



# Estimating the Volume of Monthly Deposits to Meet Expected Financial Withdrawals a Practical Study on a Sample of Iraqi Private Sector Banks

Ahmed Miri Ahmed<sup>a</sup>, <sup>a</sup>Technical College of Management /Kufa, Al-Furat Al-Awsat Technical University,31003 Al-Kufa,Iraq,

The private sector banks are no longer isolated from the government banking sector because they have attracted many of their clients with capital that has encouraged them to enter a competitive environment that offers their banking services, especially after the transformation of the economic system in Iraq after 2003. It is no secret that bank deposits are one of the main sources of banking capital. The investment of the bank is through its employment in entering projects and services that lead to an increase in its revenues and hence its profits, as well as to meet the requirements of the banking business to fulfil its obligations to their customers. Therefore, the importance of this study has emerged through the competitive role played by these banks, and thinking about how to share market shares to remain in the banking environment and grow their financial capabilities. The study aims to adopt the administrations of these banks on scientific methods in rationalizing the decisions regarding the management of financial resources away from using intuition. A detailed analysis of the volume of cash deposits was conducted in the light of the data obtained for the sample of the private banking sector of Iraq for five banks of the governorates (Najaf, Karbala, Qadisiyah, Babel, Methane) during the period of 2010-2018 using many statistical methods. The study concluded with a number of conclusions, the most important of which is the adoption of the study sample by the banks' management. This is done using the Markov chains method in determining the future indicators regarding the size of the future cash deposits, and the transitional probability matrix which is the basis for the estimation and calculation of the expected cash deposits for customers. The study came out with a number of recommendations, the most important of which is the preparation of the necessary software requirements for this purpose, (Aminita v.17, spss, Amos v.18, QSC win), especially

when the bank faces a major challenge in the face of the large size of cash deposits and how to expect them for longer periods of time.

**Key words:** *Monthly deposit, withdrawals, Markov series, bank.*

## **Introduction**

Service organizations in general and banking organizations in particular need a serious and thoughtful approach in designing their services in a distinctive manner as required by the current stage. Because of the rapid technological developments in how banks deal with their customers in order to survive in the competitive environment and to the ability to achieve financial stability for customers. On the other hand, this comes only through the existence of departments working efficiently in dealing with bank deposits, as it is one of the main sources of capital, which is the basis in the launch in its investment projects that generate profits on the one hand and to meet their obligations towards the depositors. For the purpose of completing the study, they were divided into four main subjects, the first topic was devoted to the scientific methodology of the study, while the second topic was devoted to the theoretical aspect of the study. The scientific aspect of the study was in the third subject. Finally, the fourth topic came to address the most important conclusions and recommendations of the study. Finally, the most important scientific sources and references were presented.

### **The first topic: The scientific methodology of the study**

#### ***The problem of study***

The service organizations, whether they are in the public sector or the private sector operating in the banking field, are characterized by their lack of proper foundations in the employment of bank deposits. This will increase their revenues and profits as a result of their investment to grow and remain in the competitive market.

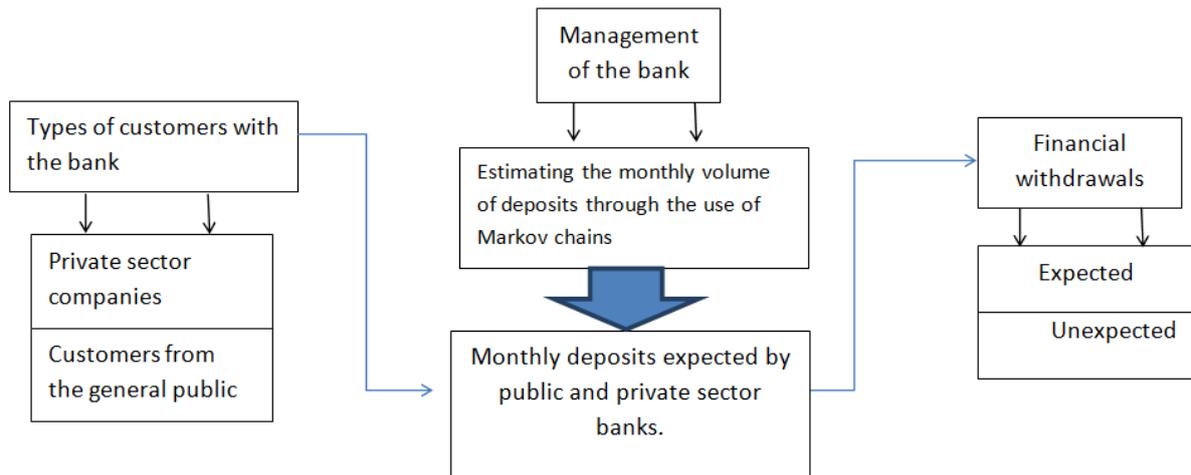
The problem of the study can be formulated through the following questions:

1. Can the Markov series approach be used in the future forecasting process in determining the market share of each bank's bank deposits in relation to the total amount of financial deposits?
2. Is there a possibility of banks sample study in the face of unexpected and unexpected financial withdrawals in the light of the expected deposits in light of competition between banks?
3. Is the management of banks sample study able to rationalize their decisions in the management of financial resources to the best possible?

### *The default model of the study*

The study is based on a hypothetical structure of the possibility of the banks' sample management to attract bank deposits as according to figure (1) below:

**Figure 1.** The default model of the study.



### **Study hypotheses:**

In line with the study methodology, the hypotheses of the study were based on the following:

1. The Bank's management can't use Markov chains in the future forecasting processes in determining the market share in the financial deposits of each bank in relation to the total amount of financial deposits.
2. There is no possibility for banks to sample the study in the face of the expected financial difficulties in light of the expected farewell in the competition between banks.
3. The Department of Banks can't sample the study by rationalizing its decisions in managing its financial resources as best as possible.

### *Importance of the study*

The importance of the study is reflected in its approach to dealing with the important and vital subject, which is to follow the correct scientific methods in the management of deposits by employing them with well-studied investment projects that are properly planned and far from just guessing and intuition. Thus, increasing it's the banks revenues and its future profits. On the other hand, prudently and rationally in the face of financial withdrawals by dealers with the bank.

