CHAPTER-II

REVIEW OF LITERATURE AND RESEARCH DESIGN

The growing importance of ALM to the banks has attracted the attention of many researchers. Researchers have studied the concept, significance, scope, componential base etc. of ALM. Before the objectives of the study were formulated, a review of existing available literature was done. The review of Literature showed that a lot of work has been done in the area of ALM. In order to make the analysis easier, the review of literature has been divided into two sections. Section I deals with articles, research papers, references of doctoral dissertations which have the phrase ‘Asset-Liability Management’ in their titles. Section II deals with articles, research papers, references of doctoral dissertations which form the componential base of Asset Liability Management in banks. The ensuing paragraphs give a year-wise account of the studies reviewed.

SECTION I: dealing with articles, research papers, references of doctoral dissertations which have the phrase ‘Asset Liability Management’ in their titles.

Tektas, Arzu, Ozkan, Nur, Gunay and Gokhan (2005) have established that an efficient Asset-Liability Management requires maximizing banks' profit as well as controlling and lowering various risks. Furthermore, the study reveals that this multi-objective decision problem aims to reach goals such as maximization of liquidity, revenue, capital adequacy, and market share subject to compliance of financial and legal requirements and institutional policies. This paper models Asset and Liability Management (ALM) in order to show how different managerial strategies affect the financial wellbeing of banks during crisis. A goal programming model has been developed and applied to two medium-scale Turkish commercial banks with distinct risk-taking behaviour. This article
Review of Literature and Research Design

brought new evidence on the performance of emerging market banks with different managerial philosophies by comparing Asset Liability Management in crisis. The study has shown how shifts in market perceptions can create trouble during crisis, even if objective conditions have not changed. The study concludes that the proposed model can provide optimal forecasts of asset-liability components and banks' financial standing for different risk-taking strategies under various economic scenarios. This may facilitate the preparation of contingency plans and create a competitive advantage for bank decision makers.

Wolff (2005)\(^2\) has based his article "Banks split on where to locate ALM" on the survey of 71 banks in Europe and North America conducted by Sun Guard Bank Ware. The web based survey, which was conducted in June 2005, found that 45% of banks located ALM in treasury while 44% placed the function in the finance department. The survey also found out that (a) all banks have their CFO on the ALCO and 77% percent include treasurers. Less than two-thirds include line of business managers, and just 6% have CROs on the committee. (b) 80% of banks surveyed mentioned ALCO meeting monthly (c) In Europe, over 80% of banks run monthly re-pricing gap reports and over 70% do liquidity gap reporting on either monthly or quarterly basis. 60% of North American banks do re-pricing gap reporting on monthly or quarterly basis, and 20% do so monthly. Over 60% of North American banks do liquidity gap reporting either monthly or quarterly but 30% never run those reports at all. (d) Over 90% of North American banks do market (or economic) value reporting either on monthly or quarterly basis, while 20% of European banks never run those reports. (e) Duration of Equity reporting seems to be less wide-spread in Europe than North America. (f) More European banks hedge interest rate risk than their US Counter-parts. (g) More European banks use Complex Financial derivatives than US counterparts. The study also highlighted that :- In

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spite of other differences between them, North American and European banks have the same top concerns; regulatory compliance, correct modeling of bank products and communicating ALM results within their institutions. However, the Europeans placed a bigger emphasis on regulatory compliance, with 45 per cent of those respondents citing it as their top concern, compared to 16 percent of North American respondents. Europeans' biggest concern in this area is the International Financial Reporting Standards, while North Americans are focused on FAS 133 and SOX 404.

Kern, David Franklin (2004), in his doctoral dissertation titled "Asset Liability Management practices of community banks relative to large banks- Implications for the future viability of community banks", has identified the assets liability structural differences between large banks and community banks. The study has also addressed the definition used in community banking research and found that the definition used could change the statistical results and possibly the conclusions.

Rajan and Nallari (2004), in their paper-titled "Study of Asset Liability Management in Indian Banks-Canonical Correlation Analysis (Period 1992-1994)", have studied the Portfolio Matching Behaviour of all Scheduled Commercial banks in terms of nature and strengths of relationship between Assets and Liability. The study has also analyzed the impact of ownership over Asset Liability Management in banks. To assess the nature and strength of relationship between assets and liabilities, canonical correlation (Multivariate statistical technique) has been used. The study found that (1) Among all groups, SBI and Associates have best Asset-Liability maturity pattern. (2) All banks, other than foreign banks, can be called liability managed banks. (3) All banks have proportionate Net Worth and Fixed Assets (4) Private banks are aggressive in profit generation (5) Nationalized banks (including SBI and Associates) are excessively concerned about liquidity.
Vaidya and Shahi (2004), in their paper titled "Asset Liability Management in Indian Banks", have discussed that in the last couple of years, liquidity risk management has not posed a challenge due to surpluses of liquidity in the banking system. The reasons behind it have been (a) surplus liquidity parked with RBI. (b) phenomenal deposit growth. (c) negligible credit off-take. However, since the beginning of the fiscal year, 2004-05, the liquidity situation underwent a change as loan growth of scheduled commercial banks far exceeded their deposit growth leading to banks facing a higher liquidity risk. The study also discussed that liquidity risk has strong correlation with other risks such as interest rate risk and credit risk. The study concluded that Interest Rate Risk and Liquidity Risk are significant risks in a bank's balance sheet, which should be regularly monitored and managed. These two aspects should be a key input in a business planning process of a bank. Banks should make sure that increased balance sheet size must not result in excessive asset liability mismatch resulting in variability in earnings. There should be proper limit structures, which should be monitored by ALCO on a regular basis. The effectiveness of a bank's ALM system should be improved with a good Fund-Transfer Pricing system.

Rajwade (2002), in his paper titled "Issues in Asset Liability Management", is of the opinion that banks in India have not paid much attention to the topic of management of interest rate mainly because all interests rates were regulated by the central bank. The author has further said that as far as commercial banks are concerned, particularly the large public sector banks, the principal source of mismatch is their holdings of fixed income securities as part of their statutory liquidity requirements (SLR). The bulk of the liabilities of commercial banks are relatively short term, while the portfolio of fixed income securities, which forms a significant portion in their total assets, often has much longer duration of maturity. This
mismatch can lead to substantial losses on the fixed income portfolio when interest rates go up.

Finch (2001), discusses the subject in the study “Asset and Liability Management for Banks: A Lawyer’s Perspective”, and says that Risk management issues and the implications and implementation of the Basel Accord have made impact on banks concentrating the minds of the banking industry on these issues. She also assesses the implications and, from a legal standpoint, advises on how to apply the new skills which will be required. She also suggests various planning points which financial institutions should take into account in the preparation for the day when the Basel Accord takes effect.

Vij (2001), conducted a case study on Industrial Development Bank of India (IDBI) titled “Asset Liability Management in Banks and Financial Institutions: A Case Study of IDBI”. The study shows that IDBI has a comprehensive framework for managing and measuring risk in-house Asset Liability Committee (ALCO). The study also concluded that IDBI faced lower spread, its major cause was increase in cost of borrowing. Another highlighted point of the study was revealing of higher NPA’s of IDBI as compared to other Development Financial Institutions (DFI’s).

Sohani (1999), in his paper titled, “Asset Liability Management: Human Resource Issues and Contexts”, has developed an infrastructural framework of internal governance for Asset Liability Management, acronym to the framework is – PICRO (Policy, Information, Control and Audit, Review, Organization). Empirically, the author has studied structural liquidity and interest rate sensitivity of 3 banks. The study revealed that all banks have intentionally taken short term exposures to industry and liabilities are skewed towards the shorter end. An analysis of interest rates sensitivity showed that the banks were lending long and borrowing short and all the 3 banks had a mismatch in assets and liabilities. While
conducting his study, the author observed that banks are yet to undertake duration analysis and value at risk analysis for the purpose of Asset Liability Management. Also that the software developed for generation of required data from fully computerized branches is yet not in place.

Sood (1999)\textsuperscript{10}, in his paper titled, "Asset Liability Management; Challenges in implementation", has discussed some generic issues of relevance in managing risks in India where the market driven financial system has just evolved. The author observed that banks have invested a large share of their resources in government securities because of which banks are expected to bear high interest rate risk. The paper concluded that management of interest rate risk is different in a country like India, in comparison with countries that have more liquid and competitive financial markets. The author suggested that the Indian Banking system must understand the risk-return profile of the customer and choose a customer-mix that best suits the bank’s own risk-return profile. Further, the government must make a conscious effort to allow the market forces to determine the portfolio-mix and prices of financial assets in the economy.

