturity levels is not an easy task; in fact they contradict each other to some extent because a spread is possible when a mismatch of maturity is taken up. Thus, a trade-off has to be maintained between profitability and liquidity. Banks generally aim to eliminate liquidity risk while managing interest rate risk. The

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[1] The first two authors are professors at Alliance Business School, No. 2 &3, 2nd Cross, 36th Main, Dollar's Colony, BTM Layout, I Stage, Bangalore-560068, and can be contacted by phone on +91-9945182465, or by email at mihirda@rediffmail.com. The third author is a research scholar at the same institution.

differential approach is primarily based on the fact that elimination of interest rate risk is not profitable, while elimination of liquidity risk does result in long-term sustenance.

An effective ALM technique aims to manage the volume, mix, maturity, rate sensitivity, quality and liquidity of the assets and liabilities as a whole so as to attain a predetermined acceptable risk/reward ratio. The purpose of ALM is to enhance the asset quality, quantify the risks associated with the assets and liabilities and further manage them, in order to stabilize the short-term profits, the long-term earnings and the long-run sustenance of the bank.

Literature Review:

There is a considerable literature addressing asset-liability management in banks. One of the key motivators of asset-liability management worldwide was the Basel Committee. The Basel Committee on Banking Supervision (2001) formulated broad supervisory standards and guidelines and recommended statements of best practice in banking supervision. The purpose of the committee was to encourage global convergence toward common approaches and standards. In particular, the Basel II norms (2004) were proposed as an international standard for the amount of capital that banks need to set aside to guard against the types financial and operational risks they face. Basel II proposed setting up rigorous risk and capital management requirements designed to ensure that a bank holds capital reserves appropriate to the risk the bank exposes itself to through its lending and investment practices. Generally speaking, these rules mean that the greater risk to which the bank is exposed, the greater the amount of capital the bank needs to hold to safeguard its solvency and overall economic stability. This would ultimately help protect the international financial system from the types of problems that might arise should a major bank or a series of banks collapse.

Gardner and Mills (1991) discussed the principles of asset-liability management as a part of banks' strategic planning and as a response to the changing environment in prudential supervision, e-commerce and new taxation treaties. Their text provided the foundation of subsequent discussion on asset-liability management.

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." Their study found that the least profitable very large banks have the largest proportions of foreign loans, yet they emphasize domestic balance sheet (asset/liability) matching strategies. Conversely, the most profitable very large banks have the smallest proportions of foreign loans, but, nonetheless, they emphasize foreign balance sheet matching strategies.

Vaidyanathan (1999) discussed issues in asset-liability management and elaborates on various categories of risk that require to be managed in the Indian context. In the past Indian banks were primarily concerned about adhering to statutory liquidity ratio norms; but in the changed situation, namely moving away from administered interest rate structure to market determined rates, it became important for banks to equip themselves with some of these techniques, in order to immunize themselves against interest rate risk. Vaidyanathan argues that the problem gets accentuated in the context of change in the main liability structure of the banks, namely the maturity period for term deposits. For instance, in 1986, nearly 50% of term deposits had a maturity period of more than five years and only 20%, less than two years for all commercial banks, while in 1992, only 17% of term deposits were more than five years whereas 38% were less than two years (Vaidyanathan, 1995). He found that several banks had inadequate and inefficient management systems. Also, he argued that Indian banks were more exposed to international markets, especially with respect to FOREX transactions, so that asset-liability management was essential, as it would

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enable the bank to maintain its exposure to foreign currency fluctuations given the level of risk it can handle. He also found that an increasing proportion of investments by banks was being recorded on a marked-to-market basis, thus being exposed to market risks. He also suggested that, as bank profitability focus has increased over the years, there is an increasing possibility that the risk arising out of exposure to interest rate volatility would be built into the capital adequacy norms specified by the regulatory authorities, thus in turn requiring efficient asset-liability management practices.

Vaidya and Shahi (2001) studied 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.

Ranjan and Nallari (2004) used canonical analysis to examine asset-liability management in Indian banks in the period 1992-2004. They found that 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; i.e. they all borrowed from the money market to meet their maturing obligations. 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.

The present study analyses asset-liability management in banks operating in India using the asset-liability guidelines provided by the Reserve Bank of India.

Data and Methodology

The present study analyses asset-liability management in banks operating in India by determining the liquidity position of banks in India through maturity profiling. The study covered all scheduled commercial banks except regional rural banks (RRBs), for the year 2008-09. The banks were grouped on the basis of ownership structure: viz. public sector banks (including SBI & associates), private sector banks, and foreign banks. The primary objective of the study was to compare the maturity gaps in public, private and foreign banks in the Indian banking industry.

The study was conducted on a sample of twenty-six public sector banks, twenty private sector banks, and ten foreign banks operating in India. The data used for the study included the major financial details of the sample banks, collected from secondary sources of data, viz. the Capitaline database and the RBI website.

The study was conducted on the basis of the Asset-Liability Guidelines issued by RBI to individual banks. All the balance sheet items have to be distributed into time buckets as follows: 1-14 days; 15-28 days; 1-3 months; 3-6 months; 6-12 months; 1-2 years; 2-5 years; and 5+ years. Bank assets and liabilities were allocated into various maturity periods as per the guidelines issued by Reserve Bank of India. Key items like deposits and advances have been distributed into actual maturity period as per the details submitted by individual banks to RBI, where available. Other items have been distributed into different time frames in a fixed proportion, as suggested by RBI guidelines and demand profiles. The guidelines are reproduced below.

