

The Arab American University Faculty of Graduate Studies

Money Demand Determinants Model in Palestine during the Period: 3rd Quarter Year 2009 to 4th Quarter Year 2020

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DEDICATION

I dedicate this thesis to my family and many friends that have helped me throughout my university journey. Their continuous support gave me the motivation I needed to push through my academic years at Arab American University.

Abstract

This research studies the demand for money and its stability in Palestine by comparing narrow and broad money respectively where the main goal is to stimulate economic growth using the required monetary policies. Hence, if money demand changes are predictable then money supply targeting could be a reliable strategy to attain a stable inflation rate.

The autoregressive distributed lag (ARDL) method was adopted to explain the cointegration framework using time series data over the period 2009Q3- 2020Q4 taken from the Palestinian monetary authority and Jordanian central bank.

The bounds testing result show that only a short-run relationship exists between money demand and its explanatory variables: real income and nominal interest rate. The error correction model (ECM) reveals the sign of each variable, the coefficient of real income appears to be negatively inelastic not as expected, while the real interest rate coefficient is negatively inelastic; this indicates that households fear to invest in this course of the economy, where the precautionary motive for holding money is very high.

The risk of investment comes from not having a domestic currency which creates an uncertain environment for all economic agents, hereby restricting the Palestinian monetary authority to use the required monetary tools to control inflation rates and drive economic growth thus stabilizing the economy.

Finally, the study reveals that money demand function is not stable in Palestine, and hence the monetary authority should use interest rate as the most appropriate instrument for the conduct of monetary policy, whereas real output does not respond instantaneously to an increase in the money supply. The research also recommends the Monetary Authority to target inflation by moving reserve requirements, as they could influence the amount of bank lending to sustain a financial stability in Palestine.

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Chapter One

General Framework of the Study

1.1 Introduction

One of the most researched macroeconomic relations is the money demand function, intended to help the monetary authority understand what motivates financial agents. Therefore, the monetary authority can decide under specific economic conditions which monetary objectives and policies are recommended. The money demand stability function indicates that the supply of money has a potential effect on both economic activity and inflation. A stable demand for money here demonstrates the efficiency with which monetary aggregates are used when carrying out monetary policy.

The Palestinian market has suffered by the absence of a national currency, where trading using shekel as main currency is in favour of Israel's economy and beneficial to its interests, moreover being dependent on three foreign currencies (shekel, dinar and dollar) makes the domestic market vulnerable to the fluctuations of their exchange rates, which in result affects domestically the inflation rate, investment level and economic growth, therefor the Palestinian authority could issue their own currency in order to be able to stimulate the economy through the establishment of monetary policies.

Monetary policies are set by the central banks to control the money supply in an economy; they could do so by increasing or decreasing the interest rate, required reserves and open market operations, thus they will be able to control the price level, inflation, exchange rates and the business cycle, but this could not be achieved without the integration between money supply and money demand, where the demand for money is the desire of households to hold money in the form of cash so they can exchange goods and services easily, which means that money has the advantage of liquidity over any other asset, this is why demand for money is sometimes called demand for liquidity in regard of its purchasing power utility.

In addition to the supply of money variable, the demand for money is a prominent key factor in developing effective monetary policies that contribute to price stability, money liquidity, inflation rate, monetary stability, economic growth, employment and a better balance of payments, for this purpose there should be a clear vision of its implications and how it can be controlled by the monetary authority.

1.2 Problem Statement

This research is looking to estimate money demand model in Palestine, and investigate the economic relationship among variables.

1.3 Research Questions

In particular, this study is conducted to answer the following questions:

- 1. What are the main variables that affect the demand for money in Palestine?
- 2. How can we estimate the money demand function?
- 3. Is money demand stable in Palestine?
- 4. To what extent the GDP affects the demand for money; is the demand for money elastic for the GDP?
- 5. To what extent the interest rate affects the demand for money; is the demand for money elastic for the interest rate?