Datar (1999)\textsuperscript{11}, in his paper titled, “Asset liability management in development financial institutions : the tasks ahead”, is of the view that in the past, risks were simple and limited. Government ownership of most of the banks and development financial institutions (DFI’s) and market sharing arrangement that prevailed till recently, helped to have similar risk preference and polices across organizations. But, in present time, it would be difficult to have similar arrangement as risks have increased and competition has become intense. The paper concludes that it had become necessary for DFI’s to evolve a distinct risk preference through organizational restructuring. Unless this is achieved, ALM may remain an isolated and peripheral exercise.
Sundararjan (1999), in his paper titled, “Key factors for successful approach to asset—liability management”, seemed to be among the growing group of asset-liability management advocates who favour eternal vigilance. He has taken a view that rather than diffusing efforts and resources on various tactical aspects of asset liability management, a simpler approach may nearly be effective in terms of net interest margin, comprising of three critical factors i.e. cost of deposits, level of non-performing assets and return on investments. The author suggested that the investment portfolio ought to have a judicious mix of short or medium term and long term securities, this mix will yield – a portfolio that will be relatively immune to (a) interest rate risk, (b) greater liquidity, and (c) greater flexibility ensuring higher future reinvestment rate.

Louis (1998), in his paper titled, “Commercial banks as Multi product firms : Relevance of Asset Liability Management in banks : A Theoretical model and Empirical Results” – is of the opinion that banks can be viewed as firms producing various outputs like loans, advances, investments etc. after utilizing inputs like deposits, borrowings, etc. As commercial organisation they would certainly like to maximize their profits to the extent possible. Given the regulatory and administrative constraints under which banks operate, Asset Liability Management is one of the managerial processes used that focuses on profitability factor. The author used a theoretical model of a bank as a multi product firm that derives the imputed values of various balance sheet items and profit parameters to make comparison between the studies conducted in 1985 and 1994-95. The study has indicated how an enlarged version of the model could be useful in gap analysis and other related concerns of Asset Liability Management.

Das (1996), in his paper titled, “Structural Changes and Asset Liability Management Mismatch of Scheduled Commercial Banks in India”, has identified and explored the relationships and structural changes
including hedging behaviour, between assets and liabilities of all scheduled commercial banks in India. The study found that public and private banks have shown systematic changes in the balance sheet proportions during the 4 years of financial sector reforms beginning with 1991 and in respect of asset liability mismatch, balance sheet behaviour in 1991 as well as in 1995, have shown no significance whereas foreign banks have shown some significance in hedging pattern between assets and liabilities in post liberalization period.

Simons (1995)\textsuperscript{15}, in his study titled, "Interest Rate Derivatives and Asset-Liability Management by Commercial Banks", used quarterly Call Report data to shed some light on the pattern of derivatives used by U.S. commercial banks to manage interest rate risk. It found that among banks with assets of less than $5 billion, larger banks tend to use interest rate swaps more intensively, while no clear relationship was found between size of bank and other interest rate derivatives. In addition, the study found that for banks with more than $5 billion in assets, those with weaker asset quality tended to be more intensive users of derivatives than banks with better asset quality. However, the author pointed out that these results, while intriguing, did not give a clear indication of how derivatives were used to manage interest rate risk, or whether they were used to increase or reduce that risk.

Fakiyesi (1988)\textsuperscript{16}, in his paper titled, "Asset and Liability Management of Commercial banking firms in the process of Monetary and financial policy making in Nigeria", has made an attempt to study the totality of the effects of portfolio management activities of the banking firms on the process of macro policy. The study observed that interest rates generally play no role in explaining the portfolio holdings of commercial banks in their choice of portfolios among the (a) non-interest earning deposits (b) interest earning deposit measures (c) net foreign assets (d) net other assets sector
borrowings and required reserves. Banks have been found more willing to allocate funds at their disposal to more liquid portfolios.

SECTION II dealing with articles, research papers, references of doctoral dissertations which form the componentual base of Asset liability management in banks.

Alcantare (2008) develops an integrated model for optimal asset allocation in commercial banks that incorporates uncertain liquidity constraints that are currently ignored by RAROC and EVA models. While the economic profit accounts for the opportunity cost of risky assets; it may even incorporate a market liquidity premium but it neglects the risk of failure due to the lack of sufficient funds to cope with unexpected cash demands arising from bank runs, drawdowns, or market, credit and operational losses, what may happen along with credit rationing episodes or systemic level dry ups. Given a liquidity Pf by constraint that can incorporate these factors, there is a failure probability Pf that the constraint will not take place resulting in a value loss for the bank, represented by a stochastic failure loss Lf. By assuming that bankers are risk neutral in their decision about the size of the liquidity cushion, the economic profit less the possible losses due to the lack of liquidity is optimized, resulting in a short –term asset allocation model that integrates market, credit and operational risks in the liquidity management of banks. Even though a general approach is suggested through simulation, (author) provides a closed form solution for Pf under some simplifying assumptions, that may be useful for research and supervision purposes an as indicator of the liquidity management adequacy in the banking system. The author also suggests an extreme value theory approach for the estimation of Lf, departing from other liquidity management models that use a penalty rate over the demand of cash that exceeds the availability of liquid resources. The model was applied to Brazilian banks data, resulting in gains over the optimization, without liquidity considerations that are robust under several tests, giving empirical
indications that the model may have a relevant impact on the value creation in banks.

**Gatev and Strahan (2008)**\(^{18}\) offer a new explanation of loan syndicate structure based on banks' comparative advantage in managing systematic liquidity risk. When a syndicated loan to “A rated borrower” has systematic liquidity risk, the fraction of passive participant lenders that are banks is about 8% higher than for loans without liquidity risk. In contrast, liquidity risk exposure, then, found further evidence that syndicate participants specialise in liquidity–risk management while lead banks manage lending relationships. Links from transactions deposits to liquidity exposure are about 50% large - at participant banks than at lead arrangers.

**Al-Tamimi, Al-Mazrooei and Mohammed (2007)**\(^{19}\) examine the degree to which the UAE banks use risk management practices and techniques in dealing with different types of risk. The secondary objective was to compare risk management practices between the two sets of banks. The authors developed a modified questionnaire, divided into two parts. The first part covering six aspects; understanding risk and risk management; risk identification; risk assessment and analysis; risk monitoring; risk management practices; and credit risk analysis. This part includes 43 close ended questions based on an interval scale. The second part consisting of two close ended questions based on an ordinal scale dealing with two topics: methods of risk identification and risk facing the sample banks. This study found that the three most important types of risk facing the UAE commercial banks are foreign exchange risk, followed by credit risk, then operating risk. It was also found that the UAE banks are somewhat efficient in managing risk and risk identification; risk assessment and analysis are the most influencing variables in risk management practices. Finally, the result indicated that there is a significant difference between the UAE national and foreign banks in the practice of risk assessment and analysis, and in risk monitoring and controlling.
Altunbas, Carbo, Gardener and Molyneux (2007) analyse the relationship between capital, risk and efficiency for a large sample of European banks between 1992 and 2000. In contrast to the established US evidence, the study did not find a positive relationship between inefficiency and bank risk-taking. Inefficient European banks appear to hold more capital and take on less risk. Empirical evidence is found showing the positive relationship between risk on the level of capital (and liquidity), possibly indicating regulator’s preference for capital as a means of restricting risk-taking activities. The authors also found evidence that the financial strength of the corporate sector has a positive influence in reducing bank risk-taking and capital levels. There are no major differences in the relationships between capital, risk and efficiency for commercial and savings banks although they are there for co-operative banks. In the case of co-operative banks, the authors did find that capital levels are inversely related to risk and also that inefficient banks hold lower levels of capital. Some of these relationships also vary depending on whether banks are among the most or least efficient operators.

Caner, Ozyildirim and Ungan (2007) test for the existence of market discipline of banks by different types of shareholders. Shareholder discipline manifests itself in the form of monitoring the riskiness of banks as well as influencing the management actions of the banks to limit risk-taking. Shareholders utilize different types of risk measures to monitor bank risk taking. Shareholders influence bank management to improve capital adequacy and loan quality when they observe increasing riskiness. Owner-managers or large shareholders demonstrate significant influence on bank management. They also found that the influence on management in small banks by shareholders is more pronounced.

Lucchetta (2007) empirically tests linkage between banks’ investment and inter bank lending decisions in response to interest rate changes. The author draws conclusions for the monetary policy, which uses
the interest rate as its main tool. Across European countries, the author found that the risk-free (i.e. monetary policy) interest rate negatively affects the liquidity retained by banks and the decision of a bank to be a lender in the interbank market. Instead, the interbank interest rate has a positive impact on these decision. The author found that banks who lend show less risk-taking behaviour and tend to be smaller than those who are borrowers. Most importantly, the risk-free interest rate is positively correlated with loans investment and bank risk-taking behaviour.

Matejasak and Teply (2007) are of the view that, in recent years, regulators have increased their focus on the capital adequacy of banking institutions to enhance their stability, hence the stability of the whole financial system. The purpose of this paper is to assess and compare how American and European banks adjust their level of capital and portfolio risk under capital regulation whether and how they react to constraints placed by the regulators. In order to do this, authors estimated a modified version of the simultaneous equations model developed by Shrieves and Dahal. This model analyzes adjustments in capital and risk at banks when they approach the minimum, regulatory capital level. The results indicate that regulatory requirements have the desired effect on bank behaviour. Both American and European banks that are close to minimum requirements simultaneously increase their capital. In addition, the US banks decrease their portfolio risk taking.