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Heads of Accounts	Classification into time buckets
A. Outflows	
1. Capital, Reserves and Surplus	Over 5 years bucket.
2. Demand Deposits (Current and Savings Bank Deposits)	Demand Deposits may be classified into volatile and core portions. 25% of deposits are generally withdrawable on demand. This portion may be treated as volatile. While volatile portion can be placed in the first time bucket i.e., 1-14 days, the core portion may be placed in 1 - 2 years bucket.
3. Term Deposits	Respective maturity buckets.
4. Certificates of Deposit, Borrowings and Bonds (including Sub-Ordinated Debt)	Respective maturity buckets.
5. Other Liabilities and Provisions	
(i) Bills Payable	(i) 1-14 days bucket.
(ii) Inter-office Adjustment	(ii) As per trend analysis. Items not representing cash payables, may be placed in over 5 years bucket.
(iii) Provisions for NPAs	(iii)
a) Sub-standard	a) 2-5 years bucket.
b) Doubtful and Loss	b) Over 5 years bucket.
(iv) Provisions for depreciation in investments	(iv) Over 5 years bucket.
(v) Provisions for NPAs in investments	(v)
a) Sub-standard	a) 2-5 years bucket.
b) Doubtful and Loss	b) Over 5 years bucket.
(vi) Provisions for other purposes	(vi) Respective buckets depending on the purpose.
(vii) Other Liabilities	(vii) Respective maturity buckets. Items not representing cash payables (i.e. income received in advances etc.) may be placed in over 5 years bucket.

Heads of Accounts	Classification into time buckets
B. Inflows	
1. Cash	1-14 days bucket
2. Balances with RBI	While the excess balance over the required CRR/SLR may be shown under 1-14 days bucket, the Statutory Balances may be distributed amongst various time buckets corresponding to the maturity profile of DTL with a time-lag of 14 days.
3. Balances with other Banks	
(i) Current Account	(i) Non-withdrawable portion on account of stipulations of minimum balances may be shown under 1-2 years bucket and the remaining balances may be shown under 1-14 days bucket.
(ii) Money at Call and Short Notice, Term Deposits and other placements	(ii) Respective maturity buckets.
4. Investments	
(i) Approved securities	(i) Respective maturity buckets excluding the amount required to be reinvested to maintain SLR corresponding to the DTL profile in various time buckets.
(ii) Corporate debentures and bonds, PSU bonds, CDs and CPs, Redeemable preference Shares, Units of Mutual Funds (close ended), etc.	(ii) Respective maturity buckets. Investments classified as NPAs should be shown under 2-5 years bucket (sub-standard) or over 5 years bucket (doubtful and loss).
(iii) Shares / Units of Mutual Funds (open ended)	(iii) Over 5 years bucket.
(iv) Investments in Subsidiaries/Joint Ventures	(iv) Over 5 years bucket.

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Heads of Accounts	Classification into time buckets
5. Advances (Performing) (i) Bills Purchased and Discounted (including bills under DUPN)	(i) Respective maturity buckets.
(ii) Cash Credit/Overdraft (including TOD) and Demand Loan component of Working Capital.	(ii) Banks should undertake a study of behavioural and seasonal pattern of availments based on outstandings and the core and volatile portion should be identified. While the volatile portion could be shown in the respective maturity buckets, the core portion may be shown under 1-2 years bucket.
(iii) Term Loans	(iii) Interim cash flows may be shown under respective maturity buckets.

6. NPAs
  (i) Sub-standard
  (ii) Doubtful and Loss
	(i) 2-5 years bucket.
	(ii) Over 5 years bucket.

7. Fixed Assets	Over 5 years bucket
8. Other Assets (i) Inter-office Adjustment	(i) As per trend analysis. Intangible items or items not representing cash receivables may be shown in over 5 years bucket.
(ii) Others	(ii) Respective maturity buckets. Intangible assets and assets not representing cash receivables may be shown in over 5 years bucket.

From the maturity profile, the maturity gap was computed by subtracting total outflows from total inflows, giving the mismatch in the outflow and inflow in the particular time bucket. A positive maturity gap means that in the particular time bucket, the inflows are more than outflows, while a negative maturity gap means that in the particular time bucket, the inflows are lesser than outflows.

The maturity gap was expressed as a percentage of outflows to identify the severity of the gap. Also, the cumulative maturity gap was computed on the basis of maturity gap of the bank to give the position of the bank during the future period. The cumulative maturity gap is of immense help for any bank to identify the gaps for the next five years and arrange funds to manage it.

In particular, the time buckets 1-14 days and 15-28 days are indicators of short term liquidity position of the bank. As per the guidelines of Reserve Bank of India, the banks should take care that the maturity gap of the short term liquidity indicator does not cross 20% of the outflow of the respective buckets.