### ***Objectives of the study***

The study aims at reaching the following issues:

1. How to predict the future market share of financial deposits of competing banks that are a part of the sample of the study by employing Markov chains style.
2. Determine the expected monthly estimate for each bank of the market shares in general and their monthly shares in particular.
3. The decision makers of the banks' management departments can obtain the expected financial resources to meet the financial withdrawals and other payments in a predictable and unexpected manner in a scientific way, thus avoiding working off intuition and speculation.

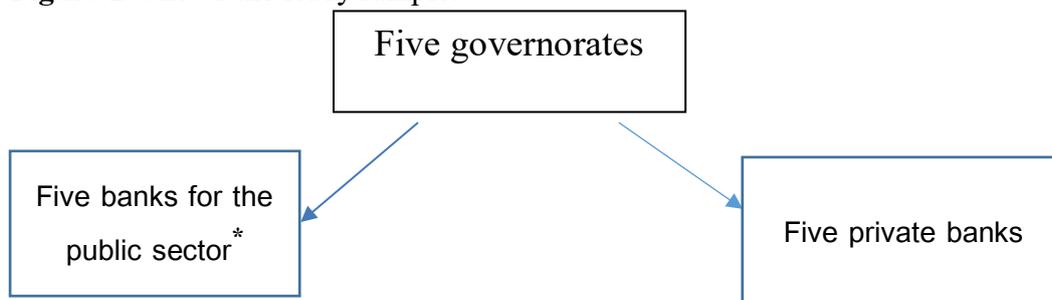
### ***Community and Study Sample***

\* The study population: represented by the Iraqi public and private banking sector.

(5) banks belonging to the private banking sector and (5) banks belonging to the public banking sector were selected for comparison. The five governorates of Iraq to the regions of the Middle Euphrates, Najaf, Karbala, Qadisiyah and Babylon And Muthanna were involved. Due to the sensitivity of the subject and attached to the reputation of those banks and their survival in the market competition, the data obtained from those banks to the private sector was conditional on the researcher, not to mention their names explicit in this study.

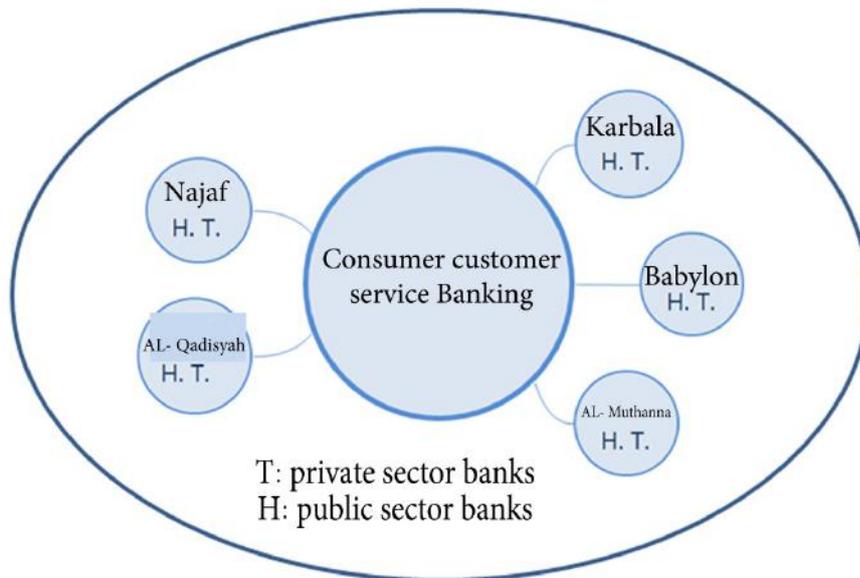
The researcher believes that not mentioning the names of these banks do not affect the course of the study as much as it is a correct scientific method to estimate the size of monthly deposits and what is the correct way to deal with withdrawals provided by customers. The following forms (2) and (3) illustrate the society and sample of the study:

**Figure 2.** Shows the study sample.



\* **Public sector banks are mentioned here for comparison purposes only**

**Figure 3.** The study population represented in (public and private sector banks for the five governorates).



**1.1.7. Limits of the study:** Spatial boundaries: The spatial boundaries are five provinces located within the Middle Euphrates (Najaf, Karbala, Babylon, Qadisiyah and Muthanna). and tThe reason for the selection of those provinces is because of the agricultural, commercial and industrial activity in these areas and the need to provide service. Time Limits: The period was from January 2017 to December 2017, where banking activity flourished <sup>(1)</sup>.

**1.1.8. Procedures and Methods of Study:** The financial reports of the private sector banks were based on the sample of the study in the collection and analysis of data to reach the final results. The presentation of the data from the private sector banks was difficult for the researcher to obtain in this study because the decision makers believed that this data will reveal financial reality. The economic situation in Iraq is unstable due to the unstable political conditions, which makes it difficult to predict the economic environment in this field.

(1) The fact of the prosperity of banking activity was achieved by following up the work of these banks sample study according to financial reports on the Internet.



## **The second part: The theoretical side of the study**

### **Monthly Deposits and their Estimation in Response to Bank Money Drawings using Markov Series**

#### ***Monthly Deposits***

Deposits, in general, are an essential element in determining what the banking company really is, and what role it plays in the Iraqi economy. The benefits of deposits are reflected in the following:

1. It is an important measure of admission to the depository institution by the public.
2. The main source represents the profits and growth of the depository institution through which the raw materials required for the provision of loans are provided.
3. Highlights the role of management effectiveness in dealing with funds deposited by the public in the financing of loans and the management of banking projects.

There are two main issues that arise as the depository institution must deal with the management of public deposits as follows:

1. Where can funds be high at the lowest possible cost?
2. How can I ensure that the management of a deposit institution always has enough to support lending and other services and other demands?

To answer these questions is difficult, especially since today's market is more competitive than ever and is heavily influenced by the pricing schedules and competitive coverage of other financial institutions who offer similar services.

The challenge today is how banks can attract important new deposits, since many institutions have created a new job centre, the head of executive deposits, as well as new types of deposits and methods to provide new services and pricing plans that are accelerating in today's world. Hence, monthly deposits constitute a basic pillar in the work of financial institutions, especially in banks, whether in the public or private banking sector. Through dealing with them in such a way that leads to the exploitation of the optimal utilization of revenue and profits of the bank by employing them on the one hand. On the other hand, is how to confront the commitments they have made through contracts with dealer's to meet the needs of withdrawals and other services provided.