Ratnovski (2007), in his paper titled, “Liquidity and Transparency in Bank Risk Management”, has studied the roles of liquidity and transparency in banks’ liquidity risk management. The study showed that investing in both is important, yet banks private choices may be distorted by leverage. Policy response is complicated by the fact that transparency is not verifiable, making the design of optimal reserve requirements a multi-tasking problem. The study also mentioned that in particular, there is a danger that reserve requirements compromise bank’s endogenous
transparency incentives. Initiatives to improve transparency may have prime importance in the regulatory efforts to control and mitigate the liquidity risks.

**Gatev, Strahan and Philip (2006)**, in their paper “Banks’ Advantage in Hedging Liquidity Risk: Theory and Evidence from the Commercial Paper Market”, are of the view that banks have a unique ability to hedge against market-wide liquidity shocks. Deposit inflows provide funding for loan demand shocks that follow declines in market liquidity. Consequently, banks can insure firms against systematic declines in liquidity at lower cost than other institutions. In their study, they have provided evidence that when liquidity dries up and commercial paper spreads widen, banks experience funding inflows. These flows allow banks to meet loan demand from borrowers drawing funds from commercial paper backup lines without running down their holdings of liquid assets. They have also provided evidence that implicit government support for banks during crisis explains these funding flows.

**Gatev and Schuemann (2006)**, in their paper titled “Managing Bank Liquidity Risk: How Deposit Loan Synergies Vary with Market Conditions”, mentioned that earlier studies have attributed liquidity risk to transactions deposits and their potential to spark runs or panics. The study found, instead, that transactions deposits help bankers hedge liquidity risk from unused loan commitments. Also, Bank stock return volatility increases with unused commitments, but the increase was smaller for banks with high levels of transaction deposits. This “deposit lending risk management synergy” becomes more powerful during periods of tight liquidity, when, nervous investors move funds into their banks. The results reversed the standard notion of liquidity risk at banks, where runs from depositors have been seen as the cause of trouble.
Haselmann and Wachtel (2006)\textsuperscript{27} relate various measures of bank risk – solvency, liquidity, default probability and credit risk among others – to the size, location, ownership, institutional settings and management characteristics of banks. Their findings are summarised by the following three points: Certain groups of banks differ in their riskiness; e.g. foreign, EU and large banks show a lower probability of default compared to their competitors. Nevertheless, these differences are not large and generally not statistically significant. This suggests that banking markets are relatively homogeneous and no clear groups of banks with excessive risk taking could be identified. The author found no clear relationship between banks’ risk taking and their institutional environment (with banks’ access to a credit registry being an exception). Their findings do, however, suggest that banks that operate in an unsound institutional environment respond to their situation by holding more capital and taking less credit risk. Banks that take on more risk also actively manage their risk by, for example, establishing a risk management department or obtaining information on borrowers’ history. Such banks also tend to hold more capital. Overall, they found that no group of banks is subject to excessive risk taking and that those banks that take on risk also take on a higher share of capital and undertake active risk management. Thus the study concluded that the transition banks in our sample seem to basically operate and manage risk as banks in other developed markets do.

Jeitshko and Jeung (2006)\textsuperscript{28} are of the view that the relationship between banks’ capitalisations and risk-taking behaviours has been one of the central issues in the banking literature because of its implication on regulatory policies, despite the fact that a considerable amount of studies have been conducted concerning the issue; neither empirical nor theoretical studies reach a consensus. The aim of this paper was to provide an empirical study on this issue on the basis of new hypotheses and methodologies not utilised in previous studies. The authors build a testing
model that incorporates the different incentives of the three entities that affect the risk determination of a bank, namely regulatory agencies, shareholders, and management. The test results using data from the Korean banking system show apparent differences in risk–capitalisation relationships across banks differentiated by the level of capitalisation and across publicly and non publicly traded banks. These results provide clear evidence that the risk capitalisation relationships are, indeed sensitive to the relative forces of the three sources of influence in determining asset risk.

Lockhart (2006) uses market microstructure estimates of information asymmetry to gain insights regarding the market’s beliefs about the interest rate risk management at U.S. commercial banks during 1995-2003. His findings suggest that banks which use derivatives and are listed on either the NYSE or AMEX are perceived to be using derivatives to hedge their interest rate exposure. However, for NASDAQ listed commercial banks, the market believes no hedging is achieved. Indeed, some evidence of the NASDAQ banks, suggest that the market believes interest rate exposures are actually increased with derivatives. The estimated response of the market maker to this exposure is small, thus the argument for increased disclosure is probably misguided. However, market beliefs regarding not only the management of interest rate risk, but also the effective use of derivatives in general, is nonetheless interesting if such beliefs have implications for the external cost of finance and even firm output prices.

Purnanandam (2006) analyze the effects of bank characteristics and macroeconomic shocks on the interest rate risk management behaviour of commercial banks. The findings are consistent with hedging theories based on cost of financial distress and costly external financing. Banks with higher probability of financial distress manage their interest rate risk more aggressively, both by means of on-balance sheet and off-balance
sheet instruments. As compared to the derivative users, the derivative non-user banks adopt conservative asset-liability management policies in tighter monetary policy regimes. Finally, the author shows that the derivative non-user banks’ lending volume declines significantly with the contraction in money supply. Derivative users, on the other hand, remain immune to the monetary policy shocks. The findings suggest that a potential benefit of derivatives usage is to minimise the effect of external shocks on a firm’s operating policies.

Staikouras (2006) extends and updates the previous survey (Staikouras, 2003) by looking at other aspects of the financial institutions, yield sensitivity. The study starts with an extensive discussion of the origins of asset-liability management and the subsequently works to identify effective ways of measuring and managing interest rate risk. The discussion implicates both regulatory and market-based approaches along with any issues surrounding their applicability. The literature is enriched by recognising that structural and regulatory shifts affect financial institutions in different ways depending on the size and nature of their activities. It is also noted that such shifts could change the bank’s risk, and force banks to adjust their balance sheet size by altering their maturity intermediation function. Besides, yield changes and market cycles are also held responsible for asymmetric effects on corporate values. Furthermore, non-standard investigations are considered, where embedded option and basic risk are significant above and beyond the intermediary’s rate sensitivity, while shocks to the slope of the yield curve is identified as new variable. When the discount privilege is modeled as an option, it is shown that its value is incorporated in the equities, of qualifying banks. Finally, volatility clustering is further established while constant relative risk aversion is not present in the U.S market. Although some empirical findings may be quite mixed yet there is a general consensus that all forms of systematic risk, "risk premia", and the "risk-return" trade off do exhibit some form of
variability, not only over time but also across corporate sizes and segments.

**Toby (2006)**, in his paper titled, "Monetary Policy Targets and Bank Liquidity Management Practices in Nigeria: An Inter-Temporal", has studied liquidity management practices of Nigerian banks. The empirical work found that the liquidity management practices of Nigerian banks have been at variance with monetary policy targets both in times of "intense" deregulation (1991-92) and "guided" deregulation (1999-2000). The evidence confirmed that a reduction in the cash reserve requirement necessitated an increase in average bank liquidity and a paradoxical decline in aggregate credit to the economy. Short-term interest rates experienced wide swings in times of "intense" deregulation with banks relying on the volatile overnight funds market to ease off temporary shortfalls in liquidity. Moreover, interest rates moderated in times of "guided" deregulation with commercial banks playing a dominant role in the Certificate of Deposit (CD) and Commercial Paper (CP) markets. This meant that banks had to expand their liabilities portfolio at an extra cost of funds compensated by wider interest margins. However, the study also mentioned a need to pursue a consistent monetary policy environment to minimise the incidence of liquidity risk in the banking system.

**Lin, Pennm, Gong and Chang (2005)** in their study “Risk based – capital adequacy in assessing insolvency-risk and financial performances in Taiwan’s banking industry”, apply the index of insolvency-risk (IR) to the failure risk in Taiwan’s banking industry during 1993-2000, to explore the relationship between capital adequacy (CA) in assessing of IR and financial performance. Specifically, their work is to indicate the diverse effects before and after the revision of capital-adequacy regulation in Taiwan, that is, at the end of 1998. The empirical results show a positive relationship between the CA and the IR index, and a significantly positive relationship between the CA and various financial performances. Alternatively, it shows a significantly negative relationship between IR and financial performances.
This work provides sound and safe suggestions about risk management for all the stakeholders, government, baking and financial industry.