Findings

The table below shows the maturity gap position of the sample public sector banks in the different time buckets:

(Rs. In crores)

Bank	1 - 14 days	15 - 28 days	29 days to 3 months	3 - 6 months	6 -12 months	1 - 2 years	2 - 5 years	Over 5 years
Allahabad Bank	9,985.83	346.31	92.44	-3,623.67	-9,003.88	-14,854.28	4,178.80	12,878.45
Andhra Bank	3,783.96	-1,063.86	-398.32	-6,572.15	-9,137.71	-3,706.63	6,447.78	10,646.95
Bank of Baroda	8,818.69	-2,797.51	-442.46	-9,072.81	-22,833.88	9,346.54	17,318.73	-337.31
Bank of India	14,895.95	-5,854.14	5,236.13	-15,074.09	-13,018.22	2,600.87	6,303.82	4,909.70
Bank of Maharashtra	6,331.62	-124.87	-3,777.45	-3,172.16	-6,520.61	-6,775.29	5,112.78	8,925.98
Canara Bank	11,434.45	561.69	7,751.16	-10,841.94	-18,370.40	10,480.77	-12,184.63	11,168.92
Central Bank of India	14,969.79	-1,924.52	-3,492.42	5,104.69	-15,136.43	-15,643.48	2,805.95	13,369.06
Corporation Bank	9,416.78	386.84	5,361.79	-3,385.79	-5,270.28	7,337.42	-5,537.52	-8,309.24
Dena Bank	4,101.11	286.20	-1,853.57	-1,120.41	-3,125.58	-11,581.89	4,253.61	9,040.54
Indian Overseas Bank	8,068.14	-2,769.44	-1,481.33	-7,384.39	-7,247.30	-14,572.07	10,311.52	16,337.34
IDBI Bank Ltd.	5,195.85	-5,408.43	-13,559.41	-10,839.04	-38,320.17	8,924.54	15,053.00	39,189.25
Indian Bank	5,345.26	517.36	1,062.96	-4,021.31	-6,541.83	-360.23	7,359.70	-3,293.18
Oriental Bank of Commerce	12,393.18	356.35	-1,962.09	-12,338.21	-24,836.49	954.27	11,067.89	14,929.13
Punjab and Sind Bank	187.85	-341.77	-464.40	-83.33	-6,066.78	885.17	2,499.13	3,384.12
Punjab National Bank	16,928.84	374.16	-3,024.17	-9,326.45	-6,636.60	-12,544.22	29,294.78	-14,690.88
State Bank of Travancore	2,141.48	3,857.66	548.95	-146.75	-1,328.66	-4,635.12	3,508.29	9,123.08
State Bank of Bikaner and Jaipur	2,760.64	-124.42	-3,103.95	-1,044.87	-4,936.29	5,874.92	-156.94	730.90
State Bank of Hyderabad	12,431.56	-1,280.70	-1,638.01	-2,810.30	-5,541.18	3,222.71	8,210.92	-12,799.37
State Bank of India	85,876.77	-13,151.45	-9,865.03	-19,487.67	-81,564.35	96,671.73	12,007.00	-70,487.01
State Bank of Indore	2,143.08	-540.12	-798.03	-2,085.66	-2,141.74	2,667.85	3,529.89	-2,775.01
State Bank of Mysore	1,665.72	-429.62	-1,622.85	-830.04	-1,609.33	4,916.77	-903.41	-1,187.24
State Bank of Patiala	5,728.63	-899.34	-1,509.15	-6,954.63	-4,776.28	-9,055.44	7,965.94	9,426.02
Syndicate Bank	10,683.31	439.84	-5,731.63	-8,894.33	-18,375.58	-1,150.17	10,045.79	12,982.75
UCO Bank	7,426.45	-1,540.21	-1,703.83	-4,591.87	-17,391.75	920.51	10,949.97	5,930.72
Union Bank of India	10,616.70	1,599.23	-2,590.31	-635.96	-11,681.74	12,464.78	8,021.75	-17,525.25
Vijaya Bank	4,808.05	-667.79	-3,134.15	-6,324.35	-13,913.37	2,678.28	5,650.98	10,902.81

(table title spanning all columns: Maturity Gap of Public Banks)

It was found that all the sample public sector banks had excess liquidity in the 1-14 days time bucket, especially so for the State Bank of India, which had an excess liquidity of Rs. 85,876.77 crores in the 1-14 days time bucket. Further, ten of the sample public sector banks had excess liquidity in the 15-28 days time bucket, and six of the sample public sector banks had excess liquidity in the 1-3 months time bucket. It was also found that all the sample public sector banks had liquidity deficiency in the 6-12 months time bucket, especially so for the State Bank of India, which had a liquidity deficiency of Rs. 81,564.35 crores in the 6-12 months time bucket. Further, it was found that nine of the sample public sector banks had liquidity deficiency in the 5+ years time bucket.

The table below shows the maturity gap position of the sample private sector banks in the different time buckets:

<div align="right">(Rs. In crores)</div>

Maturity Gap of Private Banks								
Bank	1 - 14 days	15 - 28 days	29 days to 3 months	3 - 6 months	6 -12 months	1 - 2 years	2 - 5 years	Over 5 years
Axis Bank	7,578.02	730.36	-9,958.96	-6,352.60	-12,757.94	4,121.18	14,510.61	2,129.32
Bank of Rajasthan	1,190.27	314.06	-1,003.36	-835.35	-1,192.70	89.12	1,471.14	-33.18
Catholic Syrian Bank	585.54	85.84	-447.57	-382.17	-536.08	40.90	642.85	10.69
City Union Bank	497.56	38.99	-626.68	-454.03	-675.02	151.45	963.76	103.97
Development Credit Bank	351.68	28.54	-388.49	-218.42	-480.44	124.99	613.27	-31.13
Dhanalakshmi Bank	415.91	41.72	-368.58	-285.45	-413.41	81.93	550.30	-22.41
Federal Bank	1,969.67	377.50	-2,287.13	-1,660.87	-2,537.93	1,087.50	3,851.64	-800.38
HDFC Bank	9,300.85	639.19	-12,581.18	-6,621.46	-12,995.12	5,653.51	18,447.69	-1,843.46
ICICI Bank	11,065.40	-2,276.90	-27,020.41	-4,031.10	-29,699.12	19,254.74	43,930.09	-11,222.70
IndusInd Bank	725.06	22.46	-2,005.62	-993.47	-2,185.99	618.15	2,979.54	839.86
ING Vysya Bank	938.60	38.16	-2,348.24	-839.94	-2,433.06	767.42	3,528.07	348.99
Jammu & Kashmir Bank	3,168.16	379.96	-2,381.84	-2,122.16	-3,000.37	551.61	3,434.22	-29.57
Karnataka Bank	795.23	320.00	-1,367.63	-929.00	-1,486.60	476.99	2,260.28	-69.27
Karur Vysya Bank	723.51	103.25	-1,108.13	-818.79	-1,204.75	332.85	1,772.42	199.64
Kotak Mahindra Bank	19.39	-133.74	-1,965.47	-178.77	-2,170.48	1,727.32	3,335.26	-633.52
Lakshmi Vilas Bank	463.92	-6.17	-616.79	-439.94	-641.70	144.75	869.73	226.20
Ratnakar Bank	331.02	39.10	-69.60	-85.87	-112.37	12.31	130.85	-245.43
South Indian Bank	1,123.58	191.16	-1,296.07	-1,108.70	-1,551.00	335.32	1,946.83	358.86
Tamilnad Mercantile Bank	507.40	84.51	-681.41	-539.49	-743.24	277.40	1,089.73	5.08
Yes Bank	691.71	-25.04	-1,672.42	-532.13	-2,083.29	843.25	2,554.19	223.73

It was found that all the sample private sector banks had excess liquidity in the 1-14 days time bucket, and that all except for four of the sample private sector banks had excess liquidity in the 15-28 days time bucket. Further, it was also found that all the sample private sector banks had liquidity deficiency in the 1-3 months time bucket, especially so for ICICI bank, the largest private sector bank, which had a liquidity deficiency of Rs. 27,020.41 crores in the 1-3 months time bucket. Further, it was found that ten of the sample private sector banks had liquidity deficiency in the 5+ years time bucket.

The table below shows the maturity gap position of the sample foreign banks in the different time buckets:

<div align="right">(Rs. In crores)</div>

Maturity Gap of Foreign Banks								
Bank	1 - 14 days	15 - 28 days	29 days to 3 months	3 - 6 months	6 -12 months	1 - 2 years	2 - 5 years	Over 5 years
Bank of America	827.42	134.67	-416.06	518.19	-686.20	466.12	1,345.38	-2,189.52
Bank of Nova Scotia	-117.81	-111.46	-533.11	-168.22	-833.43	615.37	750.83	397.83
Barclays Bank	260.93	296.07	-854.83	290.25	-1,075.73	1,092.81	2,582.02	-2,591.52
Calyon Bank	40.09	38.18	-396.32	221.64	-830.72	652.69	619.09	-344.65
Citibank	7,779.05	-1,318.54	-9,068.26	5,901.38	-9,396.04	1,645.37	17,156.45	-12,699.41
DBS Bank	1,089.21	314.49	-617.15	22.54	-750.11	572.25	952.29	-1,583.52
Deutsche Bank	3,088.69	313.60	-1,318.87	273.44	-1,859.25	808.74	2,773.55	-4,079.89
Hong Kong & Shanghai Banking Corporation	5,712.68	-530.15	-7,650.04	7,087.35	-6,288.88	1,036.72	16,111.98	-15,479.67
Royal Bank of Scotland	1,182.10	-189.86	-2,457.48	-627.16	-3,130.62	1,850.01	3,162.92	210.09
Standard Chartered Bank	-1,147.02	-3,516.09	-10,890.41	12,545.32	-6,165.16	834.16	22,639.50	-14,300.30

It was found that all except for two of the sample foreign banks had excess liquidity in the 1-14 days time bucket, and that five of the sample foreign banks had excess liquidity in the 15-28 days time bucket. In particular, Bank of Nova Scotia and Standard Chartered Bank were found to have a severe short term liquidity deficiency.

The table below shows the maturity gap position of the sample public sector banks in the different time buckets as a percentage of outflows:

Maturity Gap as a % of Total Outflow of Public Banks								
Bank	1 - 14 days	15 - 28 days	29 days to 3 months	3 - 6 months	6 -12 months	1 - 2 years	2 - 5 years	Over 5 years
Allahabad Bank	186.99%	15.96%	1.74%	-33.79%	-63.36%	-40.34%	61.35%	79.18%
Andhra Bank	164.03%	-50.11%	-6.20%	-58.54%	-63.01%	-14.80%	550.56%	185.94%
Bank of Baroda	48.95%	-34.48%	-1.67%	-29.16%	-49.85%	24.43%	231.71%	-0.65%
Bank of India	63.66%	-46.87%	24.93%	-44.35%	-50.61%	9.77%	37.35%	7.46%
Bank of Maharashtra	272.58%	-9.16%	-61.72%	-50.21%	-66.24%	-26.27%	225.91%	177.71%
Canara Bank	62.56%	12.72%	61.95%	-45.51%	-43.52%	36.66%	-33.28%	20.99%
Central Bank of India	161.98%	-37.28%	-33.34%	91.83%	-67.11%	-27.17%	19.37%	60.14%
Corporation Bank	155.77%	17.58%	94.73%	-24.54%	-30.41%	86.64%	-35.71%	-46.38%
Dena Bank	196.67%	26.64%	-44.76%	-28.83%	-40.84%	-47.37%	342.21%	229.89%
Indian Overseas Bank	86.76%	-61.81%	-13.43%	-52.88%	-46.81%	-29.11%	407.72%	114.84%
IDBI Bank Ltd.	31.54%	-77.16%	-63.24%	-50.35%	-73.19%	31.72%	305.62%	191.63%
Indian Bank	130.44%	22.21%	16.54%	-39.20%	-39.13%	-1.39%	709.10%	-19.10%
Oriental Bank of Commerce	193.39%	8.59%	-21.04%	-59.54%	-73.51%	4.91%	349.15%	95.84%
Punjab and Sind Bank	5.14%	-22.53%	-7.82%	-2.13%	-68.98%	13.39%	116.62%	38.41%
Punjab National Bank	140.24%	5.93%	-20.58%	-40.20%	-22.95%	-14.24%	900.12%	-20.87%
State Bank of Travancore	239.13%	184.11%	14.87%	-2.04%	-14.55%	-47.92%	31.85%	213.15%
State Bank of Bikaner and Jaipur	141.05%	-11.06%	-68.28%	-24.89%	-62.40%	44.30%	-3.16%	8.60%
State Bank of Hyderabad	368.75%	-62.19%	-36.18%	-37.15%	-69.37%	15.01%	933.39%	-44.69%
State Bank of India	84.87%	-43.04%	-14.14%	-26.65%	-75.67%	51.13%	10.94%	-24.84%
State Bank of Indore	187.56%	-67.86%	-28.79%	-58.24%	-48.99%	26.79%	1245.57%	-27.29%
State Bank of Mysore	92.15%	-50.81%	-36.70%	-24.23%	-26.96%	54.63%	-16.34%	-12.48%
State Bank of Patiala	166.98%	-45.73%	-22.15%	-42.57%	-33.97%	-43.36%	1101.34%	192.33%
Syndicate Bank	100.60%	13.30%	-49.61%	-53.32%	-63.15%	-3.24%	279.73%	65.11%
UCO Bank	116.56%	-40.92%	-17.33%	-32.37%	-53.59%	7.11%	334.65%	20.34%
Union Bank of India	120.07%	56.71%	-20.51%	-4.40%	-37.94%	50.11%	108.79%	-29.43%
Vijaya Bank	137.60%	-30.93%	-46.95%	-66.14%	-78.84%	15.51%	585.91%	236.68%

It was found that all the sample public sector banks had excess liquidity in the 1-14 days time bucket. It was also found that fourteen of the sample public sector banks had liquidity deficiency in excess of 20% of total outflows in the 15-28 days time bucket. As per the RBI guidelines, the mismatch during the 1-14 days and 15-28 days time buckets should not in any case exceed 20% of the cash outflows in each time bucket. However, as they had a huge surplus (in excess of 100% of total outflows for eighteen of the sample public sector banks) in the previous time bucket, they may have a higher tolerance level in the 15-28 days time bucket.

Further, it was found that fourteen of the sample public sector banks had liquidity deficiency in excess of 20% of total outflows in the 1-3 months time bucket, and that all except for four of the sample public sector banks had liquidity deficiency in excess of 20% of total outflows in the 3-6 months time bucket.

The table below shows the maturity gap position of the sample private sector banks in the different time buckets as a percentage of outflows:

Maturity Gap as a % of Total Outflow of Private Banks								
Bank	1 - 14 days	15 - 28 days	29 days to 3 months	3 - 6 months	6 -12 months	1 - 2 years	2 - 5 years	Over 5 years
Axis Bank	61.89%	11.14%	-49.41%	-32.37%	-51.36%	21.16%	488.89%	5.08%
Bank of Rajasthan	91.89%	44.38%	-43.12%	-35.12%	-45.31%	3.59%	415.78%	-0.66%
Catholic Syrian Bank	109.93%	30.04%	-47.03%	-38.90%	-49.05%	3.97%	449.86%	0.53%
City Union Bank	72.40%	10.64%	-51.13%	-35.77%	-47.73%	11.37%	525.78%	3.75%
Development Credit Bank	75.73%	11.30%	-49.54%	-28.43%	-51.28%	16.23%	522.29%	-1.67%
Dhanalakshmi Bank	99.62%	18.65%	-49.44%	-37.06%	-48.23%	10.15%	491.95%	-1.31%
Federal Bank	69.55%	24.74%	-45.90%	-32.73%	-43.88%	20.68%	515.02%	-6.27%
HDFC Bank	65.22%	7.79%	-50.36%	-27.58%	-46.47%	23.60%	471.58%	-3.29%
ICICI Bank	34.82%	-11.84%	-52.42%	-9.18%	-49.89%	49.16%	531.53%	-8.88%
IndusInd Bank	32.53%	1.79%	-52.26%	-26.81%	-49.48%	16.73%	504.51%	10.58%
ING Vysya Bank	36.32%	2.54%	-52.25%	-19.72%	-48.35%	18.26%	498.88%	3.85%
Jammu & Kashmir Bank	109.80%	25.05%	-47.50%	-41.15%	-50.32%	10.28%	465.04%	-0.27%
Karnataka Bank	46.62%	35.10%	-44.94%	-29.51%	-42.39%	14.44%	496.01%	-1.02%
Karur Vysya Bank	57.48%	15.53%	-49.57%	-35.20%	-46.27%	13.61%	534.00%	3.84%
Kotak Mahindra Bank	0.79%	-9.02%	-50.34%	-5.48%	-47.25%	60.75%	535.04%	-6.64%
Lakshmi Vilas Bank	73.39%	-1.79%	-54.51%	-38.09%	-49.94%	12.04%	506.15%	9.42%
Ratnakar Bank	302.44%	66.97%	-35.66%	-42.48%	-49.88%	5.80%	448.34%	-36.23%
South Indian Bank	72.07%	23.37%	-47.63%	-39.43%	-48.05%	11.42%	485.86%	6.08%
Tamilnad Mercantile Bank	63.51%	20.07%	-48.11%	-36.61%	-44.94%	17.90%	519.07%	0.15%
Yes Bank	34.62%	-2.23%	-52.08%	-18.12%	-53.02%	30.46%	525.33%	3.47%