1.4 Objectives of the study

This research aims to estimate the demand for money by analyzing the relationship between money demand and its determinants here in Palestine by understanding both its nature and size, as not much attention had been given to the subject before, this can be achieved by:

- 1. Determining the variables that affects the demand for money in Palestine
- 2. Use a scientific method to estimate the money demand function
- 3. Test the stability of money demand functions
- 4. Show the effect of GDP on the demand for real money
- 5. Show the effect of real interest rate on the demand for real money.

1.5 Importance of the study

The examination of demand for money stability has multiple implications. It helps to choose a monetary policy appropriately because instable money demand is a major factor in the preference of liquidity .Secondly, a stable demand for money implies a stable money multiplier that guarantees a correct prediction of the effects on aggregate income from money supply shocks. Finally, money demand stability provides valuable information about the link between money and inflation.

Nevertheless, that we are economically occupied and left without a national currency in which the Palestine monetary authority have no hand over the control of money, the desire of this research is to obtain logical results that justify the current economic situation, concerning the stability of money demand that would assure the implementation of an effective monetary policies managed by the Palestinian monetary authority.

So, for clarification if the central bank decides to implement expansionary monetary policy to boost the economic activity, it will keep interest rate low to ensure price stability and encourage borrowing, although none of this will be effective if they didn't have a clear and accurate illustration of money demand size and its stability (Corker, 1991)

Not to forget that the results of this study will be crucial in further economic analysis and may help the ministries of finance and economics to more deeply understand the nature of money demand determinants, so they can keep them under control and thus be able to hold a stable economic environment that would be beneficial to encourage developmental projects and attract foreign investments.

Palestinian Monetary authority (PMA) should be able to control inflation and stability of our future currency and decreasing the cost of using many currencies, as the complexity of dealing with three main different currencies and not having control over its flows, makes having independent monetary policies for the Palestinian country far from possible, where obtaining relevant data may be both inaccurate and inefficient to make such statistics that could help in choosing the right policy to be implemented.

Furthermore, the escalation of money demand is now considered as one of the main indicators that reveal the economic improvements for a country, so many theories have been developed to study the demand for money function using several methodologies that express the economist's view of money demand determinants, more specifically, monitoring such determinants would help the established policies by the concerned authorities to target the growth of the economy effectively.

Since no prior related research was made regarding the Palestinian economy, this study aims to give some recommendations that will help policy makers to take effective decisions and hence maintain a stable economy.

1.6 Contents of the study

This study consists of five chapters. Chapter one includes six sections: introduction, problem, research questions, objectives of the study, importance of the study, and finally the contents of the study. Chapter two covers the theoretical framework and a literature review of previous studies that are relevant to the main topic, chapter three contains a detailed description of the methodology used by addressing the type of data and the selection of variables that formulate the functional model of this study, Chapter four analyzes the data statistically by testing the main research hypothesis, Chapter five gives the final conclusions of the study and the recommendations that are to be addressed to the respective authorities.

1.7 Limitation of the study

While calculating both narrow and broad money, the study used an estimated currency in circulation data done by the Palestinian monetary authority.

In addition, the study has only considered real income and interest rate as dependent variables in an open economy like Palestine.

1.8 Definitions of terms

Serial Correlation: Serial correlation occurs in a time series when a variable and a lagged version of itself (for instance a variable at times T and at T-1) are observed to be correlated with one another over periods of time.1

Cointegration: is a statistical method used to test the correlation between two or more non-stationary time series in the long-run or for a specified time period.2

¹ https://www.investopedia.com/terms/s/serial-correlation.asp

Chapter Two

Theoretical framework and literature review

2.1 Concept of money

Money that is measured in terms of narrow money called M1, includes coins and notes in circulation, checkable deposits and other money equivalents that are readily convertible into cash, while near money called M2, includes M1plus savings deposits, money market securities, mutual funds and other time deposits that are less liquid than M1 which makes M2 less accepted as an exchange medium.