**2.2. Financial withdrawals:** Financial withdrawals are one aspect of bank credit that depends primarily on confidence. The confidence element that the bank places on its client is the ability for client to make available a certain amount of money to be used for a



particular purpose over a certain period of time, and is repayable under certain conditions for an agreed upon return <sup>(2)</sup>.

It is important to note here that trust is an essential aspect of the banking credit activity:

The first aspect is the trust of the public in the bank and the deposit of an individual's funds in the hope of achieving the positive aspects of this deposit that include security, services, and interest.

The second aspect is the banks' trust in their customers to lend their customers a part of these deposits.

Therefore, building confidence in its forms is not easy. It requires a period of time to take root in the real estate. The bank's clients can be loyal to this bank, which requires the bank to provide the individuals, institutions and the community with the necessary funds. To pay these funds, interest, commission, and expenses in one instalment or in instalments on specified dates. This relationship is reinforced by providing a set of guarantees that ensure that the bank is able to recover its money in case the customer stops paying without any losses.

#### ***Areas to be addressed by financial withdrawals <sup>(3)</sup>***

The financial withdrawals in contemporary economic life are of great importance in increasing the efficiency of the process of allocating resources in society both in production and in the field of consumption or in the field of exchanges. These treatments include the following resources:

1. Financing the production processes: The bank works to mediate between the money collectors and the seekers to achieve benefits for the parties and reduce the risks. Thus, the banks have a clear role in transforming the economic resources of society into the hands of the most efficient producers and to be able to exploit them in the production processes.
2. It also finances consumption: through the bank lending to individuals to finance their needs and consumer purchases of durable goods such as cars, refrigerators, washing machines ... etc. These loans are given out through credit cards where the money is replaced by credit cards and are secured by the banks. The credit cards can be used by

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<sup>(2)</sup> For further details see: Said, Abdel Salam Lefta, "Banking and private Banking" AL-Zekhara publishing and Distribution, First Edition, Jordan, Amman, 2013, p. 185-188.

<sup>(3)</sup> Same as the previous source.

the consumer in the purchase of all their daily needs, they will then pay the value of those goods to the banking institution during a certain period of time for a commission or interest.

3. Settlement of swaps: Money is no longer the only means of exchange. There are many other credit instruments such as contracts, bonds, and bills of exchange, which makes swap operations for goods and services more rapid and larger when compared to the number of physical instruments of money that are used. As a result, the use of paper and metal money through the use of instruments, as well as taking advantage of the facilitation and expansion of foreign exchange through the opening of documentary credits, leads to an increase in the volume of international trade.
4. The distribution of resources and the benefit of the disabled ones: The financial withdrawals also help to distribute cash and credit resources to various sectors and optimize their use by ensuring that they flow to all projects according to their needs to achieve parallel economic growth aimed at supporting the economic and credit policy of the state. Of idle economic resources using these resources in different production projects that will increase the national income and raise the level of economic activity.

### ***Markov Series***

#### ***Markov chains as a method of forecasting and future planning***

The Markov chain is also known as the Markov analysis and is concerned with the current behaviour of some changes for the purpose of predicting future behaviour. It was first used by Andrei A. Markov at the beginning of the 20th century. The method is used in various administrative and economic activities and depends mainly on matrices. In particular, it relies on a mathematical matrix known as the Transition Probability Matrix. It is the basic rule or system in the process of converting the quantitative estimates from one position to another, A specific time, so it is known as the Matrix system (MS).

The general formula for such matrix values can be as shown below:

whereas:

MS code for the transition probability matrix

P<sub>k<sub>v</sub></sub> the final limit of the probability of losses or revenues achieved where:

**K = 1, 2, 3, ..., n**

**V = 1, 2, 3, ..., n**

n = the last number of organizations competing in the ranks

n = the last number of organizations competing in columns

Assuming that (n = 5), The size of this matrix is as shown in Figure (4):

**Figure 4.** Draw five-dimensional matrixes

<b>M S =</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
	<b>1</b>	<b>0</b>	<b>P<sub>1 2</sub></b>	<b>P<sub>1 3</sub></b>	<b>P<sub>1 4</sub></b>	<b>P<sub>1 5</sub></b>
	<b>2</b>	<b>P<sub>2 1</sub></b>	<b>0</b>	<b>P<sub>2 3</sub></b>	<b>P<sub>2 4</sub></b>	<b>P<sub>2 5</sub></b>
	<b>3</b>	<b>P<sub>3 1</sub></b>	<b>P<sub>3 2</sub></b>	<b>0</b>	<b>P<sub>3 4</sub></b>	<b>P<sub>3 5</sub></b>
	<b>4</b>	<b>P<sub>4 1</sub></b>	<b>P<sub>4 2</sub></b>	<b>P<sub>4 3</sub></b>	<b>0</b>	<b>P<sub>4 5</sub></b>
	<b>5</b>	<b>P<sub>5 1</sub></b>	<b>P<sub>5 2</sub></b>	<b>P<sub>5 3</sub></b>	<b>P<sub>5 4</sub></b>	<b>0</b>

The size of this matrix can become much more complex to bring together many competing parties. Figure 2 shows the number of competing parties. The complexity of such a matrix is that there are sites that are not involved in the competition process, (= 0), where these sites were as follows:

- The horizontal level (from the contender (18) to the competitor (25)), therefore we have shown,  $Q_{23} = Q_{32} = Q_{54} = 0$ .
- The vertical level (from the competitor number (18) to the number (31)) and therefore we have  $Q_{34} = Q_{43} = Q_{42} = 0$ .

Despite these non-competing sites, the size of the matrix remains constant (31 x 31) and the zero axis starts from P11 and descends towards P3131 at the bottom of the matrix.

The idea of such a matrix is that it can be used to serve a larger number of competitors on an amount of market share, with competitors reluctant to compete in certain locations or situations <sup>(4)</sup>.

***Application requirements for Markov chains:***

The Markov series method is the logical arrangements, assumptions, and determinants of the same problem. In general, the process of applying Markov chains requires the following requirements:

1. Familiarity with the rules of multiplication of matrices and specifically multiplying the horizontal vector by a matrix.
2. Knowledge of the rules of conduct of future serial data according to the requirements of the general trend series.
3. Acceptance of the principle of expectation, which is weakened over time by external and internal environmental influences.