It was found that all the sample private sector banks had excess liquidity in the 1-14 days time bucket, and that none of the sample private sector banks had liquidity deficiency in excess of 20% of total outflows in the 15-28 days time bucket. However, it was found that all of the sample private sector banks had liquidity deficiency in excess of 20% of total outflows in the 1-3 months time bucket.

The table below shows the maturity gap position of the sample foreign banks in the different time buckets as a percentage of outflows:

Maturity Gap as a % of Total Outflow of Foreign Banks								
Bank	1 - 14 days	15 - 28 days	29 days to 3 months	3 - 6 months	6 -12 months	1 - 2 years	2 - 5 years	Over 5 years
Bank of America	111.72%	30.74%	-36.94%	56.44%	-49.19%	60.54%	765.13%	-51.14%
Bank of Nova Scotia	-16.04%	-27.55%	-53.98%	-22.07%	-58.49%	107.36%	531.12%	20.22%
Barclays Bank	18.09%	37.14%	-36.48%	13.23%	-37.54%	51.75%	733.66%	-30.16%
Calyon Bank	5.01%	7.98%	-39.38%	36.25%	-57.08%	225.42%	403.20%	-18.93%
Citibank	86.55%	-21.64%	-59.33%	49.33%	-60.49%	16.45%	641.46%	-36.53%
DBS Bank	99.66%	43.08%	-33.88%	1.59%	-39.37%	48.88%	302.23%	-38.51%
Deutsche Bank	162.25%	27.64%	-42.30%	10.03%	-51.54%	32.43%	559.99%	-43.06%
Hong Kong & Shanghai Banking Corporation	77.88%	-10.08%	-56.58%	65.38%	-51.40%	10.91%	653.61%	-46.24%
Royal Bank of Scotland	37.75%	-9.90%	-51.27%	-16.64%	-54.34%	60.62%	410.71%	2.36%
Standard Chartered Bank	-15.28%	-57.20%	-73.57%	116.04%	-55.88%	9.45%	769.75%	-40.37%

It was found that none of the sample foreign banks had liquidity deficiency in excess of 20% in the 1-14 days time bucket, and that three of the sample foreign banks had liquidity deficiency in excess of 20% in 15-28 days time bucket. However, it was found that all of the sample foreign banks had liquidity deficiency in excess of 20% of total outflows in the 1-3 months time bucket. Also, it was found that all the sample foreign banks had very high excess liquidity in the 2-5 years time bucket. The table below shows the cumulative maturity gap position of the sample public sector banks in the different time buckets:

(Rs. In crores)

Cummualtive Maturity Gap of Public Banks							
Bank	1 - 14 days	15 - 28 days	29 days to 3 months	3 - 6 months	6 -12 months	1 - 2 years	2 - 5 years	Over 5 years
Allahabad Bank	9,985.83	10,332.14	10,424.58	6,800.91	-2,202.97	-17,057.25	-12,878.45	0.00
Andhra Bank	3,783.96	2,720.10	2,321.78	-4,250.37	-13,388.08	-17,094.71	-10,646.93	0.00
Bank of Baroda	8,818.69	6,021.18	5,578.72	-3,494.09	-26,327.97	-16,981.43	337.30	0.00
Bank of India	14,895.95	9,041.81	14,277.94	-796.15	-13,814.37	-11,213.50	-4,909.68	0.00
Bank of Maharashtra	6,331.62	6,206.75	2,429.30	-742.86	-7,263.48	-14,038.76	-8,925.98	0.00
Canara Bank	11,434.45	11,996.14	19,747.30	8,905.36	-9,465.04	1,015.73	-11,168.90	0.00
Central Bank of India	14,969.79	13,045.27	9,552.86	14,657.55	-478.88	-16,122.36	-13,316.42	0.00
Corporation Bank	9,416.78	9,803.62	15,165.41	11,779.62	6,509.34	13,846.76	8,309.24	0.00
Dena Bank	4,101.11	4,387.31	2,533.73	1,413.32	-1,712.26	-13,294.15	-9,040.54	0.00
Indian Overseas Bank	8,068.14	5,298.71	3,817.38	-3,567.01	-10,814.31	-25,386.38	-15,074.86	0.00
IDBI Bank Ltd.	5,195.85	-212.58	-13,771.99	-24,611.03	-62,931.20	-54,006.66	-38,953.66	0.00
Indian Bank	5,345.26	5,862.63	6,925.59	2,904.28	-3,637.55	-3,997.78	3,361.91	0.00
Oriental Bank of Commerce	12,393.18	12,749.54	10,787.45	-1,550.76	-26,387.24	-25,432.97	-14,365.08	0.00
Punjab and Sind Bank	187.85	-153.92	-618.31	-701.64	-6,768.43	-5,883.25	-3,384.12	0.00
Punjab National Bank	16,928.84	17,303.00	14,278.83	4,952.38	-1,684.21	-14,228.44	15,066.35	0.00
State Bank of Travancore	2,141.48	3,999.13	2,548.09	-598.66	-1,927.32	-6,562.45	-3,122.16	0.00
State Bank of Bikaner and Jaipur	2,760.64	2,636.22	-467.73	-1,512.60	-6,448.88	-573.96	-730.90	0.00
State Bank of Hyderabad	12,431.56	11,150.87	9,512.86	6,702.55	1,161.37	4,384.09	12,595.01	0.00
State Bank of India	85,876.77	72,725.31	62,860.29	43,372.61	-38,191.73	58,480.00	70,487.00	0.00
State Bank of Indore	2,143.08	1,602.96	804.93	-1,280.74	-3,422.47	-754.63	2,775.26	0.00
State Bank of Mysore	1,665.72	1,236.10	-386.75	-1,216.79	-2,826.13	2,090.65	1,187.24	0.00
State Bank of Patiala	5,728.63	4,829.29	3,320.14	-3,634.48	-8,410.76	-17,466.20	-9,500.26	0.00
Syndicate Bank	10,683.31	11,123.15	5,391.52	-3,502.81	-21,878.39	-23,028.56	-12,982.77	0.00
UCO Bank	7,426.45	5,886.24	4,182.41	-409.46	-17,801.21	-16,880.69	-5,930.73	0.00
Union Bank of India	10,616.70	12,215.93	9,625.62	8,989.65	-2,692.08	9,772.70	17,794.45	0.00
Vijaya Bank	4,808.05	4,140.25	1,006.11	-5,318.25	-19,231.62	-16,553.34	-10,902.36	0.00

