Investigation of the Supply Chain Management and Cash Balances Impact on Planning

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***Abstract*— Cash reserves of bank, including bill, coins and check, which are used for daily operation of customers, shall be managed so that in spite of covering the risk of liquidity, arising from cash deficit, the cost of cash excess stagnation is minimized. Therefore, the aim of this study is to optimize the remained cash of banks' branches fund. To determine the optimum limit of money in the funds, we used two approaches of time series and propagation model 4 and prediction was conducted monthly and seasonally. The function of possible distribution of deposits and withdrawals of branch customers' cash and required net liquidity as well as the function of time distribution of cash deposit and withdrawal were used in the propagation model. The used data were daily gathered in the time intervals of 2016-2017 from the selected branches. Using the conducted stimulation, in addition to determine the optimal limit of money maintenance in fund, money limit was 25% reduced in comparison with current situation.**

***Keywords*—** *liquidity management, optimizing, Miller-Over, propagation model, organization management, supply chain management*

1. Introduction

Supply chain management (SCM) is defined as a combination of different arrangements. It occurs between various business entities involved in the production, procurement, processing, and marketing of products. Since the recent financial crises, legal status of bank has been significantly changed. Before global financial crisis, the legislators had facilitated the obligations, believing that capital adequacy allocation can be achieved through financial innovation. However, since the global financial crisis, both economists and legislators have agreed that some specific components of legal facilitation for vulnerability strengthened financial system. Basel Committee on Banking Supervision (BCBS) and legislation system of important countries consider the banks tendency to severely rely on financial supply of wholesale as an important source of intensifying financial market distress. On this basis, they are expected to adopt liquidity law in addition to financial law as a legislation plan in global scale.

Financial supply of banks wholesale (macro) are not generally covered by certificate of deposit. Hence; not certified creditors sensitively react to market liquidity shocks. Therefore, when liquidity shocks of market are high, the banks with high macro financing are extremely affected in lending money. On the contrary, concentrated financing of bank, having stable financial sources adequately, is relatively less sensitive to liquidity shocks of financial market. BCBS has strengthened its liquidity framework through developing a minimum standard for financing, designed to achieve subsequent goal. It has to reduce the risk of financing in a time horizon through obliging the banks for financing their activities with adequate stable sources of financial capital to decrease the risk of future financing pressure. Similar to sustainable financing sources, BCBS recommends micro deposits (demand and periodic), capital and liabilities with effective due time of one year or more. Therefore, same as concentrated financing, we consider micro deposits (demand and periodic) supported by deposit certificate (or concentrated deposits), concentrated capital (the capital of ring 1) and banking debt securities with long-term due time. Since most of micro deposits are covered by deposit certificate, micro depositors are far less sensitivity to market liquidity shocks. Moreover, the banks are full of capitals from incoming deposit flows because the investors tend to look for a safe base for their money in financial market distress. As the result, the banks with high concentrated financing can even increase loans to the companies till liquidity shocks are severe.

Since the branches of bank require maintaining excess cashes to respond unexpected withdrawal of cash flows and cash withdrawal demand of customers, affording the cost of maintaining such cashes as waiving the obtained interest of possible investment is inevitable. Cash resources of branch refer to the cash flow of daily operations of branch, customers' deposits and cash reserve of fund which

is daily supplied by bank treasury. Keeping cashes in the fund of branch has been always along with a cost-benefit. In other word, the benefit of keeping excess cashes is to cover the risk of liquidity and ensure no liquidity deficit. On the contrary, the cost of it includes increasing the cost of dormant money and losing the opportunity of investment. Therefore, liquidity manager is always seeking for optimization of fund cashes given its daily operations. As we can see in figure 1, the rate of cash optimum, given the cover of liquidity excess cost and liquidity risk arising from the shortage of cashes, will be dot. Importantly, the branch and financial manager do not try to make liquidity gap zero but the aim is to adjust and control liquidity gap in controllable limit because supplying liquidity is a major part of banks' duties and functions. The banks earn money through doing such services for customers. Therefore, to manage liquidity gap, the cash flow of branch shall be first estimated then predicted.