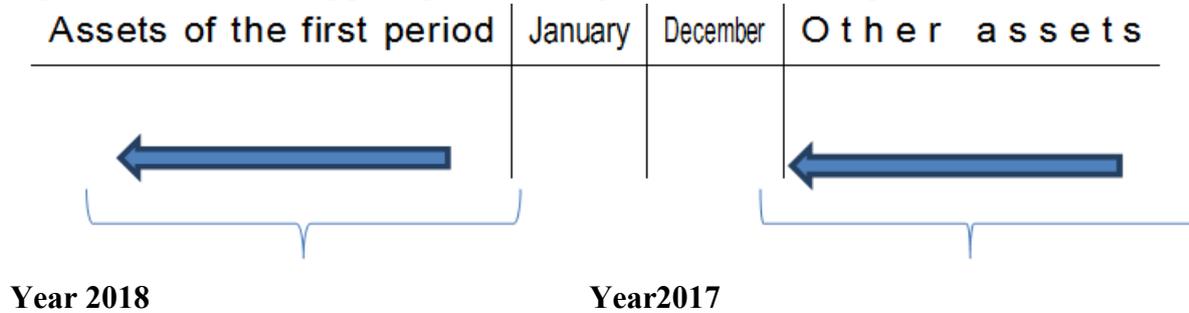
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(4) For more details see:

AL- Shokri, Boshra shaker and Abdul Hussien, "critical Success Factors for total Quality management and Tourism Marketing project in Improving the Quality of Religious Tourism product" master thesis submitted to the Board of the Faculty of Management and Economics/ university of Kufa, Muayed aL –Fadl: 2011,p: 182.

4. Acceptance of the accounting principle in the process of approving the data, which is the last term assets of the monthly deposits at the end of the year, the assets of the first term at the beginning of the new year. As in Figure (5):

**Figure 4.** The accounting principle in the adoption of data from deposits.



5. The existence of the transition probability matrix.

***The meaning of the bank*** <sup>(5)</sup>

Despite the difference in what is meant by the bank, but it can be defined in the light of the following things:

1. Economic functions performed.
2. Services provided to customers.
3. The legal basis for quality.

The Bank is to ensure the transfer of funds from depositors to the lenders (financial intermediation) and in the purchase of goods and services. It is also known as "any business offering deposits to be withdrawn by check or by electronic transfer. The loan is granted for commercial purposes as credit grants for the expansion of stock Goods or to buy new equipment.

In recent years, many industrial companies have tried to control the bank, provide loans, credit cards, savings schemes, and other traditional banking services. There are different types of financial service providers calling themselves banks. The focus of this study will be on private commercial banks, one of which is the acceptance of deposits and the provision of loans or cash withdrawals.

(5) Previous Source: Rose, 2010, p1.

**The third topic: The practical aspect of the study**

**(Analysis of monthly deposits and how to calculate cash withdrawals using Markov series for private banks sample study)**

***Data for monthly deposit volume***

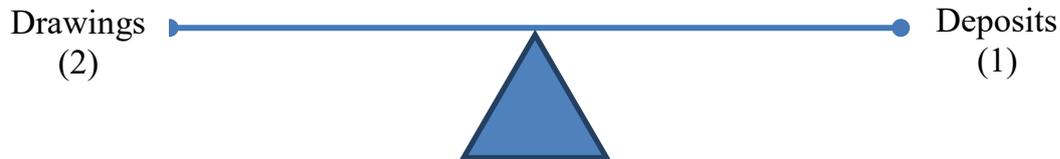
The volume of deposits in Table (1) below is for the banks. Private Sector Sample of the study for the period of January 2010 - January 2018:

**Table 1:** The volume of deposits in the private sector banks in the period from January 2010 to January 2018.

b	a	n	k	s	The size of deposits in dollars
A	.	8	8	0	. 0 0 0 \$
B	.	8	8	0	. 0 0 0 \$
C	.	1	. 0	4	0 . 0 0 0 \$
D	.	9	2	0	. 0 0 0 \$
E	.	1	. 0	0	0 . 0 0 0 \$
<b>The total volume of deposits</b>					<b>4 7 2 0 . 0 0 0 \$</b>

**3.2. Explanation of the data of the study problem:** The data of the study problem can be explained in Figure (6), which shows the mathematical relationship between the two withdrawals:

**Figure 6.** The relationship between the mathematical draw and deposit.



From the above illustration, the deposit process includes many related activities such as deposits (savings accounts, current accounts, second deposits, bank transfers to other destinations ... etc).

With regard to withdrawals, it includes many activities related to them such as withdrawals (savings accounts, current accounts, fixed deposit accounts, withdrawals to other banks or others ... etc)

***Encoding data for the study problem***

The data can be encoded according to the following table (2), which shows the banks sample study that provides services to customers within the five governorates.

**Table 2: Characterization of sample banks by governorates**

<b>A L - N a j a f</b>	<b>T<sub>1</sub> - A</b>
<b>K a r b a l a</b>	<b>T<sub>2</sub> - B</b>
<b>AL-Qadisiyah</b>	<b>T<sub>3</sub> - C</b>
<b>B a b y l o n</b>	<b>T<sub>4</sub> - D</b>
<b>AL-Muthanna</b>	<b>T<sub>5</sub> - E</b>

Represents the private sector banks (A, B, C, D, E) represent the provinces, → represents the path

Through the coding in Table (2) above, the researcher has shown the following possibilities and paths:

**First:** The selection of five different private sector banks so that each bank is located in a governorate.

**Second:** The selection of five private sector banks all located in one governorate.

**Third:** The selection of five private sector banks as multiple branches of one bank, and this bank either needs to be located in one province or to be located in different governorates.

The path is comprised of five private sector banks operating in different geographical locations along with the five public sector banks.