2.2 Money functions

2.2.1 (Traditional view) Money was created to support market development by providing three main functions: medium of exchange, store of value and unite of account.

- 1. Medium of exchange : the most important role of money is to facilitate the transaction procedure of goods and services, using old bartering system is both difficult and inefficient, as you have to possess a good or a service of equal value that is also in the desire of the other supplier, otherwise trade won't occur, another issue is the transportation of these goods, e.g. trading a cow would make transaction mobility very difficult, money in its new form overcomes both issues stated above, as it also neglects the possibility for both issues to happen at the same time.
- 2. Store of value : in order to make the first function effective, money has to act as a store of value, where it can retain its value in other trades and thus fulfill the needs of the second party whom you want to trade with , again the bartering system has failed to achieve that, where some goods have a

² https://www.wallstreetmojo.com/cointegration/

validity period as it would become worthless if it gets expired like food, money for that was created so it can store its own value and still be acceptably traded at any time and everywhere which gives it the feature of liquidity.

3. Unit of account: money also serves as unite function as it unifies all the measures of the values of exchangeable goods and services, as it answers the question of how much of the good to purchase, supply or trade with another good.

2.2.2 (Modern view) As mentioned earlier, money's primary goal is to develop the market system by providing an ease of use to all people practicing economical activities in favour of their own benefit, therefore economist have exploited from previous basic functions to make a balanced market system:

- 1. Money is used to finance investments that provide jobs and productivity by making use of the country's resources and to encourage economic activities that contribute to more employment and growth.
- 2. Redistribution of income is very important to the balance of the economy, where money is lent to those who are in need as they can benefit from this supply of money to develop their businesses and also to the lender who gains an interest for lending such amount of money.

2.3 Demand for money theories

The study of money effect on the economy is called monetary theory, this section describes four main theories of money demand and how they evolved:

2.3.1 The Classical Theory

The classical quantity theory of money was developed in the ninetieth and early twentieth centuries by Irving Fisher stating that the nominal income is solely determined by movements in the quantity of money, as it tells us exactly how much money is held for a given amount of income (Fisher, 1911).

In general, the theory discusses the inverse relationship between the quantity of money and its purchasing power, whereas the quantity of money increases, the monetary units (shekel, dollar...) tend to buy fewer amounts of goods and services than before.

The link between money supply (quantity of money) and consumption of goods and services, lead us to a new concept called the velocity of money, which by definition is the average number of times per year that a monetary unit is spent used to buy goods and services produced in the economy.

By equation:

$$V = \frac{Total \ consumption}{Money \ supply} = \frac{P.Y}{M}$$

Where the price levels (P) and the real income(Y) are both determinants of household consumption, however nominal GDP is the measure used to estimate the spending on goods and services.

The previous equation is rearranged to obtain Fisher's equation of exchange:

$$M.V = P.Y$$

The equation states that the quantity of money multiplied by number of times this money is spent in a given year must equal to nominal GDP (PY). So according to Fisher theory, the demand form money is determined by the level of transactions generated by the level of nominal income or GDP (P.Y) only, while not considering interest rate as explanatory variable.

In further details the theory implies that if money supply (M) doubles then the price level (P) must also double in the short run while holding velocity of money (V) and real income(Y) as constants.

2.3.2 The Neo-Classical Theory

The Neo-classical theory given by the British economist Marshall and Pigou discusses that money doesn't serve only as a medium of exchange but also as a store of value, the theory here came to explain what Fisher has failed to, which is why people hold money, as it is not possible to say that velocity of money will remain constant when money supply changes.

The theory mainly focused on the behavior of household to choose the amount of money in trading assuming that the demand for real balances (Md/P) is proportional to the level of income for each individual, so the price level here is only affected by the part of money household desire to hold in the form of cash for transaction purpose and not by MV as suggested in the earlier theory.