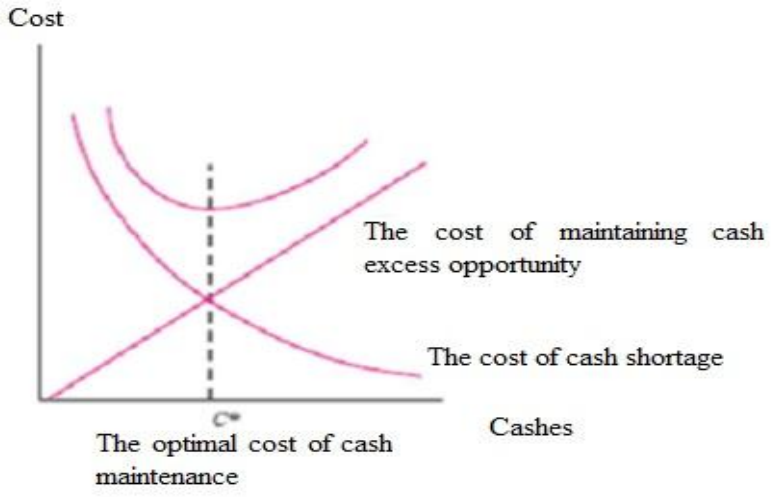

Figure 1. The optimum amount of cash

In fact, the aim of liquidity prediction is to ensure adequate sources of cashes in an acceptable cost level in future. For liquidity prediction, knowing three parameters of required liquidity, required time and future available sources are important. To this end, predicting the input and output cash flow during a time interval and calculation of difference between received and paid cashes and prediction of liquidity deficit or excess are conducted. After identifying the excess or deficit, the planning will be conducted to compensate deficit or consume excess to reach liquidity balance at the end of period. Also, to estimate the values of cash flows, it shall be noticed that the less possibility of future cash flows identification makes modeling the cash flow more complicated.

The aim of current study is to optimize the cash flows of bank branches fund to minimize the cost of cash flows stagnation, considering the risk of liquidity shortage and better use of excess cashes for earning money. the second part of study is related to theoretical literature. Then we investigate the framework of analysis and used model theoretically in third part. In fourth part, after introducing data, the model is estimated, predicted and analyzed. The results of study will be also proposed in fifth part.

One of the issues faced by finance companies in management of cash is determination of appropriate reference of money for the company either to be utilized as the start of work. Other issues are identification of right fund chance for idle moneys, non-cash programs, and determination of the optimal level of cash to be maintained by the company. Kesseven (2006) proposed that most supply chain management systems are dealt with the problem of enhancing a desired trade-off between liquidity and profitability in optimizing the efficiency of the company. This study suggested that too much focus on profitability will cause asset–liability mis-match causing increasing profitability in the short term at a risk of insolvency. In [7] however, is of the opinion that finding a trade off between sufficient and insufficient cash to be held has been a major problem faced by many organizations, while Olowe (1998) advised that cash must be obtained from appropriate source in order to avoid the problem of fund mismatch in investment decisions.

2. Method

Bamol designed a model, in which the depositor can equally withdraw his interest-bearing deposit in a period of time. He faces a fixed transactional cost for each time and a variable one for each unit of each withdrawal. The demand of liquidity is determined in this model and it will be minimized based on operational cost. He also designed a model for managing the cash flows through relating the cost of money maintenance opportunity and transactions cost for the first time. Since the securities exchanges are along with the cost of them, determining the higher level of remained cash reduces the cost of exchanges. Moreover, the cost of lost opportunity will be more in case of maintaining excess cashes in company.