*Arrange the problem as a matrix:*

*Private sector banking matrix:*

The matrix can be done according to the table (3) below:

**Table 3: Private Sector Banks Matrix by Governorate Sample Study.**

Governorate P a t h	A .	B .	C .	D .	E .
T <sub>1</sub> → AAL-Najaf	0	P <sub>1 2</sub>	P <sub>1 3</sub>	P <sub>1 4</sub>	P <sub>1 5</sub>
<b>Karbala</b> T <sub>2</sub> → B	P <sub>2 1</sub>	0			
T <sub>3</sub> → CAL-Qadisiyah	P <sub>3 1</sub>		0		
T <sub>4</sub> → DBabylon	P <sub>4 1</sub>			0	
T <sub>5</sub> → EAL-Muthanna	P <sub>5 1</sub>				0

whereas:

(A, B, C, D, E): the five governorates

P: Probability

: path

T: Private banks

***Profit and Loss Matrix for Private Sector Banks Study Sample:  
Earnings matrix:***

<b>Banks competing</b>	<b>A</b>	<b>.</b>	<b>B</b>	<b>.</b>	<b>C</b>	<b>.</b>	<b>D</b>	<b>.</b>	<b>E</b>	<b>.</b>
<b>A</b>	<b>0</b>		<b>4</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>6</b>
<b>B</b>	<b>5</b>	<b>0</b>	<b>0</b>		<b>2</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>4</b>	<b>0</b>
<b>C</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>		<b>4</b>	<b>0</b>	<b>5</b>	<b>0</b>
<b>D</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>		<b>2</b>	<b>0</b>
<b>E</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>4</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	

***Loss matrix:***

<b>Banks competing</b>	<b>A</b>	<b>.</b>	<b>B</b>	<b>.</b>	<b>C</b>	<b>.</b>	<b>D</b>	<b>.</b>	<b>E</b>	<b>.</b>
<b>A</b>	<b>0</b>		<b>4</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>6</b>
<b>B</b>	<b>5</b>	<b>0</b>	<b>0</b>		<b>2</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>4</b>	<b>0</b>
<b>C</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>		<b>4</b>	<b>0</b>	<b>5</b>	<b>0</b>
<b>D</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>		<b>2</b>	<b>0</b>
<b>E</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>4</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	

***Probability Matrix***

The joint transition matrix of five private sector banks can be worked out with the possibility of entering other governorates as shown in figure 7 below:

**Figure 7.** Matrix of the joint transition possibilities of the study sample banks and the area of entry to other governorates.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
Najaf	T1 → A.	1	0	$P_{1,2}$															
Karbala	T2 → B.	2	$P_{2,1}$	0															
AL- Qadisyah	T3 → C.	3	$P_{3,1}$		0														
Babylon	T4 → D.	4	$P_{4,1}$			0		$P_{4,7}$		$P_{4,10}$									
AL- Muthanna	T5 → E.	5	$P_{5,2}$			0				$P_{5,10}$									
Government Sector banks	H1 →	6		$P_{6,3}$			0												
	H2 →	7						0										$P_{7,17}$	
	H3 →	8			$P_{8,4}$			$P_{8,7}$	0										
	H4 →	9						$P_{9,7}$		0									
	H5 →	10			$P_{10,4}$	$P_{10,5}$	$P_{10,6}$		$P_{10,8}$	$P_{10,9}$	0								
		11								$P_{11,10}$	0								
		12								$P_{12,11}$	0		$P_{12,14}$						
		13								$P_{13,11}$		0							
		14								$P_{14,11}$	$P_{14,12}$	0							
		15								$P_{15,12}$	$P_{15,13}$		0						
		16								$P_{16,12}$	$P_{16,13}$			0	$P_{16,17}$				
		17								$P_{17,14}$	$P_{17,15}$	$P_{17,16}$	0						

Society of the current study  
study community to enter other governorate

### Determination of the Transition Probability Matrix

The definition of the matrix of transitional probabilities is determined by finding what is known as the retention strength of the cash deposits for each bank of the sample of the competing study according to the following mathematical relationship:

(6)

whereas:

M = the strength of the cash deposit

(6) For more information see Fadel, Dr. Moayad Abdul Hussain, "quantitative and qualitative models in rationalizing the decisions of the organization/ applications of productive and Service organizations" AL- Warraq publishing and Distribution, Jordan, Amman, 2008.

$K$  = the volume of cash deposits that have been lost

$V$  = total cash deposits at the beginning of the time period

The probability of loss of all deposits for the number of deposits and they're going to other banks is calculated according to the following mathematical relationship:

(7)

whereas:

$p$  = which means the possibility of losing the number of deposits

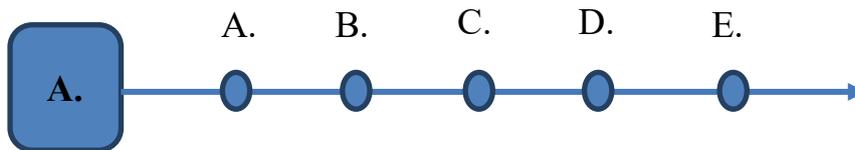
$W$  = the volume of deposits that have been lost and gone to other banks

$V$  = total cash deposits at the beginning of the time period

Based on the above, calculations are made according to the following steps:

**Step 1:** Calculate the probability of bank (A) loss of deposits for other banks. This is expressed as follows:

Accordingly, the calculation will be made in accordance with the above relationship as follows:



$P_A =$	<b>Calculate the odds of A loss for B. – C. – D. – E.</b>
	$V$

This relationship is detailed as follows:

$P_A =$	<b>Calculate the odds of A loss for B.</b>	$=$	<b>5 0</b>	$= 0.057$
	$V$		<b>8 8 0</b>	

$P_A =$	<b>Calculate the odds of A loss for C.</b>	$=$	<b>2 0</b>	$= 0.023$
	$V$		<b>8 8 0</b>	

(7) For more information see Fadel, Dr. Moayad Abdul Hussain, "quantitative and qualitative models in rationalizing the decisions of the organization/ applications of productive and Service organizations" AL- Warraq publishing and Distribution, Jordan, Amman, 2008.