Akashdeep and Schaefer (2004)\textsuperscript{34}, in their paper titled “Are banks liquidity transformers”, have used an economic inductive measure of Liquidity transformation. It revealed that commercial banks in the United States performed a low level of Liquidity transformation. The paper also showed that the most important regulatory initiative for facilitating liquidity transformation, deposit insurance, had only limited impact: additional insured deposits largely replaced uninsured liabilities rather than expanding the deposit base of the bank or encouraging it to make more loans. Instead, credit risk had a substantial impact on crowding out liquidity risk from bank portfolios. The paper further suggested that the beneficial effect of risk based capital requirements might extend beyond merely keeping in check the adverse incentives created by deposit insurance. In contrast, the modest impact of deposit insurance calls for a re-evaluation of its efficacy.

Amadou sy (2005)\textsuperscript{35} measures and assesses the management of interest rate risk of banks’ government securities portfolios in India, which it identifies as a key risk for the banking system. In particular, it finds that the current aggregate level of Investment Fluctuation Reserve (IFR) in the banking system would be insufficient to compensate for market losses resulting from a one percentage point parallel shift in the yield curve. However, while some Public Sector Banks (PSBs) and old private banks are the most vulnerable, foreign and new private banks have built in an adequate cushion. As a result, a key priority for the Indian authorities will be to scrutinise the risk management practices of individual banks. Given the potential for interest shocks higher than the one percentage point increase studied in the paper, an accelerating convergence towards Basel I risk – weighted capital charges, and the adoption of the Basel II Pillar II approach for interest rate risk supervision, especially for the stability of the financial system. In addition, the merits of Basel II, Pillar III relative to enhanced
transparency on risk management should be considered rapidly. In this regard, the recent review by the Indian authorities of the recommendations of the advisory groups on international financial standards and codes, in particular those related to interest rate risk, is an encouraging step.

Ali (2004)\textsuperscript{36}, in his paper titled, “Islamic Modes of Finance and Associated Liquidity Risks”, has analysed the sources of liquidity risk using the categorization given by Jameson. The study identified the risk in the various modes of finance used by Islamic banks.

Fan and Shaffer (2004)\textsuperscript{37}, in their paper on “Efficiency versus Risk in Large Domestic US Banks”, study the profit efficiency of a sample of large U.S. commercial banks and explore how this performance varies with selected measures of bank risk, reflecting various aspects of credit risk, liquidity risk, and insolvency risk. They have used a standard profit function and the stochastic frontier approach, and compared the two standard functional forms - Cobb-Douglas and Translog - to assess the “trade-off” between precision and parsimony. They found that profit efficiency is sensitive to credit risk and insolvency risk but not to liquidity risk or to the mix of loan products.

Das and Ghosh (2004)\textsuperscript{38}, utilise several periods of cross-section data on commercial banks in a simultaneous equation framework to estimate the effect of changes in risk on changes in capital, and changes in capital upon changes in risk. The sample encompasses 27 public sector banks operating in India over the period 1995–96 through 2000-01. Empirical findings establish a negative and significant impact of size on capital, indicating that large banks increased their ratio of capital to risk weighted assets less than other banks. Regulatory pressure is also found to have a negative and significant impact on the ratio of capital to risk – weighted assets. Ceteris paribus, adequately capitalised banks decrease their capital ratio more prominently than other banks. The results establish
that risk exposure and capital levels are simultaneously related, and that the majority of banks mitigate the effects of increases in capital by decreasing asset risk posture, and vice versa. The results, however, do not necessarily imply that levels of bank capital are adequate from a public policy perspective.

Naji, Mahshid and Deniz (2004) have conducted a qualitative study where Authors interviewed appropriate staff members from the four savings banks. They found that the level of risk taking in savings banks varies between the different savings banks in the study, and the reason for savings banks having low interest rate risk is that they lack the resources and knowledge for managing higher interest rate risk efficiently. The level of interest rate risk taking is also affected by the fact that the savings banks act in a more limited and riskier markets, and have to balance the level of risk taking within the bank. They opined having no shareholders makes it possible for the savings bank to pursue long term strategies and they do not need to take on more risks in order to earn higher returns. Neither are they exposed to the same pressure as commercial banks are towards the demands from their shareholders. Instead they focus on earning money on traditional banking activities and not on speculations. All the tools available for managing interest rate risk can be applied by saving banks, but some tools are more commonly used than others. The most common tool for measuring and managing interest rate risk are the gap model and interest rate swaps.

Krishnan, Ritchken and Thomson (2004), examined whether mandating banks issuing subordinated debt would enhance market monitoring and control risk taking. To evaluate whether subordinated debt enhances risk monitoring, the authors extracted the credit–spread curve for each banking firm in the sample and examined whether changes manifested in bank risk variables, after controlling for changes in market and liquidity variables. They did not find strong and consistent evidence that
they do. To evaluate whether subordinated debt controls risk taking changes and the risk-taking behaviour of a bank, they found that it does not. The study concludes that a mandatory subordinated debt requirement for banks is unlikely to provide the purported benefits of enhancing risk monitoring or controlling risk taking. An integrated model for liquidity management and short-term asset allocation in commercial banks has been given by the authors.

Thingalaya (2004), in his article titled, “Giants and Pigmies”, has found that out of 40 banks studied, only eight banks had deposits over Rs. 50,000 crore. On the lower end, there are three banks having deposits not more than Rs. 1000 crore. State Bank of India has the largest volume of deposits. ICICI Bank, the leader of the new generation private banks has the largest deposits in its private sector banks cluster. The article concluded that in deposit mobilization, the new generation private banks have overtaken the older banks; their strategy has been to mop up low cost deposits.

Pagano (2004), using a sample of 241 U.S bank holding companies, he tested all relevant rationales for corporate risk – management activities related to interest rate risk. Three main results emerge. (1) measurement error and the possibility of multiple influences on the model's proxy variables indicate that the confirmatory factor analysis method can provide a more accurate and comprehensive test of interest rate risk management rationales than conventional estimation techniques; (2) the corporate risk management theories, most consistently supported are those related to financial distress costs and firm size, and (3) an exogenous factor related to interest rate volatility negatively influences a firm's interest rate risk exposure.

Sen, Sarma and Ghosh (2004). In their paper titled “Net Interest Margin: Does Ownership Matter?” the authors have attempted to explore
the role played by ownership factors in the determinants of Net Interest Margin (NIM) or spreads in Indian banking. They found that ownership per se has a significant impact on spreads other than the proportion of investment in government securities, proportion of lending to priority sector, Capital Risk Adjusted Ratio (CRAR) and Non-Performing Assets (NPA's).

Patnaik and Shah (2003)\textsuperscript{44} have expressed concerns about the impact of a rise in interest rates upon banks in India in their paper, “Interest-rate risk in the Indian banking system.” In their study, they have measured the interest rate risk of a sample of major banks in India, using two methodologies. The first consisted of estimating the impact upon equity capital of certain interest rate shocks. The second consisted of measuring the elasticity of bank stock prices to fluctuations in interest rates. The study found that as of 31 March 2002, many major banks had economically significant exposures. Using the first approach, they found that roughly two-thirds of the banks in the sample stood to gain or lose over 25% of equity capital in the event of a 320 bps move in interest rates. Using the second approach, they found that the stock prices of roughly one-third of the banks in the sample had significant sensitivities.

Patnaik and Shah (2003)\textsuperscript{45} in another study, the authors have based their paper titled “Interest Rate Volatility and Risk in Indian Banking” on a relatively complex imputation procedure which used the Liquidity statement in banks' annual reports to estimate future cash flows. The study found that there was heterogeneity across banks. Banks holding similar portfolios of government securities had rather different interest rate risk exposure. The study finally suggested that RBI's investment fluctuation reserve was an unsatisfactory approach to address interest rate risk.

Ramaiah and Ghosh (2003)\textsuperscript{46}, in their paper titled, “Understanding the Determinants of Bank Spreads in India: An Empirical Analysis”, have
investigated the determinants of interest rate spread in the Indian banking system using a combination of bank specific, bank industry specific and macro-economic factors. Using the narrow and wide definitions of spreads, the paper found that among the bank specific factors, operating expenses, other income and, to a certain extent, provisions are the key determinants. Among the bank industry specific factors, the yield on 91-day Treasury Bills remained a significant factor influencing spreads. Finally, inflation is an important macroeconomic variable impinging on spreads. The authors also found that the magnitude of the elasticities computed, using the mean values for the respective spread and explanatory variables, reflected that, overall, operating expenses, other income and inflation are the important variables explaining spreads. The explanatory power of the equations revealed that the wide definition performed relatively better vis-à-vis the narrow definition in explaining spreads.