The Cambridge demand equation for money is
$$\frac{Md}{P} = KY$$

Where money demand (MD) must equal money supply at equilibrium in a market, (k) is the constant that's shows the proportion of money income held by households in form of currency and bank deposits (Aspromourgos, 1986).

2.3.3 The Keynesian Theory

Although the neo classical theory recognized that there are other factors influencing the demand for money proportion like interest rate, it failed to incorporate it systemically in the analysis, the credit goes to the great economist Keynes as he examined the link between the demand for real balances (MD/P) and the interest rate (i).

Keynes in his book "The General Theory of Employment and Money (1937)" gives another term for money demand called liquidity preference as he viewed that money has a ready purchasing power and can be converted into any commodity when desired.

Therefore Keynes established three main motives for why money is demanded, the first primary reason is the transaction motive where money is demanded to meet the daily needs of goods and services, second is the precautionary motive believing that every individual has to save some money for unexpected expenses or future obligations in which he or she won't have to sell an asset to meet his commitments, and finally the speculative motive, which is to hold money to exploit from upcoming investment opportunities regarding the interest rate.(Keynes, 1937).

This brief description indicates that money demand will depend positively on both the price level and the economic activities due to the first two motives while not surprisingly will depend negatively on the interest rate as discussed in the speculative motive which shows the opportunity cost of holding money. The demand for transaction and precautionary money is proportional to the level of income f(Y), while demand for speculative money is inversely proportional to the interest rate f (i)

Keynes derived equation is
$$\frac{Md}{P} = f(Y, i)$$

The demand for real money balances is positively related with the real income, but negatively related to the interest rate.

The money demand determinants are:

- 1. National income, where people would have higher ability to spend on goods and services.
- 2. The frequency getting paid, as there would be little need to hold money for precautionary purpose

- 3. Interest rate, cost of borrowing will be high so the demand for money will decrease, savings will increase for a higher rate of return, so money demand will decrease even more.
- 4. Seasonal fluctuations, in Christmas for example people tend to buy more gifts, so the demand for money will increase
- 5. Expectations about prices, if households expect the inflation rate to get higher, they will prefer to spend now before the actual inflation of prices, and thus money demand will increase.
- 6. Expectations about interest rate, so if households expect the interest rate to get higher by time, they will prefer to borrow now than later, thus money demand will increase.

Moreover, Keynes through his theory made a real revolution in the history of economic thought, as he believed in the importance of money role in making significant changes to the economic situation, while the old theories have sufficed to think that money demand is nothing more than an indicator.

Keynes sought that the changes in the quantity of money affect directly other economic variables like production, investment, consumption and savings in which they contribute to the total balance of the economic market system, for example the shifts of price levels in such economy which are due to the changes of the quantity of money are just reflections of employment and GDP levels.

2.3.4 Friedman's Theory

Milton Friedman developed the modern quantity theory of money demand in 1956, believing that money demand is influenced by the same factors that affect the demand for any ordinary asset.

Keynes was criticized for his view on speculative demand for money for saying that people hold all their wealth either in form of money or bonds depending on the expectations regarding the future interest rate, so he failed to explain how an individual diversifies his portfolio between money and bonds at the same time as a store of wealth.

The theory of asset demand indicates that wealth and expectations about other asset returns relative to the expected return on money should act as explanatory variables in the money demand function, from this reasoning Friedman expressed his formula as:

 $\frac{Md}{P} = f(Y_{p}, r_{b} - r_{m}, r_{e} - r_{m}, \pi^{e} - r_{m}) \text{ where }$

 $\frac{Md}{P}$: The demand for real money balances

Y_p: the permanent income

rb: is the expected return on bonds

r_m: the expected return on money

re: the expected return on equity (common stocks)

 π^{e} : the expected inflation rate

Money demand is positively related to permanent income which is Friedman's measure of wealth to support the stability of money demand function better than taking the current income, so there won't be a lot of fluctuation in money demand, permanent income can be measured as the expected average long-run income (Friedman, 1970).