It was found that only two of the sample public sector banks, namely IDBI Bank and Punjab and Sind Bank, had severe liquidity deficiency starting from the 15-28 days time bucket. It was also found that two other sample public sector banks, namely State Bank of Bikaner and Jaipur and State Bank of Mysore, had liquidity deficiency starting from the 1-3 months time bucket. Further, it was found that ten of the sample public sector banks had excess liquidity until the 3-6 months time bucket, and that two of the sample public sector banks, namely Corporation Bank and State Bank of Hyderabad, had excess liquidity in all the time buckets.

The table below shows the cumulative maturity gap position of the sample private sector banks in the different time buckets:

<div style="text-align: right;">(Rs. In crores)</div>

Bank	1 - 14 days	15 - 28 days	29 days to 3 months	3 - 6 months	6 -12 months	1 - 2 years	2 - 5 years	Over 5 years
Axis Bank	7,578.02	8,308.39	-1,650.57	-8,003.17	-20,761.12	-16,639.93	-2,129.32	0.00
Bank of Rajasthan	1,190.27	1,504.33	500.97	-334.38	-1,527.07	-1,437.95	33.18	0.00
Catholic Syrian Bank	585.54	671.38	223.81	-158.36	-694.44	-653.54	-10.69	0.00
City Union Bank	497.56	536.55	-90.14	-544.16	-1,219.18	-1,067.73	-103.97	0.00
Development Credit Bank	351.68	380.23	-8.26	-226.69	-707.13	-582.14	31.13	0.00
Dhanalakshmi Bank	415.91	457.63	89.05	-196.40	-609.81	-527.88	22.41	0.00
Federal Bank	1,969.67	2,347.18	60.04	-1,600.83	-4,138.76	-3,051.26	800.38	0.00
HDFC Bank	9,300.85	9,940.04	-2,641.15	-9,262.61	-22,257.74	-16,604.22	1,843.46	0.00
ICICI Bank	11,065.40	8,788.50	-18,231.91	-22,263.01	-51,962.14	-32,707.40	11,222.70	0.00
IndusInd Bank	725.06	747.52	-1,258.11	-2,251.57	-4,437.56	-3,819.40	-839.86	0.00
ING Vysya Bank	938.60	976.76	-1,371.48	-2,211.42	-4,644.48	-3,877.06	-348.99	0.00
Jammu & Kashmir Bank	3,168.16	3,548.12	1,166.28	-955.88	-3,956.26	-3,404.65	29.57	0.00
Karnataka Bank	795.23	1,115.22	-252.41	-1,181.41	-2,668.00	-2,191.02	69.27	0.00
Karur Vysya Bank	723.51	826.75	-281.37	-1,100.16	-2,304.91	-1,972.06	-199.64	0.00
Kotak Mahindra Bank	19.39	-114.35	-2,079.82	-2,258.59	-4,429.06	-2,701.74	633.52	0.00
Lakshmi Vilas Bank	463.92	457.75	-159.04	-598.98	-1,240.69	-1,095.93	-226.20	0.00
Ratnakar Bank	331.02	370.12	300.51	214.65	102.27	114.59	245.43	0.00
South Indian Bank	1,123.58	1,314.75	18.68	-1,090.02	-2,641.02	-2,305.69	-358.86	0.00
Tamilnad Mercantile Bank	507.40	591.92	-89.49	-628.98	-1,372.22	-1,094.81	-5.08	0.00
Yes Bank	691.71	666.67	-1,005.75	-1,537.88	-3,621.17	-2,777.92	-223.73	0.00

Table title: Cummualtive Maturity Gap of Private Banks

It was found that only one of the sample private sector banks, namely Kotak Mahindra Bank, had severe liquidity deficiency starting from the 15-28 days time bucket. Apart from this bank, all other sample private sector banks had excess liquidity in the 1–28 days period wherein they are supposed to maintain a solid liquidity position as per the RBI guidelines. It was also found that eleven other sample private sector banks had liquidity deficiency starting from the 1-3 months time bucket. ICICI bank and HDFC bank, the major players in the private sector have liquidity deficiency starting from the 1-3 months time bucket till the 1–2 years time bucket. Further, it was found that one of the sample private sector banks, namely Ratnakar Bank, had excess liquidity in all the time buckets.