Mun and Morgan (2003), in their paper “Bank Foreign Exchange and Interest Rate Risk Management: Simultaneous versus Separate Hedging Strategies”, investigated the hedge ratio dynamics for large US banks with exposure to both interest rate and foreign exchange risks. Using a mean-variance framework, the paper evaluates hedging performance when interest rate and foreign exchange risks are hedged separately versus simultaneously optimal hedge exchange risk. Using a mean-variance framework, the paper evaluates hedging performance when interest rate and foreign exchange risks are hedged separately versus simultaneously. Optimal hedge ratios for separate hedge ratios were found to consistently overstate that of simultaneous hedge ratios for banks that engage in both domestic loan extensions and foreign exchange operations. Both in-sample and out-of-sample results indicate that a simultaneous hedging strategy outperforms a separate hedging strategy. The mean-variance efficiency test results strongly support statistical significance to this finding.
Upadhyay (2003)\textsuperscript{48}, in her paper titled, “Financial Sector Reforms : New Norms have reduced Credit Supply to Commercial Sector”, has studied the effect of introduction of Capital Adequacy Norms on the credit flow and asset structure of public sector banks. The study revealed that higher capital requirement has reduced the flow of credit to commercial sector, rapid changes and lowering of rate of interest has also reduced the interest spreads for the banks as a whole. The study further concluded that the bank strategy of investment has shifted in favour of government securities and these exceeded the Statutory Liquidity Requirements (SLR).

Bauer and Ryser (2002)\textsuperscript{49}, in their paper, “Risk management strategies for banks”, analyze optimal risk management strategies of a bank financed with deposits and equity in a period model. The banks’ motivation for risk management comes from deposits which can lead to bank runs. In the event of such a run, liquidation costs arise. The hedging strategy that maximizes the value of equity is derived. They identify conditions under which well known results are obtained. The initial debt ratio, the size of the liquidation costs, regulatory restrictions, the volatility of the risk asset and the spread between the riskless interest rate and the deposit rate are shown to be the important parameters that drive the banks’ hedging decisions. They further extend their basic model to include counterpart risk constraints on the forward contract used for hedging.

Boukrami (2002)\textsuperscript{50} is of the view that the need for the management of interest rate risk has driven bank managers to use new financial tools. Banks’ interest rate exposure associated with a mismatch between assets and liabilities can be measured using traditional GAP and duration Gap analysis. Derivatives instruments are new tools used by banks in order to adjust the amount of assumed interest rate risk. These instruments include interest rate swaps, interest rate futures and forward rate agreements. This study, using annual data for the year 2001, tried to shed some light on the pattern of interest rate swap use for asset liability purposes by a number of
leading US Commercial banks. Thus the banks' specific characteristics (size, asset quality, capitalization, profitability, interest rate risk profile) regressed against the notional amount of the interest are swaps reported as hedging activities. The results suggest that larger banks (as measured by the number of total assets) tend to use interest rate swaps more intensively than smaller banks. In addition, the study has found that banks with better asset quality tend to be more intensive users of interest rate swaps than those with weaker asset quality. Finally, the study found that banks with high capitalisation are bigger users of the interest rate swaps than those with lower capitalisation.

Buch, Driscoll and Ostergaard (2002)\textsuperscript{51}, in their paper titled, “Cross border diversification in Bank asset portfolios”, have used mean variance portfolio model as a benchmark to compute the optimally diversified portfolio for banks located in France, Germany, UK and US under different assumptions about currency hedging. They compared these optimal portfolios with the actual cross border assets of banks from 1995-1998. They found that banks over invest domestically and that cross border diversification entailed considerable gain. The study further commented that: (a) Banks under weigh countries which are culturally less similar, (b) Capital controls have a strong impact on degree of under investment and (c) Low political risk increases degree of over investment.

English (2002)\textsuperscript{52}, in his paper titled, “Interest rate risk and bank net interest margins”, has examined the specific component of interest rate risk arising from the possible effects of changes in market interest rates on bank net interest margins. The paper adopted a simple approach focussing on the empirical relationship between market interest rates and banks’ flows of interest income and expense. The paper found that, for most countries, the long run behaviour of the average yield earned on bank assets, appeared to reflect a weight average of the short-term and long-term rates with each of the weights...
less than one and the sum of the weights as well generally less than one. The relative importance of short and long term rates for the yield on assets differed considerably across the countries considered. In four of them—Australia, Germany, Japan and the US—the rate earned on assets appeared to carry a higher weight on long term rate than on the short term rate, suggesting a longer average repricing period or base rate in those countries. For the same countries, the short run dynamics also suggested a relatively larger share of assets carrying longer term rates as evidenced by the relatively large and statistically significant coefficients on the change in the long term rate in the error correction equation. And the empirical results for the average rate paid on liabilities was broadly similar to those for the yield on assets. Again, long term rates seemed to play a larger role in Australia, Japan and US, though not in this case in Germany. In addition, the paper also examined NIM for 10 countries along with the slope of the yield curve and the change in the short term rate for each country. The results did not suggest strong relationship among the variables in most of the countries. The paper concluded that banks in the countries examined have been fairly successful in limiting the exposure of their NIM’s to market interest rates over the past 20 years or so. However, the analysis of NIM’s presented in this paper has left aside two potentially important issues. First, there has been no effort to evaluate whether the NIM’s earned by banks were appropriate, given the expected riskiness of bank assets. Secondly, the extent to which the approach employed makes important differences either among banks or over time.

Fiedler, Brown and Moloney (2002), in their paper “Liquidity risk: What Lessons can be learnt from the Crisis in Japan’s Banking System?”, depict the need to expel huge amounts of non-performing loans from their balance sheets, their share prices sinking and their credit ratings lowered. Japan’s banks are struggling to raise new capital and may face collapse.
But the current crisis could have been avoided. If they had implemented rigorous liquidity risk management structures, the banks would have got a clear view of their true position and could have avoided spinning into the vicious circle of a funding crisis.

Hasan and Sarkar (2002)\textsuperscript{54} have mentioned that Interest rate risk is a major concern for banks because of the nominal nature of their assets and the asset-liability maturity mismatch, in their paper “Banks' Option to Lend, Interest Rate Sensitivity, and Credit Availability”. The paper proposed a new way to derive a banks' interest rate sensitivity, by examining separately the effects of interest rate changes on existing loans (loans-in-place) and potential loans (loans-in-process). In the study, a potential loan is shown to be equivalent to an American option to lend, and is valued using option theory. Furthermore, the study mentions that an increase in interest rates generally has a negative effect on existing loans. However, if both deposit and lending rates rise by the same amount, the value of a potential loan generally increases. Hence a bank’s lending slack (or ratio of loans-in-process to loans-in-place) will determine its overall interest rate risk. Empirical evidence in the study indicates that low-slack banks indeed have significantly more interest rate risk than high-slack banks. The model also makes predictions regarding the effect of deposit and lending rate parameters on bank credit availability.

Kosmidou and Zopounidis (2002)\textsuperscript{55}, in their paper, have presented an Asset Liability Management (ALM) technique, which combines a goal programming model with a simulation analysis to determine the balance sheet of a bank for the year 2000. To attain this goal, they analyzed the 1999 balance sheet of a Greek commercial bank facing conflicting goals such as returns, liquidity, solvency and expansion of deposits and loans under uncertainty. An optimizer was embedded in a simulation model to obtain different optimal solutions for a set of interest rate scenarios, while a
sensitivity analysis explored the effects of alterations in the order of goal priorities.

Kantawala (2001)\textsuperscript{56}, using a sample of 27 public sector banks in his paper titled, "Risk Assessment of Public Sector Banks", has made an attempt to examine whether any relationship exists between risk index and asset size, capital adequacy, profitability and liquidity. The major objectives of the study were: (1) To estimate the risk of Public Sector Banks (PSB), (2) The probability of book insolvency; and (3) To examine the relationship, if any, of Risk indices with size. Profitability, liquidity and solvency, taking all the banks together as well as groupwise i.e. nationalized banks and SBI Group. The Study concluded that range of Risk index is substantially wide (from 1.14 to 22.30) and the nationalized banks have higher risk as compared to SBI group. The author is of the view that as no guidance is available regarding what should be Risk Index. Probability of book insolvency is a better guide to examine of this. He also emphasized that nationalized 5 banks have much risks than the SBI group banks and finally an attempt was made to examine whether relationship, if any, existed between risk and size, probability, Capital adequacy and Liquidity. The Spear man's Rank Correlation showed that there exists positive relationship between RI & ACV & NPM implying lower the risk, higher the profitability.

Falconer (2001)\textsuperscript{57} gave in his study, "structural liquidity: the worry beneath the surface", an analysis of the underlying structural liability in the banking business by analysing balance sheets across the banking industry. He shows that the structural liability of different banks varies enormously. He argues that asset and liability management professionals need to have a deep understanding of the financial markets and of the many lines that their banks will be running. Even then, he suggests that liquidity crises are very difficult to predict or control.
Hussain, A Hassan AL – Tamini (2001)\(^5\), in his doctoral dissertation, titled “Risk Management Practices: An Empirical Analysis of UAE Commercial Banks”, has investigated the degree to which UAE commercial banks use risk management techniques in dealing with different types of risk. The author conducted a primary survey of both local and foreign banks and found that UAE commercial banks mainly faced credit risk. Inspection by branch manager and financial statement analysis was the main method used in risk identification, the main techniques used in risk management were establishing standards, credit score, credit worthiness analysis, reports, risk rating, collateral etc. The analysis of result also indicated high willingness on the part of banks to use sophisticated risk management techniques and, finally, to reduce the credit risk by all the banks in UAE adopted conservative credit policy while granting loans.