$P_A =$	Calculate the odds of A loss for D.	$=$	4 4	$= 0.050$
	V		8 8 0	

$P_A =$	Calculate the odds of A loss for E.	$=$	3 0	$= 0.034$
	V		8 8 0	

**Step 2:** Calculate the probability of bank (B) loss of cash deposits compared to other banks. This is expressed as follows:



$P_B =$	Calculate the probability of loss for B A.-C.-D.-E.	$=$		
	V			

This relationship is detailed as follows:

$P_B =$	Calculate the probability of loss of B. For A.	$=$	4 0	$= 0.045$
	V		8 8 0	

$P_B =$	Calculate the probability of loss of B. For C.	$=$	3 0	$= 0.034$
	V		8 8 0	

$P_B =$	Calculate the probability of loss of B. For D.	$=$	4 0	$= 0.045$
	V		8 8 0	

$P_B =$	Calculate the probability of loss of B. For E.	$=$	2 4	$= 0.027$
---------	--	-----	-----	-----------

V	880
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**Step 3:** Calculate the probability of bank (C) loss of cash deposits compared to other banks. This is expressed as follows:



Accordingly,

$P_C =$	Calculate the probability of loss for A.-B.-D.-E.
	V

This relationship is detailed as follows:

$P_C =$	Calculate the probability of loss of C. For A.	=	30	= 0.029
	V		1040	

$P_C =$	Calculate the probability of loss of C. For B.	=	20	= 0.019
	V		1040	

$P_C =$	Calculate the probability of loss of C. For D.	=	30	= 0.029
	V		1040	

$P_C =$	Calculate the probability of loss of C. For E.	=	40	= 0.038
	V		1040	

**Step 4:** Calculate the probability of bank (D) loss of cash deposits relative to other banks. This is expressed as follows:



Accordingly,

$P_{D.} =$	Calculation of D loss probabilities for A. – B. – C. – E.
	V

This relationship is detailed as follows:

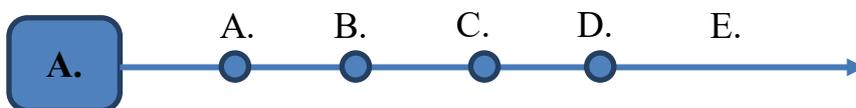
$P_{D.} =$	Calculate the probability of loss of D. For A.	$=$	$\frac{20}{920}$	$= 0.022$
	V			

$P_{D.} =$	Calculate the probability of loss of D. For B.	$=$	$\frac{24}{920}$	$= 0.026$
	V			

$P_{D.} =$	Calculate the probability of loss of D. For C.	$=$	$\frac{40}{920}$	$= 0.044$
	V			

$P_{D.} =$	Calculate the probability of loss of D. For E.	$=$	$\frac{20}{920}$	$= 0.022$
	V			

**Step 5:** Calculate the bank's probability of loss (E) of cash deposits compared to other banks. This is expressed as follows:



Accordingly,

$P_{E.} =$	Calculation of E loss probabilities for <b>A. – B. – C. – D.</b>
	<b>V</b>

This relationship is detailed as follows:

$P_{E.} =$	Calculate the probability of loss of E. For <b>A.</b>	<b>=</b>	<b>2 0</b>	<b>= 0.036</b>
	<b>V</b>		<b>1000</b>	

$P_{E.} =$	Calculate the probability of loss of E. For <b>B.</b>	<b>=</b>	<b>2 4</b>	<b>= 0.040</b>
	<b>V</b>		<b>1000</b>	

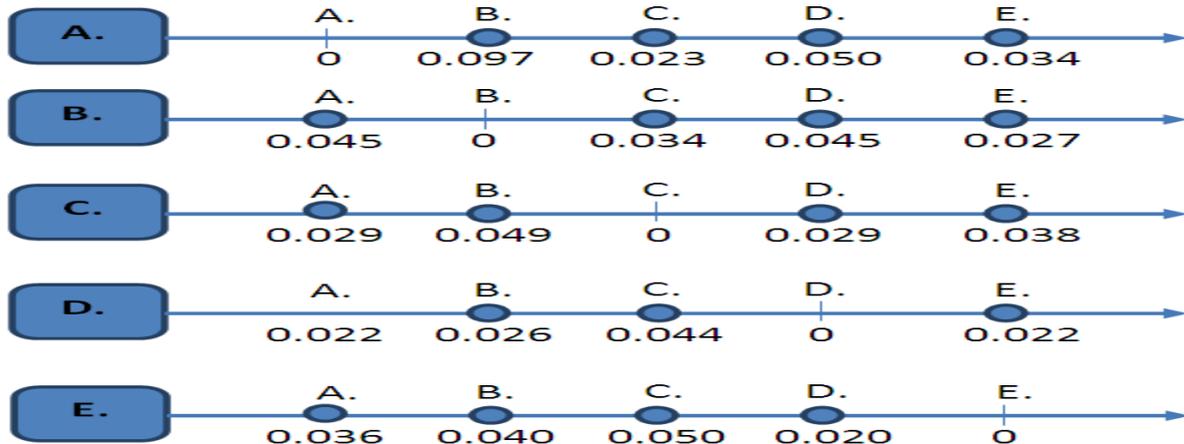
$P_{E.} =$	Calculate the probability of loss of E. For <b>C.</b>	<b>=</b>	<b>4 0</b>	<b>= 0.050</b>
	<b>V</b>		<b>1000</b>	

$P_{E.} =$	Calculate the probability of loss of E. For <b>D.</b>	<b>=</b>	<b>2 0</b>	<b>= 0.020</b>
	<b>V</b>		<b>1000</b>	

Based on the foregoing forms and calculations, the transitional probability matrix is constructed as shown below<sup>(8)</sup>:

<sup>(8)</sup> For more details see:

AL- Obeidi, Mahmoud: AL –Fadhel, Moaged, "Operations Research and its Applications in production and service organizations, AL – Warraq printing and publishing Est, Jordan, Amman, 2006, p:12.



On the basis of these forms and data, the transitional probability matrix is constructed as follows:

	A .	B .	C .	D .	E .
A .	0	0 . 0 9 7	0 . 0 2 3	0 . 0 5 0	0 . 0 3 4
B .	0 . 0 4 5	0	0 . 0 3 4	0 . 0 4 5	0 . 0 2 7
C .	0 . 0 2 9	0 . 0 1 9	0	0 . 0 2 9	0 . 0 3 8
D .	0 . 0 2 2	0 . 0 2 6	0 . 0 4 4	0	0 . 0 2 2
E .	0 . 0 3 6	0 . 0 4 0	0 . 0 5 0	0 . 0 2 0	0

The values of the axis are added to the matrix above, from the values that express the retention strength of the cash deposits for each of the study sample banks as follows:

	A .	B .	C .	D .	E .	
A .	0 . 8 3 6	0 . 0 4 7	0 . 0 2 3	0 . 0 5 0	0 . 0 3 5	≈ 1
B .	0 . 0 4 5	0 . 8 4 8	0 . 0 3 4	0 . 0 4 5	0 . 0 2 7	≈ 1
C .	0 . 0 2 9	0 . 0 1 9	0 . 8 8 5	0 . 0 2 9	0 . 0 3 8	≈ 1
D .	0 . 0 2 2	0 . 0 2 6	0 . 0 4 4	0 . 8 8 7	0 . 0 2 2	≈ 1
E .	0 . 0 3 6	0 . 0 4 0	0 . 0 5 0	0 . 0 2 0	0 . 8 5 4	≈ 1

This matrix is the basis for forecasting the future cash deposits of each of the sample banks. In this case, the following mathematical relationship is used:

)<sup>9</sup>(

(9) AL- Fadhel, Mo'ied A. AL- Hussien, "Quantitative and qualitative models in rationalizing the decisions of the Organization" , previous Source 2006.