The other variables in Friedman's money demand function shows the opportunity cost of holding money, where the returns on bonds, stocks and goods relative to the expected return on money $(r_b - r_m, r_e - r_m)$, and $\pi^e - r_m$), are negatively related to the demand for money, so the higher returns means the lower the

quantity of money demanded, note the Friedman didn't assume the return on money to be zero as it depends on the services provided on bank deposits like bill paying and check cashing, and also on the interest on checkable deposits (Friedman, 1987).

2.4 Literature Review

This section puts a spotlight on previous studies that share the same theoretical views about money demand function despite the different methodological approaches the researchers intended to use to reach their purpose, as for example the study of Anwar and Asghar (2012) entitled 'Is Demand For Money Stable In Pakistan' aimed to conduct analysis regarding the long run relationship between money demand, inflation rate, real income and exchange rate using ARDL approach, while in another study of "Inflation Expectations and the Demand for Money in Iceland", the research focused only on the regression analysis that defines the relationship between inflation and money demand as it has been an interesting subject to investigate, the specifications of the money demand function are estimated using time series data, to find out later that the appropriate measure to estimate the scale variable was the real income in which various forms of expected income forms through experiments did not improve the results, furthermore the study have used inflation rate to show lately the significant inverse relationship between inflation rate and real money balances and most notably that the income elasticity of money demand is inelastic (Eggertsson, 1982). In another literature relevant to the research problem 'Seasonal fluctuations and the demand for money', The aim was to study the money demand function by observing the changes in the level of transactions in reference to the seasonal fluctuations, the data was collected among different countries where several measures have been evaluated in estimating the money demand function, the research showed that consumption expenditure on service and non-durable goods resembles most of the seasonal fluctuations transactions and superior to other measures noticing that the transaction elasticity of the demand for money is also inelastic (Faig, 1989), back to the Pakistan

stability inquiry, the results revealed that M2 is cointegrated and have a stable relationship with its determinants where the study suggests that monetary authorities have to focus only on long run stabilization policies.

Dritsakis (2010) inspected the demand for money in Hungary using (ARDL) cointegration framework, where the results showed a stable and cointigrated long run relationship between money demand and it determinants : inflation rate, real income and nominal exchange rate , the empirical study indicates that the real income coefficient is positively related to the demand for money while the inflation rate and nominal exchange rate are negative, which mean that the depreciation of the domestic currency decreases the money demand. Singh (2010) analyzed narrow money (M1) demand functions for the Pacific Island countries using time series data from (1974 to 2004) , he used Johansen maximum likelihood (JML) technique to estimate the demand for money function, the results suggest that the real income, nominal interest rate and real narrow money are cointegrated, where the stability test results show that money demand function for Pacific Island countries are stable, thus monetary authorities are able to target money supply in applying their monetary policies.

Ozdemir (2013), investigated whether considering uncertainty variables in the money demand function can create a stable relationship in Turkey, proved by the cointegrated VAR methodology, appropriate measurement of uncertainty is significant in estimating a stable demand for money function for Turkey. Civcir (2003) studied the relationship between money, real income, interest rates, inflation and expected exchange rate and its constancy by taking into account the financial crisis, the findings reveal that the expected exchange rate is statistically significant in the demand for money equation, the constancy results show that inflation and income effects are smaller in the short run than long run, however the demand for money in Turkey is stable, despite the financial reform and deregulation of financial market.

Hossain (1994) analyzed the demand for money function by applying Johansen cointegration approach using data period 1951-1991, where the outcomes of the literature revealed that there was a cointegration relationship between real money balances and its determinants. The study also showed that M1 is more stable than the M2, so it's more appropriate to take M1 when targeting monetary policies. Cheong Tang (2007), investigated empirically the demand for money formula for 5 Southeast Asian countries: Thailand, Malaysia, Singapore, Indonesia, and the Philippines, the research reveals that M2 ,real expenditure components, inflation rate , and exchange rate are cointegrated for the Philippines, Singapore and Malaysia by following the ARDL modeling approach.