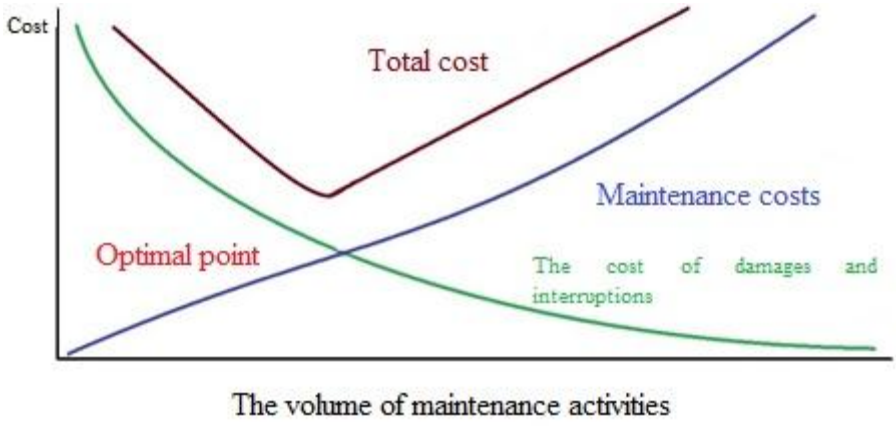

Figure 2. Determining the optimal point of cash

Figure 2 shows the optimal point of cash. The horizontal axis in this diagram represents the value of liquidity and vertical one the rate of the cost of cash. According to this diagram, the more maintained cash in firm is, the less exchange cost. Moreover, maintenance of cash reduces the cost of investment opportunity and its benefits. Therefore, the opportunity cost has a positive relationship and exchange cost negative relationship with cash maintenance. Thus, Bamol considers three variables to solve optimization problem of cash:

F: The fixed cost of exchanges for compensating cash deficit

T: Total amount of required cash for a planned period

K: The cost of cash maintenance opportunity, securities maintenance interest rate

Morton Miller and Daniel Over designed a model based on the daily fluctuations of cashes. In this model, normal distribution of cash net flow is assumed and the net cash flow every day can be equal to, less or more than expected value.

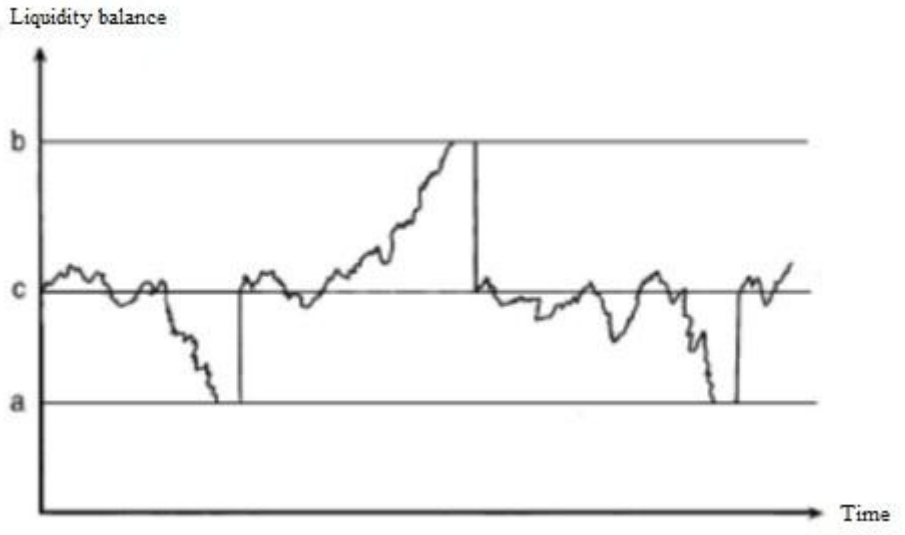

Figure 3. Miller-Over model

Similar to Bamol's model, Miller-Over model also depends on the cost of opportunity and exchange. The cost of each exchange such as buying and selling securities is considered fixed (F). The cost of maintaining cash opportunity is a period of time is also interest rate of securities.

Unlike Bamol's model, the number of exchanges in a period of time is a random variable which is different in any period, depending on input and output cash flows. Liquidity balance has a static and random behavior that is in a small time interval of a working day with the probability of Bernoulli 0.5 symmetrically, we can have both deposit and withdrawal.