The size of bank deposits in the current period	=	The volume of deposits of the bank at the beginning of the period
		A total volume of cash deposits of banks at the beginning of the time period

During the follow-up of the data in the banks' sample study, and based on the requirements of the application of Markov chains mentioned earlier, in particular, paragraph (4), the:

**First:** The size of the bank's cash deposits (A) in late 2017 is equal to the volume of cash deposits at the beginning of 2018, especially in January.

**Second:** The size of the C cash deposits in late 2017 is equal to the volume of cash deposits at the beginning of 2018, especially in January.

**Thirdly:** The size of C cash deposits in late 2017 is equal to the volume of cash deposits at the beginning of 2018, especially in January.

**Forth:** The size of the bank's cash deposits in late 2017 is equal to the volume of cash deposits at the beginning of 2018, especially in January.

**Fifth:** The size of the bank's cash deposits in late 2017 is equal to the volume of cash deposits at the beginning of 2018, especially in January.

These deposits in the size of deposits for each of the five banks form with some of the following rows:

A	B	C	D	E
0 . 1 8 6	0 . 1 8 6	0 . 2 2 0	0 . 1 9 5	0 . 2 1 2

This row is for the first month of January 2018. In order to calculate the expected shares for the following months, the row above is multiplied by the previous transition probability matrix as follows:

( 0 . 1	0 . 8 3 6	0 . 0 4 7	0 . 0 2 3	0 . 0 5 0	0 . 0 3 5	0 . 2 1 2 )
	0 . 0 4 5	0 . 8 4 8	0 . 0 3 4	0 . 0 4 5	0 . 0 2 7	
	0 . 6 0 2 9	0 . 0 8 1 0	0 . 8 2 5 2	0 . 0 0 2 9	0 . 0 3 5 8	
	0 . 0 2 2	0 . 0 2 6	0 . 0 4 4	0 . 8 8 7	0 . 0 2 2	
	0 . 0 3 6	0 . 0 4 0	0 . 0 5 0	0 . 0 2 0	0 . 8 5 4	

The calculations for each of the banks are as follows:

**1. Calculating the volume of cash deposits of Bank A. for February 2010:**

$$[(0.186)(0.836)+(0.186)(0.045)+(0.220)(0.029)+(0.195)(0.022)+(0.212)(0.036)] = 0.155 + 0.008 + 0.006 + 0.004 + 0.008 = 0.181$$

**2. Calculating the volume of cash deposits of Bank B. for February 2010:**

$$0.186(0.047)+0.186(0.848)+(0.220)(0.019)+(0.195)(0.026)+(0.212)(0.040) = 0.009 + 0.158 + 0.004 + 0.005 + 0.009 = 0.185$$

**3. Calculating the volume of cash deposits of Bank C. for February 2010:**

$$[(0.186)(0.023)+(0.186)(0.034)+(0.220)(0.885)+(0.195)(0.043)+(0.212)(0.050)] = 0.004 + 0.006 + 0.195 + 0.008 + 0.011 = 0.224$$

**4. Calculating the volume of cash deposits of Bank D. for February 2010:**

$$[(0.186)(0.050)+(0.186)(0.045)+(0.220)(0.029)+(0.195)(0.884)+(0.212)(0.050)] = 0.207$$

**5. Calculating the volume of cash deposits of Bank E. for February 2010:**

$$[(0.186)(0.035)+(0.186)(0.027)+(0.220)(0.022)+(0.195)(0.022)+(0.212)(0.854)] = 0.202$$

The previous values constitute a new row for the month of February 2012 as follows:

A	B	C	D	E
0 . 1 8 1	0 . 1 8 5	0 . 2 2 4	0 . 2 0 7	0 . 2 0 2

In the same way, the volume of deposits for March 2010 are calculated. This row is multiplied by the previous transition probability matrix. It is worth noting that the total values of the previous row for January, as well as the total value of the row for February, should be equal to one.:

$$0.186 + 0.186 + 0.220 + 0.195 + 0.212 = 0.999 \approx 1$$

$$0.181 + 0.185 + 0.224 + 0.207 + 0.202 = 0.999 \approx 1$$

These results can be explained as follows:

If there were 1,000 cash deposits, the bank's share (A, C) = 186 cash deposits for each, while the bank's share (C) = 220 deposit, bank share (D) = 195 deposit, 212 deposit, and so on for the following months.

It is clear that the banks' management must identify the reasons for achieving these results through their rational decisions to manage their financial resources as best as possible by working to raise the quality of the banking service product, thus attracting cash deposits, The various financial withdrawals described above and the following table (4) illustrate this:

**Table 4:** Expected cash deposits and their corresponding expected and unexpected cash withdrawals for the same year 2018.

	Unexpected or unexpected cash withdrawals for 2018	Cash deposits expected for 2018
<small>Cash withdrawals are expected or unexpected for each of the months during the year and according to the needs of business under different environment states</small>	For the month of January For the month of February For the month of March • • •	For the month of January For the month of February For the month of March • •
	<b>E n d o f y e a r</b>	<b>E n d o f y e a r</b>