Arize and Nam (2012) examined the effect of exchange rate changes on the demand for money for seven countries by taking the period 1973-2009. The study noticed that exchange rate has a positive sign while domestic interest rates have negative impact on the demand for money in all the countries. The study also suggests that broad money should be considered in achieving the desired objectives. Bahmani Oskooee (2009) addressed the money demand stability for 21 African countries over the period 1971-2004, the author used cointegration and error correction modeling for his study, the results showed that M2 money demand is stable, which could be due to the short-run adjustments in testing for the stability of the long-run elasticity estimates.

Halicioglu and Ugur (2005) studied the stability of money demand function by considering narrow money (M1), the research was applied in Turkey using annual data over the period 1950-2002, as they used cointegration technique proposed by Pesaran et al. (2001) along with the CUSUM and CUSUMSQ stability tests to achieve their objectives, finally they proved that there is a stable money demand function, in which monetary policies can be applied successfully in Turkey.

Chapter Three

Research Methodology

3.1 Data and variables selection

The empirical research of money demand in Palestine is based on data sources obtained from Palestine Monetary Authority (PMA) and the Central Bank of Jordan, the sample taken covers the period 2009Q3-2020Q4 using quarterly data.

3.1.1 ARDL general equation

$$\Delta(\mathbf{Y}_{t}) = \mathbf{C} + \lambda \mathbf{Y}_{t-1} + \beta \mathbf{X}_{t-1} + \sum_{i=1}^{m} a\mathbf{1}, i \ast \Delta(\mathbf{Y}_{t-i}) + \sum_{i=0}^{m} a\mathbf{2}, i \ast \Delta(\mathbf{X}_{t-i}) + \varepsilon_{t}$$

3.1.2 Research model equation

$$\Delta(\text{Log M/P}_{t}) = \text{C} + \text{B}_{1}(\text{Log M/P})_{t-1} + \text{B}_{2}(\text{Log GDP})_{t-1} + \text{B}_{3}(\text{Log IR})_{t-1} + \sum_{i=1}^{p} \boldsymbol{B}_{4} \Delta(\text{Log M/P}_{t})_{t-i} + \sum_{i=1}^{q} \boldsymbol{B}_{5} \Delta(\text{Log GDP})_{t-i} + \sum_{i=1}^{r} \boldsymbol{B}_{6} \Delta(\text{Log IR})_{t-i} + \varepsilon_{t}$$

M/P: real money demand

GDP: Gross domestic product

IR: interest rate on deposits (weighted average for all currencies)

 Δ : is the first difference operator

C: Constant term

p, q, r: represents the lag order for Log (M/P), Log (GDP) and (IR) respectively.

 ε_t : is the error term

λ : is the error correction term

B_{1.2.3.4.5.6} : are coefficients of considered variables

The Model has six variables, $\sum_{i=1}^{p} B_4 \Delta(\log M/P_t)_{t-i}$ is the lagged dependent variable, while $\sum_{i=1}^{q} B_5 \Delta(\log GDP)_{t-i}$ and $\sum_{i=1}^{r} B_6 \Delta(\log IR)_{t-i}$ are the lagged independent variables, the coefficients of these variables represents the short-term effect of each.

Whereas, (Log M/P) t-1, (Log GDP) t-1, (Log IR) t-1 shows only information about long-run relationship between variables, so in order to derive the long-term coefficients, both B_2 and B_3 are divided by the error correction term B_1 .

This research follows Keynes work, as it interprets the determinants of money demand conveniently, by analyzing the relationship between the demand for real balances $(\frac{Md}{p})$ as dependent variable, and the volume of transactions (Real income) plus the opportunity cost of holding money for households as independent variables.

It's important to identify the correct measure of money thus the monetary policy implied can follow the right path in achieving price stability, from this reasoning money demand is measured in terms of both: narrow money, represented by the monetary aggregate M1 and in terms of near money denoted as M2.