Miller-Over tested their model using nine-month cash data of a company. The model could determine the average level of cash remained less than firm estimation level. They also showed that the firms, the cash flows of which are more certain, shall maintain more remained cash. It can be finally said that low limit is determined with the idea of management and using prediction techniques.

3. Results

The used data include time series of daily data of customers' cash deposit and withdrawal of sample branch throughout 2016-2017. Eviews has been used for statistical analysis for modeling. Also, to investigate the effect of particular days or months on liquidity flow of branch, known as calendar effects, virtual variable was used. EndFirst variable represent the first and last days of month and Thu variable indicates Thursday of each week. To investigate durability of variables, Dickey-Fuller unit root test in the level of 5 and 10% was used. Given the results of test, the variables are durable in the level of 19. Data logarithm was used for paving. The results of data durability have been indicated in table 1.

Table 1. The durability of branch cash flow input and output

	statistic	α:5%	α:10%	p-value
ln(Cash out)	-3.17	-2.96	-2.62	0.0312
an(Casb in)	-4.86	-2.96	-2.62	0.0004

3.1. Propagation model

Determining upper and lower bounds of cashes deposit and withdrawal

In fact, most of financial companies and banks want to ensure their cash reserves include planned part [33] and supportive par [34]. Planned part includes the reserves, considered for the last liquidity prediction. Supportive part includes an extra margin of liquidity reserve on recent prediction. Supportive part of liquidity, depending on risk management strategy, can be big or small. If the managers of liquidity are risk taking [35], they select small supportive margin and instead invest cash resources to increase bank profitability in productive assets. On the contrary, risk-averse [36] liquidity managers [36] select a big supportive margin to cope with liquidity crises and uncertain conditions. To investigate the status of normal-based liquidity gap, margin prediction of 95% possibility is used. So as the first step, the input and output flow for intended period shall be predicted. Then using standard deviation of prediction error and considering two standard deviations of prediction mean, upper bond [37] and lower bond [38] of two series are created in the confidence level of 95%.

3.2. Normal status

It is assumed in this case that the way of customers' cash deposit and withdrawal is like past and as bank expectation. Therefore, the mean value of two mentioned series prediction is used.

3.3. Pessimistic and risk-averse status

The most amount of cash out with the least amount of cash in. In fact, in the worst mood of liquidity of branch, it is assumed that cash deposit by customers is significantly less than management expectations. Moreover, it is assumed that demand for cash withdrawal is maximum. In this case, the predicted lower bond of deposit and upper bond of withdrawal are respectively used. So the highest rate of liquidity gap and consequently the highest need of liquidity is predicted.

Figure 4. Calculating the net liquidity in risk-averse and normal conditions

4. Conclusion

The optimum point of liquidity growth, both followed by anti-inflation achievement and financing in production section, is about 23%. It currently seems that policy making in monetary policies and liquidity growth are the opposition issues between experts. Some of economists believe that sustainable economic growth is impossible in high inflation condition. Therefore, to achieve high economic growth, contractionary policies shall be continued. The gradual decrease of inflation for preventing the reduction of production and deepening the recession shall be also

emphasized. On the contrary, some of experts believe that durability of contractionary policies currently affect production. According to them, when economy is boomed and inflated, increase in liquidity by increasing coefficient is desired but if the economy is with recession, the liquidity growth, arising from monetary base, is preferred to monetary increasing coefficient. Therefore, till contractionary policies is continued by controlling monetary base, high economic growth will be achieved difficulty. Therefore, given these attitudes, determining the optimal point in the rate of liquidity growth, followed by win-win policy for inflation and production, seems necessary.

The pivotal aim of this study was to respond whether risk parameters (credit, operational, liquidity and market risk) affect the efficiency of Iran banking system or not. The results of study showed that risk components have been of a great importance in the efficiency and inefficiency of Iran banks. Ignoring credit risk management may lead to following challenges for bank in long-term and neglecting the adequacy of required capital especially in granting loans leads to risky activities.

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