Mitusch and Nautz (2001)\(^5\), in their paper, “Interest rate and liquidity risk management and the European money supply process”, mentions that monetary setup of the European Central Bank (ECB) centres around short-term securities repurchase agreements (repos) which ensure the flexibility of its money market management. However, a flexible repo-based monetary policy exposes banks to both interest rate risk and liquidity risk. This paper investigates the consequences for the money supply process and the conduct of monetary policy. They have developed a loan supply model with maturity transformation and show how banks respond when future monetary policy is expected to become tighter or more uncertain. Their results also shed light on the rationale behind the use of different pricing rules in the ECB’s repo auctions.

Pagano (2001)\(^6\) examines the rationales for risk taking and risk management behaviour from both a corporate finance and a banking perspective. After combining the theoretical insights from the corporate finance and banking literature to determine which of these theories is best supported by the data. Managerial incentives are the most consistently
supported rationale for describing how banks manage risk. In particular, moderate/high levels of equity ownership reduce bank risk while positive amount of stock option grants increase bank’s risk taking behaviour. The review of empirical tests in the banking literature also suggests that financial intermediaries coordinate different total risk. The empirical results indicate hedgeable risks such as interest rate risk which represent only one dimension of the risk management problem. This implies empirical tests of the theories of corporate risk-management need to consider individual sub components of total risk and the bank’s ability to trade these risks in a competitive financial market. This author is of the view that finding is consistent with the reality that banks have non-zero expected financial distress costs and bank managers cannot fully diversify their bank-related personal investments.

Byrne (2000)61, in his paper titled, “Bringing banking risk up to date”, has considered the difficulties experienced by banks in implementing integrated asset and liability management. The paper explains some of the measures needed in the worlds of credit risk and interest rate. The paper also presents a matrix for risk management and encourages training in this area.

Jones (2000)62, in the paper “Liquidity and the markets”, discusses a talk given by him at the UK Asset and Liability Management Association forum about the effect that globalization is having on the increased lack of financial controls. He looks at the history of liquidation and how it was achieved. Further, he investigates IT and the markets and how they have changed under technology's influence - but that it should be used properly to add value. He wonders whether in the future, there will be only one settlement and clearing system for the whole world!

Puwalski (2000)63, in his paper on “Increasing Interest Rate Risk at Community Banks and Thrifts”, mentions that there are indications that the
community banking and thrift industry's vulnerability to interest rate risk (IRR) is increasing. Over the past several years, the average maturity of assets at banks and thrifts has extended. During the same time, volatile liabilities have been growing, strengthening the link between bank funding costs and market interest rates. Together, these trends suggest that industry earnings and equity values are increasingly at risk to rising interest rates. The Office of Thrift Supervision (OTS) has noted several consecutive quarters of rising IRR at thrifts, and Olson Research Associates (Olson), an IRR consulting firm serving mostly the community banks, has also noted increasing IRR among its clients and other banks that it monitors. Moreover, wide swap spreads and the expectation of new derivatives accounting might have discouraged some banks from purchasing interest rate protection before rates rose in 1999. With rates having risen recently, community bank and thrift net interest margins (NIMs) may come under pressure.

Laeven (1999) uses a linear programming technique called Data Envelopment Analysis to estimate the inefficiencies of banks in Indonesia, Korea, Malaysia, the Philippines and Thailand. He applies this technique to the pre-crisis period 1992–96. Efficiency measures, however, are not sufficient to assess the overall performance of a bank risk-taking. He found that foreign owned banks took little risk relative to other banks but risk factors should be taken into account as well. He, therefore, introduced a measure for the banks in the East Asian region, and that family-owned banks were among the most risky banks, together with company owned banks. His risk measure helps to predict which banks were restructured after the crisis of 1997. Restructured banks had excessive credit growth, were mostly family-owned or company-owned, and were almost never foreign owned.

Carter and Sinkey (1998) investigate the use of interest-rate derivatives by U.S. Commercial banks with total assets between $100
million and $1 billion. The authors are of the view that these banks are interesting, because they allow them to focus on the end-users of interest-rate derivatives rather than dealers. Over their four-year test period, 1990-1993, only 10% of these large community banks, on average about 250 banks per year, used interest-rate derivatives. They also found evidence that the use of interest-rate derivatives is positively related to exposure to interest-rate risk as measured by the absolute value of the 12-month maturity gap. In addition, a community bank's decision to participate in interest-rate contracts is positively related to size. Nevertheless, they found no positive relationship between size and the extent of participation in the derivatives market. Finally, their evidence suggests that banks that participate more heavily in interest-rate swaps have stronger capital positions, an indicator of market or regulatory discipline or both.

Ahmed, Beatty and Takeda (1997) provide evidence on the Interest Rate Risk (IRR) management activities of commercial banks including their use of derivatives. They found that (i) banks primarily focus on managing interest rate sensitivity of net income rather than the interest rate sensitivity of stock returns, (ii) the level of IRR taken by banks is directly related to liquidity and inversely related to managerial quality and bank size, (iii) derivative users, as group, have lower mean and median exposure than non-users, and (iv) for the majority of users, derivatives reduce exposure. These findings are inconsistent with the view that derivatives threaten the viability of the banking system.

Elyasiani (1997) estimates the interest rate and exchange rate risk betas of 59 large U.S. commercial banks for the period of 1975-1992 as well as the bank--specific determinants of these betas. The estimation procedure uses a modified seemingly unrelated simultaneous method that recognises crossequation dependencies and adjusts for serial correlation and heteroskedasticity. Overall, the exchange rate risk betas are more significant than the interest rate risk betas. More importantly, the author
draws comparison between the scale of a bank’s interest rate and currency derivative contracts and the bank’s interest rate and exchange rate risks. Particularly noteworthy is the influence of currency derivatives on exchange rate betas.

Cole and Featherstone (1997)\textsuperscript{68} in their study paper, “Asset Liability Management in Kansas Banks”, presented the results of survey of Kansas bankers’ analysis of risk and ALM. One hundred seventeen of the 441 banks surveyed responded to the questionnaire mailed in the fall of 1995, for a response rate of 26.5%. Information was collected regarding bank characteristics, risk perceptions, risk management practices, and ALM practices in Kansas banks. Survey results show credit risk to be the predominant risk concern of Kansas bankers, with cost of funds risk being the second most important. These rankings have not changed since 1985. The farm economy and personnel quality are the most important factors contributing to these banking risks. Since 1985, the volatility of interest rates, personnel quality, and competitor’s activities have increased in importance as risk contributing factors, highlighting the increased importance and awareness of ALM during the last decade. Banks currently perceive themselves to be in overall excellent financial condition. Asset/Liability Management practices vary throughout the state. Nearly 95% of all banks have formal ALM policies, and nearly 90% have ALM Committees to oversee various ALM activities. Gap analysis, loan product pricing, and diversification are the major risk-management techniques used in Kansas banks. Derivative products are seldom used by Kansas banks. Specialized ALM computer software is popular with Kansas banks. Little to no relationship appears to exist between ALM software use and total asset volume, KBA district, return on assets, CEO experience, or total agricultural loan volume.

and the External Financing of Private Corporate Sector in Recent Years”, have studied the portfolio behaviour of commercial banks in the changing scenario consequent to financial sector reforms. The authors, against the backdrop of portfolio behaviour of commercial banks (CBs) and the credit policy measures, have also studied the structure of lending of commercial banks to private corporate sector and borrowing pattern of companies in private sector. The study concluded that the portfolio behaviour of CB’S has undergone radical changes with the introduction of financial sector reforms with the relatively low credit deposit ratios in the post reform period and also that the distribution of bank credit to industry was highly skewed and the banks share in total borrowings of private corporate sector has declined over the years.

Kiyama, Yamashita, Yoshiba and Yoshida (1998)70, in their paper titled, “Interest Rate Risk of Banking Accounts: Measurement using the VaR framework”, have worked to measure the Interest Rate Risk of banking accounts such as deposits and loans using value at risk concept, which is useful for the risk valuation of trading accounts. The authors said that, for the purpose of this study, they have taken into account the following issues in order to apply VaR concept:- (a) the larger risk evaluation period because of the inflexibility of adjustability of banking accounts positions (b) the evaluation of risk included in the administered rates (c) the prepayment risk. Therefore, in their paper, they first constructed a VaR model including a term structure model to express the stochastic process of market rate, the administered rate model and prepayment functions model. Then, they performed simulation using an imaginary port folio to analyze the factors determining interest rate risk. The paper proved that the factor of administered rates increased interest rate risk both in single products and in the port folio. The study also took into account the behaviour of customers who wanted better interest rate conditions, the study found that the factor of prepayment decreased the
present value, which is itself the basis of calculating risk. Finally, the paper mentions the model parameters to show the magnitude of model risk.