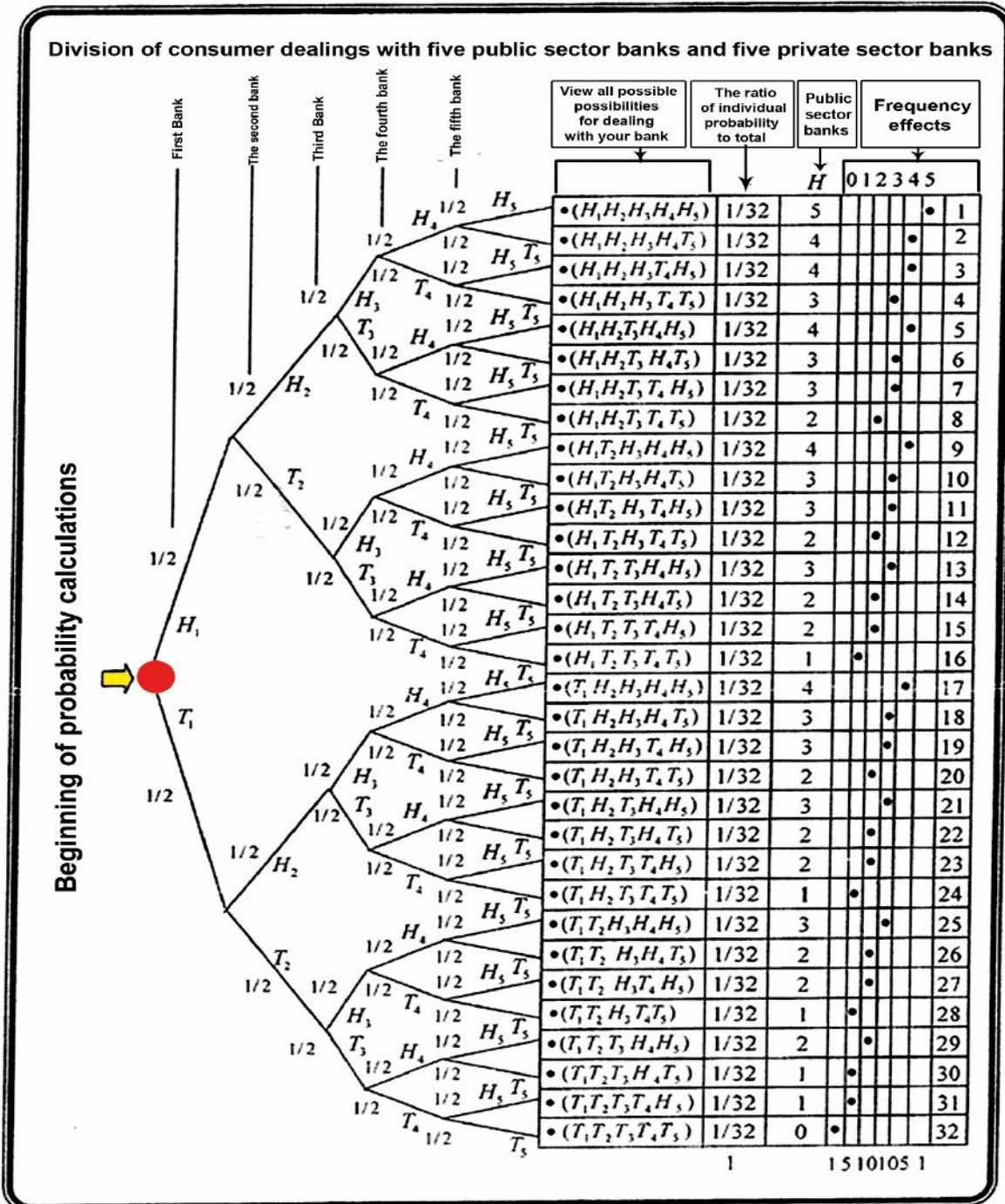
Thus, the management of the banks sample of the study has quantitative indicators to assist in the completion of decisions regarding the response to cash withdrawals both expected and unexpected, and therefore all of the results are reached by the researcher through the practical side, it demonstrates the difference with the three main hypotheses of the study.

***Probability calculations for the study problem***

The customer, whether private, public, or individual, has a wide range of options (32), as shown in figure (8) below, which represents the number of probabilities in case of dealing with Private and public sector banks<sup>(10)</sup>.

(10) Here are the public sector banks for comparison only graphically.

**Figure 8.** Calculation of the number of probabilities in the case of consumer dealings with private sector banks (T) and public sector banks (H).



**The final balance of cash deposits:**

The maximum balance of the number of cash deposits earned and the number of deposits lost from each bank can be presented in table (5) below:

**Table 5:** The final balance of the volume of cash deposits ("amounts in dollars").

The bank	A volume of loss deposits	The size of deposit earning
A .	1 4 4 \$	1 2 6 \$
B .	1 3 4 \$	1 3 4 \$
C .	1 2 0 \$	1 4 0 \$
D .	1 0 4 \$	1 3 4 \$
E .	1 4 6 \$	1 1 4 \$
T o t a l	6 4 8 \$	6 4 8 \$

**The fourth topic: conclusions and recommendations**

**1.4 Conclusions:** Through the course of the study and the results reached, the researcher reached the following conclusions:

1. The Markov chain method is one of the methods that serves the decision maker in banks to determine the future impact on the size of cash deposits for the coming months of the year.
2. There is a possibility to program this method, which is included in the quantitative methods package in the program Win Q.S.C, where the decision-maker can rely on this program after the details of the current study, the mechanism on which this method is based.
3. Sample banks may use this method to rationalize their decisions to determine the size of cash deposits in any month of the coming year to meet cash withdrawals by customers.
4. The cash deposits of the banks' sample study were in a state of development and growth month after month, and these banks compete with each other for the acquisition of the largest possible amount of these deposits.
5. The calculated transition probability matrix is the basis for the process of estimating and calculating the expected share of cash deposits for customers.

**2.4 Recommendations:** Based on the above conclusions, the study recommends the following:

1. The need to stay away from the method of intuition and guessing in the process of forecasting the size of cash deposits and the orientation to scientific methods, including the Markov chains.
2. It is necessary to train cadres who can use this method and continue to communicate with the process of determining the size of cash deposits to meet the expected and unexpected withdrawals.



3. It is imperative to pay attention to the issue of competition in the market, by following up the activity of other banks for the size of the market share of deposits for each of the competing sample study banks.

4. To prepare the necessary software requirements for this purpose, such as WinQ.S.C - Amos V.18 - SPSS - Minitab V.17, especially when the bank faces a large volume of cash deposits and is required for longer periods of time.

5. The management of sample banks requires further study to focus on providing two quantitative tools within the Markov chains method, namely:

1. Transition Probability Matrix.
2. Profit and loss matrix for cash deposits.

The availability of these tools will push the implementation of the Markov analysis method in a continuous manner, in order to serve the expectation of the size of the cash deposits.



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