The table below shows the cumulative maturity gap position of the sample foreign banks in the different time buckets:

<div align="right">(Rs. In crores)</div>

Bank	1 - 14 days	15 - 28 days	29 days to 3 months	3 - 6 months	6 -12 months	1 - 2 years	2 - 5 years	Over 5 years
Cummualtive Maturity Gap of Foreign Banks								
Bank of America	827.42	962.10	546.03	1,064.22	378.02	844.14	2,189.52	0.00
Bank of Nova Scotia	-117.81	-229.28	-762.38	-930.60	-1,764.03	-1,148.66	-397.83	0.00
Barclays Bank	260.93	557.00	-297.83	-7.58	-1,083.31	9.50	2,591.52	0.00
Calyon Bank	40.09	78.27	-318.05	-96.41	-927.13	-274.44	344.65	0.00
Citibank	7,779.05	6,460.51	-2,607.75	3,293.63	-6,102.41	-4,457.04	12,699.41	0.00
DBS Bank	1,089.21	1,403.70	786.55	809.09	58.98	631.23	1,583.52	0.00
Deutsche Bank	3,088.69	3,402.29	2,083.41	2,356.85	497.60	1,306.34	4,079.89	0.00
Hong Kong & Shanghai Banking Corporation	5,712.68	5,182.53	-2,467.51	4,619.85	-1,669.03	-632.31	15,479.67	0.00
Royal Bank of Scotland	1,182.10	992.23	-1,465.24	-2,092.40	-5,223.02	-3,373.01	-210.09	0.00
Standard Chartered Bank	-1,147.02	-4,663.11	-15,553.52	-3,008.20	-9,173.36	-8,339.20	14,300.30	0.00

It was found that two of the sample foreign banks, namely Bank of Nova Scotia and Standard and Chartered Bank, had severe liquidity deficiency starting from the 1-14 days time bucket itself. Apart from these two banks, the remaining sample foreign banks have a good short term liquidity position. It was also found that five other sample foreign banks had liquidity deficiency starting from the 1-3 months time bucket. Citibank and HSBC have huge amount of money invested in the 2–5 years bucket which earn them more yield. Further, it was found that three of the sample foreign banks, namely Bank of America, DBS Bank, and Deutsche Bank, had excess liquidity in all the time buckets.

Discussion

Asset-Liability Management has evolved as a vital activity of all financial institutions and to some extent other industries too. It has become the prime focus in the banking industry, with every bank trying to maximize yield and reduce their risk exposure. The Reserve Bank of India has issued guidelines to banks operating in the Indian environment to regulate their asset-liability positions in order to maintain stability of the financial system.

Maturity-gap analysis has a wide range of focus, not only as a situation analysis tool, but also as a planning tool. Banks need to maintain the maturity gap as low as possible in order to avoid any liquidity exposure. This would necessarily mean that the outflows in different maturity buckets need to be funded from the inflows in the same bucket. As per the RBI's guidelines, banks have to maintain a stable liquidity position in the short term duration, including both 1-14 days and 15-28 days time buckets, to ensure the stability and credibility of the banking system of the country.

The results of the study suggest that, overall, public sector banks had a better short-term liquidity position than the private sector banks and foreign banks.

Overall, the public sector banks were very conservative in their liquidity risk management. With the opening of banking domain to global players in Indian environment and increasing penetration of private sector banks, such a high short-term liquidity would be adverse for the public sector banks in terms of profitability, since the yield in this maturity bucket is lower than the yield in higher period maturity buckets, while the cost of the funds invested in the shorter period maturity buckets are higher, as they are sourced from higher period maturity buckets. There is great scope for the

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public sector banks to improve their profitability by reducing their short-term liquidity. Dash and Pathak (2011) have shown this scope using a linear programming model for asset-liability management.

Overall, the private sector banks also had a comfortable short-term liquidity position. They have managed their short-term liquidity better than the public sector banks. This could be a major factor contributing to the higher overall profitability of the private sector banks. Dash and Pathak's (2011) model can also be applied to further improve the profitability and liquidity of the private sector banks.

Overall, the foreign banks did not have a comfortable liquidity position. The foreign banks have primarily focused on corporate lending, with a tenure range of 1-5 years. However, they have slowly started tapping the opportunities in retail banking and slowly moving towards it. Again, there is great scope for improvement in profitability and liquidity for the foreign banks.

There are some limitations inherent in the present study. The actual maturity profiles of some of the balance sheet items were not available from the secondary sources. These balance sheet items were distributed in a pre-determined proportion for all the banks, based on overall demand patterns, as expressed by RBI. Also, the sample size was relatively small, and contained only ten foreign banks. In particular, some of the foreign and private banks are yet to scale up its retail banking division, and hence the comparison with public banks is problematic.

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