Hirtle (1997)\textsuperscript{71}, in his paper titled “Derivatives Portfolio Composition, and Bank holding Company: Interest Rate Risk Exposure”, has examined the role played by derivatives in determining the interest rate sensitivity of bank holding companies’ (BHC’S) common stock, controlling for the influence of on balance sheet activities and other bank specific characteristics. The major result of the analysis suggested that derivatives have played a significant role in shaping banks’ interest rate risk exposures in recent years. For the typical BHC in the sample, increases in the use of interest rate derivatives corresponded to greater interest rate risk exposure during 1991-1994 period. This relationship was found to be particularly strong for BHC’s that served as derivative dealers and for smaller end user BHC’s. During earlier years, however, there was no significant relationship between the extent of derivatives activities and interest rate exposure. The study suggested two plausible interpretations of the relationship between interest rate derivative activity and interest rate exposure in the latter part of the sample period: one interpretation suggested that derivatives tend to enhance interest rate risk exposure for the typical BHC in the sample while the other suggested that derivatives might be used to partially off-set high interest rate risk/exposure arising from other activities.

Saha and Ravisankar (1996)\textsuperscript{72} in their paper titled, “Assessing Relative Strengths of Banks in Managing Risk : An Indian Evidence”, have attempted to measure the relative efficiencies of various public sector banks in India in managing risk. In their endeavour to provide the system of a risk-rating framework for Indian banks, they have developed a rating framework for banks using size, profitability, capital adequacy and liquidity parameters. 30 ratios divided into four groups were used by the authors as efficiency indicators of the parameters listed above. Profitability parameters received
the greater weightage followed by liquidity, capital adequacy and size factors. In their paper, authors have given a ratio profile of one bank as illustration on the plea that individual banks will then be able to identify their position in the comity of banks in each of these financial ratios / parameters and evolve suitable strategies to improve their ranking wherever possible.

Arjunrao (1980), in his doctoral thesis titled “Indian Private Sector Scheduled Commercial Bank”, has studied the trends in the areas of asset and liability portfolios. His study found that: (a) the flow of Indian Private Sector Scheduled Commercial Bank (IPSSC) earnings to reserves and surpluses had been larger and steadier than the increase in their share capital, (b) deposits constituted as the main source of funds and the average proportion of both savings and fixed deposits in total deposits of banks increased and (c) Finally, the study concluded that the RBI policies profoundly influenced the way private sector Commercial Bank managed their portfolios. On the Asset Management: (a) The CGR of asset portfolio of the IPSSC banks during the study period was higher as compared to their growth the rates in the earlier periods, (b) The asset portfolio behaviour of IPSSC banks were towards increasing the share of high income yielding assets and some banks adopted more aggressive policy towards it, (c) Investment operations of banks were to purchase and sale of govt. securities and (d) Finally the study concluded that, IPSSC banks employed major portion of funds in loans, cash credit, overdraft etc. The author has also studied the inter relationships between Liabilities and asset, portfolios of banks. This aspect of study found: (i) a positive relationship between cash/deposit ratio and total deposit accretion, (ii) increase in high income yielding assets were positively correlated with the increase in interest bearing liabilities and (iii) volume of total deposits and different types of deposits were important determinants of Commercial Bank’s major asset portfolio mix.
Wadekar (1979), in his paper titled “Portfolio Behavior of Foreign banks, in India”, has analyzed the structural changes in the liability and asset portfolios of foreign banks in India over the period 1949-76. The analysis showed that structural changes in assets and liabilities were remarkable in 1949/50, 1950/51, 1951/52, 1955/56, 1956/57, and 1957/58. Although the structural changes in assets were found to be mostly dependent on the structural changes in the liabilities yet the RBI’s banking policies have influenced the way in which the foreign banks managed their assets and liabilities during the period under study.

Kwan and Eisenbeis (1977), in their paper titled, “Bank Risk, Capitalization, and operating efficiency”, have investigated the relation between bank risk-taking and operating efficiency in a simultaneous equation-setting. While inefficiency was found to have positive effects on both credit risk and interest rate risk, it also has positive effect on capitalization. The positive effect of inefficiency on risk taking supported the moral hazard hypothesis that poor performers were more vulnerable to risk-taking than high performance banking organizations. The positive effect of inefficiency on the level of capital was attributable to regulatory pressure on under performing firms to have more capital. The study also mentioned that regulators preferred to discipline weak and inefficient firms by imposing higher capital requirements rather than through imposing portfolio restrictions possibly because capital is more transparent and can be measured accurately. The study also found that credit risk, interest rate risk and capitalization seemed to be jointly determined reinforcing and compensating each other. Firms with more capital were found to operate more efficiently than firms with less capital indicating that the level of capitalization is a good proxy for performance. The study also found mixed results regarding the effects of credit risk and interest rate risk on operating efficiency Interestingly, a Ushaped relation between inefficiency and loan growth rate was
detected up to a certain point. Operating efficiency improved at a decreasing rate as loan growth increased. This was consistent with the hypothesis that sustainable loan growth in accomplished by good management, which operated close to the efficient frontier. However, at excessive growth rates, operating efficiency decreased with loan growth. The finding supported the hypothesis that entrenched managers who pursue a growth objective to enhance their own wealth tend to operate inefficiently. Finally, it was worth noting that overall explanatory power of the estimated equations was quite low, and that there were inconsistencies in the findings.

At the end, it is seen that the Review Of Literature, given above, leads us to a conclusion that ALM is a managerial process which is still evolving in India. Banks in India have not paid much attention to areas of ALM. Majority of banks are yet to take up sophisticated practices. Also, they have not paid much attention to Risk assessment. Most of the researches on ALM and Risk Management have been conducted abroad. Only a small number of studies have been conducted on the subject in India.

Need of the study

The concept of Asset Liability Management is important to the banking industry. It is likely to gain further momentum when India will be implementing Basel II in 2009. Indian Banks will witness entry of world-class banks, competition, stringent rules etc, and if our domestic banking sector has to compete with those banks it should be empowered and enabled to deal with all aspects of asset liability management. RBI issued the guidelines relating to Asset Liability Management (ALM) in the year, 1999. Since then, a number of studies have taken place. The researchers have studied only one of the components of ALM in isolation. The same is the case with the studies in the area of risk assessment and identification. The Review of Literature brings out the fact that there is a need to study the ALM practices of Commercial Banks. Also, there is a need to study the
magnitude of risk in Indian Banking Sector. This study is aimed at fulfilling this research gap. The present study would examine all aspects of Asset Liability Management in Commercial Banks in India i.e. (a) study of ALM Practices of banks under study, (b) identification and measurement of Interest Rate Risk and Liquidity Risk, banks assume on their balance sheet, (c) Problems in ALM and Risk Management system of Commercial Banks.

Scope of the Study

The scope of the present study is limited to Indian Commercial Banks only. The study covers the whole cluster of SBI and its associates (8) and Nationalized Banks (19). Out of the cluster of private sector banks, 10 banks have been selected. The selection of private sector banks has been made on the basis of size of deposits (as on March 31, 2004) (Source-Indian Banks Association). The list of sample banks is given in Table-

<table>
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<tr>
<th>Nationalized Banks (19)</th>
<th>SBI and its Associates (8)</th>
<th>Private Sector Banks (10)*</th>
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<td>Allahabad Bank</td>
<td>State Bank of India</td>
<td>ICICI Bank</td>
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<td>Andhra Bank</td>
<td>State Bank of Bikaner &amp; Jaipur</td>
<td>HDFC Bank</td>
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<td>State Bank of Hyderabad</td>
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<td>State Bank of Indore</td>
<td>Jammu and Kashmir Bank</td>
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<td>Bank of Maharashtra</td>
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<td>Oriental Bank of Commerce</td>
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<tr>
<td>United Bank of India</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Punjab &amp; Sind Bank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UCO Bank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vijaya Bank</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TABLE-2.1

LIST OF BANKS INCLUDED IN THE SAMPLE
It is worth mentioning here that Ing Vysya Bank started its operations during October, 2002 that is why analysis for this bank pertains only to 2003 and 2004. Also that UTI Bank has rechristened itself as AXIS Bank from July 30, 2007.

Period of Study

The present study covers a period of six years from 1999 to the year 2004. This period is considered adequate to examine the position of ALM in banks under study. Moreover, using distant past data may not be useful as far reaching changes consequent upon introduction of Guidelines by RBI on ALM of has taken place most recently and reviewed periodically to stabilize the environment in which the Indian banks operate today.

Objectives of the study:

The study aims at fulfillment of following objectives:

1) To study the Asset-Liability Management (ALM) practices of the banks under study.
2) To study the interest rate risk and liquidity risk of banks under study.
3) To identify the problems in Asset Liability Management and Risk Management in banks.
4) To make suggestions to improve the position of Asset- Liability Management and Risk Management in banks.

