ABSTRACT

James Tobin's portfolio theory can be applied to bank portfolio management in that a bank would maximise the rates of return of its portfolio of assets, subject to the expected degree of risk and liquidity. Chambers and Charnes (1961), Cohen and Hammer (1967), Booth and Dash (1979) and others apply the linear programming model to the management of bank funds. This paper carries out a linear programming analysis on the consolidated balance sheets of commercial banks in Singapore for the period 1978-1983. The results show that by and large banks do try to maximise the returns of their portfolio, subject to legal, policy, bounding and total asset constraints, which denote riskiness and liquidity of the portfolio of assets. In a direct way, banks conform to the portfolio choice theory; they have to balance yield and liquidity against security. Although the computer cannot replace a manager, linear programming can serve as a useful guide.

INTRODUCTION

Various portfolio theories have been propounded for the management of bank funds. Ronald I. Robinson proposed four priorities of the use of bank funds: 1. primary reserves, 2. secondary reserves (or protective investment), 3. loans and advances (customer credit demand) and 4. investment account (open market investment for income) in descending order of priority. A bank has to place primary reserves at the top priority in order to comply with the minimum legal requirements, to meet any immediate withdrawal demand by depositors and to provide a means of clearing cheques and credit obligations among banks. However, the central provision for bank safety comes not in primary, but in secondary reserves. The usual practice is to keep as small a primary reserve position as the law permits. Thus, although the primary reserve requirement has the twin objectives of safety and monetary control in a modern banking system, monetary control is in fact the more important.

Secondary reserves include cash items from banks, treasury bills, trade bills and other short-term securities. Banks should have to satisfy customers’ loan demand (third priority), before allocating the balance of the funds in the investment market (fourth priority).

Loans and investment are in fact complementary. According to Robinson, investment should be tailored to the strength, seasonality and character of loan demand. Banks that experience sharp seasonal fluctuations in loan demand need to maintain more liquidity in their investment programme. Moreover, during a boom when loan demand is high and credit-worthy customers are available, banks should allocate more funds to loans and less funds to investment; and vice versa during a recession when loan demand is low.

According to Robinson, the crucial banking problem is to resolve the conflict between safety and profitability in the employment of bank funds. The conflict is...
essentially the conflict between liquidity and the size of earning assets. Robinson suggested that when there is a conflict between safety and profitability, it would be better to err on the side of safety.

It has been commented that Robinson's division of priorities may be mechanical. In real banking practice, banks would, after allowing for the minimum reserve requirement, adjust their portfolio of assets in accordance with the rate of return, risk and liquidity of each category of assets. With changing expectation and yield, riskiness and liquidity of different types of assets, banks have to adjust their portfolio position consistently.

James Tobin's portfolio theory can be regarded as an evolution of Keynesian theory. Tobin defines yield and return, liquidity, reversibility, divisibility and predictability of value clearly. According to him, an asset-holder balances expectation of return \( E(R) \) and liquidity on one hand, and risk (standard deviation of returns) on the other, with due consideration of the asset-transaction cost; whilst divisibility is a further consideration for a small economic unit.

This idea can be applied to the management of bank portfolio because the principles of commercial banking are liquidity, security and profitability. Hence a bank would maximise the rates of return of the spectrum of assets, subject to its expected degrees of risk and liquidity. Under different circumstances and expectations, the attributes of the rates of return, risk factor and liquidity of different types of asset would change. For example, a change in interest rates would affect the portfolio choice and change the whole spectrum of asset holdings of banks.

The portfolio theory was further elaborated by Markowitz. His Portfolio Selection Model deals with the risk and return trade-off, characteristics of the security portfolio and the determination of a set of efficient portfolios. It has been commonly applied to the stock market but rarely to the commercial banks. Instances of its application are limited to the investment assets, particularly government securities, which are only one type of the many earning assets of a commercial bank.

With the advent of computerisation and the growing use of operations research technique, optimization model, in particular linear programming model, has been introduced for improving portfolio performance of banks. Linear programming (LP) is a systematic way of finding the best course of action when many variables and many conditions must be taken into consideration; it is an approach to maximize or minimize a value, subject to many constraints.

The forerunners of the application of LP models to the management of bank portfolio were Chambers and Charnes (1961). They set up a model of bank portfolio choice, using required reserve ratio and "balanced" portfolio, as constraints. They defined "balanced" portfolio as a set of measures used by bank examiners of the Federal Reserve System; in effect, it includes the capital adequacy ratio and other safeguards. The model is to determine an optimal portfolio for an individual bank over several time periods in accordance with the requirements laid down by bank examiners.

Cohen and Hammer (1967) extended the Chambers and Charnes Model. They offered three alternative objective functions:

- Maximizing the present value of stockholder's equity at the end of the final period.
- Maximizing the present value of the net income stream during the planning period.
- Maximizing the present value of the net income stream during the planning period, plus the stockholder's equity at the end of the period.

This sophisticated and large scale LP model takes into account operational constraints as well as projections of various intertemporal relationships between