Data Collection

The present study is based upon both primary and secondary data. Primary data has been collected through Questionnaire. The questionnaire was designed considering three pillars of ALM as defined by RBI-

a) ALM information system
b) ALM organization
c) ALM process
Based on these three pillars, questionnaire was divided into 4 parts consisting of 29 questions. This was done to judge the practices and status of ALM in Indian banking Industry. The questionnaire was mailed/e-mailed to the ALM and Risk management department of banks under study. All the banks have email Id's and internet connectivity. In order to get the required information, the link to online questionnaire was sent to ALM department, risk management department and officials of the banks selected. A follow up letter was mailed to all non-responding banks. Also, personal visits were made to Zonal Offices of the banks to get the required information. Twelve usable questionnaires were received out of 37 sent. The final response rate was 32.4%.

The sources of secondary data explored for the purpose of this study are – Statistical tables relating to banks in India, Report on Trends and Progress in Banking, Report on Currency and Finance, RBI Bulletin, RBI Annual Report, Weekly Statistical Supplement, Website of Reuters, Website of NSE, Website of CCIL, PROWESS (a corporate data base developed by CMIE), annual Reports of Banks, Web sites of various banks, etc.

Tools for Analysis

In the present study, following techniques have been used for analysis.

A) Techniques For Analysis of Questionnaire

For analyzing the responses of the banks under study on the questionnaire sent to them for the purpose of obtaining information on the practices adopted by them with respect to ALM, the following tools have been used:

1) PERCENTAGES AND FREQUENCY DISTRIBUTION: The data was tabulated using computer and processed in SPSS 13.0. Then the
percentages and frequency distribution were worked out. Percentages reveal a part of the whole expressed in hundredths and frequency distribution gives a set of data organized by summarizing the number of times a particular value of a variable occurs.

2) **ONE WAY ANOVA (Analysis of Variance)** is the analysis of the effects of one treatment variable on a dependent variable. This technique is used when means of more than two groups or populations are to be compared.

One way ANOVA technique helps us to determine if statistically significant differences in means occur between two or more groups. The technique involved the following steps:

(i) Obtain the mean of each sample
(ii) Work out the mean of the sample means
(iii) Take the deviations of the sample means from the mean of the sample means and calculate the square of such deviations which may be multiplied by the number of items in the corresponding sample, and then obtain their total. This is known as the sum of squares for variance between the samples (or SS between).
(iv) Divide the result of the (iii) step by the degrees of freedom between the samples to obtain variance or mean square (MS) between samples.
(v) Obtain the deviations of the values of the sample items for all the samples from corresponding means of the samples and calculate the squares of such deviations and then obtain their total. This is known as the sum of squares for variance within samples (or SS within).
(vi) Divide the result of (v) step by the degrees of freedom within samples to obtain the variance or mean square (MS) within samples.
(vii) Finally, f-ratio will be worked out (Kothari).

The information obtained through various steps stated can be presented in a table form.

**TABLE-2.2
ANALYSIS OF VARIANCE TABLE FOR ONE-WAY ANOVA
(There are k samples having in all n items)**

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Sum of squares (SS)</th>
<th>Degrees of freedom (df)</th>
<th>Mean Square (MS)</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Sample or groups</td>
<td>$n_i (\bar{X}_i - \bar{X})^2 + ... + n_k (\bar{X}_k - \bar{X})^2$</td>
<td>(k-1)</td>
<td>$SS_{between} / (k - 1)$</td>
<td>$MS_{between} / MS_{within}$</td>
</tr>
<tr>
<td>Within samples or groups</td>
<td>$\sum_i (X_{ij} - \bar{X}<em>i)^2 + ... + \sum_i (X</em>{ij} - \bar{X}_k)^2$</td>
<td>(n-k)</td>
<td>$SS_{within} / (n - k)$</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$\sum_i \sum_j (X_{ij} - \bar{X})^2$</td>
<td>(n-1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Kothari, C.R., Research Methodology.

$\bar{X}$ = mean of the sample

$\bar{X}$ = mean of the sample means

n = total number of items in all the samples

(K - 1), (n-K), (n-1) = degrees of freedom

For the Purpose of this study, one way ANOVA has been applied on the number of independent variables and dependent variables. The list of independent and dependent variables is exhibited in Table 2.3
ANOVA has been applied to examine whether any differences exist in the different groups of independent variables in relation to ALM practices of banks. The three different groups of independent variables were considered. The null hypothesis stated is there is no difference between the ALM Practices of Banks.

B) Techniques For Measurement of Liquidity Risk

With the purpose of studying the Liquidity Risk of Banks, Ratio Analysis has been used. A set of Eight Ratios has been calculated to measure the risk.

RATIOS EXAMINED FOR STUDYING LIQUIDITY RISK OF INDIAN COMMERCIAL BANKS

1) Capital Adequacy Ratio
2) Net Loans to total Deposits
3) Total Deposits to Total Assets
4) Prime Assets to Total Assets
5) Liquid Assets to Total Assets
6) Liquid Assets to Total Deposits
7) Net Loans to Total Assets
8) Total Deposits to Net Loans

1) Capital Adequacy Ratio

Capital Adequacy Ratio (CAR) is a measure of bank's capital. This ratio is expressed as a percentage of bank's risk weighted assets. That is

<table>
<thead>
<tr>
<th>DEPENDENT VARIABLE</th>
<th>INDEPENDENT VARIABLE</th>
</tr>
</thead>
</table>
| 1) ALM PRACTICES OF BANKS | 1) INCOME  
2) DEPOSITS  
3) CAR  
4) TOTAL ADVANCES  
5) BETA  
6) EPS  
7) MARKET CAPITALISATION |
why the ratio is also known as capital to Risk weighted asset ratio (CRAR). The minimum regulatory requirement (MRR) is 9% for the commercial banks in India (for the year ending March 31, 1999, the MRR was 8%).

II) Ratio of Net Loans to Total Deposits-

This ratio indicates the percentage of loans, which are funded by customer deposits. It is calculated by dividing Net loans by Total deposits. Lower ratio indicates potentially Low Liquidity problems for the bank and vice versa.

III) Ratio of Total Deposits to Total Assets:

This ratio indicates the percentage of deposits in the total assets of the bank. It is arrived at by dividing total deposits with total assets. Higher ratio indicates potentially low liquidity problems for the bank and vice versa.

IV) Ratio of Prime Assets to Total Assets.

This ratio shows the percentage of prime assets (Cash Balance with bank and balances with RBI and other banks) in the total assets of the bank. It is arrived at by dividing prime assets by total assets. The general rule preferred in case of the ratio is: higher the better.

V) A ratio of Liquid assets to Total Assets

It is calculated by dividing the liquid assets by total assets. A higher ratio indicates low liquidity risk for the bank.

VI) Ratio of Liquid Assets to total deposits. It is the ratio of liquid assets to total deposits; higher the ratio better it is for the bank. It is arrived at by dividing the liquid assets by total deposits.

VII) Ratio of Net Loans to Total Assets.

It is the ratio of Net Loans to Total Assets; higher ratio here would mean illiquidity leading to higher liquidity risk.
VIII) Ratio of Total Deposits to Net Loans.

It is calculated by dividing Total Deposits by Net Loans. A higher ratio indicates potentially less liquidity problems for the bank.

C) Techniques For Measurement of Interest Rate Risk

One of the sophisticated approaches to Interest Rate Risk measurement is Duration Gap Analysis. In this study, we approach the measurement of IRR exposure of banks through Duration Gap Analysis. There are four steps in D Gap Analysis. These are (Koch and Mac Donald) assessed as under:

1) Develop an interest rate forecast

2) Estimate the market value of bank assets, liabilities, and stockholders’ equity.

3) Estimate the weighted average duration of assets and weighted average duration of liabilities, also incorporating the effects of off-balance sheet items, based on the estimated market values. Calculate Duration Gap.

4) Forecast change in the market value of stockholders' equity across different interest rate environments.

It is worth mentioning here that, the maturity profile of assets and liabilities is essential for applying D Gap analysis. There was non availability of maturity data for the year 1999. Due to this reason, the IRR analysis for banks under study has not been conducted for the year 1999.

Limitations of the Study

1) Though utmost care was taken to get accurate data and results, yet the possibility of some inaccuracy cannot be ruled out because of probable mis-interpretation and misunderstanding on the part of the respondents.
2) The findings which are applicable in today's context, may not be applicable in total in the future because of fast changing environment.

3) The findings may vary in other private sector banks and foreign banks to some extent.

Organization of Study:-

The study has been organized into 6 chapters, as under:

Chapter 1 – deals with Introduction including the background and theoretical context of the study.

Chapter 2 – deals with Review Of Literature related to ALM. This chapter also contains the research design encompassing the scope, objectives and procedure adopted to analyse the information.

Chapter 3 – contains the detailed analysis of the ALM practices of banks under study.

Chapter 4 – is devoted to the measurement of liquidity Risk and IRR of banks under study. The analysis has been done year-wise using Ratio analysis and duration gap analysis, respectively.

Chapter 5 – discusses the problems and the suggestions for improving the ALM practices and Risk management practices of banks under study.

Chapter 6 – summarizes the main findings of the study and suggests the areas of further research.
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