The quantity of money demand at current price levels is chosen to represent the demand for real money balances, symbolized as the fraction of money demand over the price level, which means that the model incorporates an assumption of price homogeneity assuming that money is neutral in the long run, where the desire to hold nominal money balances is proportionally to any changes in price level.

The scale variable (Real GDP) in the demand for money function is used as a measure of transactions for being most comprehensive indicator of general economic activity, where both GDP and price level are united to same base year of 2015.

The opportunity cost is the interest rate forgone on alternative assets ,where nominal interest rate on deposits is considered to be an adequate proxy of the opportunity cost of holding money, and to make the research more inclusive, the weighted average of all currencies is taken into account.

An equation that specifies a linear relationship among the variables gives an approximate description of economic behavior related to the function model, for that a log-linear model is used to illustrate the linear relationship between real money balance and its determinants, however taking the logarithmic form of interest rate is pointless. Finally, based on the above specification the function model can be formulated as:

$$Log(\frac{Md}{P}) = log(real GDP) + (nominal interest rate) + e$$

3.2 Approach

To start with, the research examines the stationary of the data, as to choose the best model that can show significant regression analysis.

Using Augmented Dickey-Fuller test, the non- stationary variables are detected when the computed Z(t)statistic is smaller in magnitude than critical value at 5%, or when p value exceeds the 5% level of significance (Dickey and Fuller, 1979). If results show that data is stationary, the research can proceed with OLS model for being unbiased with minimum variance and most efficient estimator of regression analysis, however, if one of the variables is found to be integrated (non-stationary), variables will not behave as constants as required in OLS, it would show high t values and significant results but in reality those results are inflated because of common time component and are called spurious regression in econometrics, for that another model is addressed to deal with non-stationary variables.

The autoregressive distributed lag (ARDL) model introduced originally by Pesaran and Shin (1999) and further developed by Pesaran (2001), has the advantage to deal with (non-stationary variables); diverging away from their mean over time, suggesting that there is a single long run relationship between the lagged dependent variable and its determinants, also it can estimate the short and long-run dynamic simultaneously.

(ARDL) cointegration model has been chosen since it can be applied for a small sample size (Pesaran, Shin and Smith, 2001). Moreover, ARDL can be used when having variables that are integrated of different order, I(0), I(1) or both but none should be I(2).

Afterwards bound testing is applied to examine the existence of long run relationship.

Hypothesis of ARDL model (bounds testing)

H1: there is cointegration among variables $(\beta 1 \neq \beta 2 \neq \beta 3 \neq 0)$

H0: there is no cointegration among variables ($\beta 1 = \beta 2 = \beta 3 = 0$)

The lower critical bound assumes all the variables are I(0) meaning that the data is stationary, hence there is no cointegration relationship among variables. The upper bound assumes that all the variables are I(1) meaning that there is cointegration between the examined variables. So when F-statistic (Wald test) is greater than the upper bound critical value, H0 is rejected, while if the F-statistic is below the lower bound critical value, then H0 cannot be rejected, and finally when the F-statistics falls between the lower and upper bound, then the results are uncertain, (Pesaran, Shin and Smith, 2001).

From here, the research continuous to investigate the lag length of ARDL mode using Akaike Information Criterion (AIC) to capture the linear autocorrelation among multivariate time series.

Finally, the error correction model is derived from ARDL model to be evaluated and interrupted based on empirical results obtained from main research tests, which approve the significance of the used model and free from suspected errors.

3.3 Hypothesis of the study

Hypothesis of money demand estimation model

Ha: there is positive relationship between real money demand and real GDP but negative relationship with interest rate.

H0: there is negative relationship between real money demand and real GDP but positive relationship with interest rate.

3.4 Expected outcomes

The expected outcomes from this research is to have estimation model for money demand in Palestine and propose certain monetary policies that are data driven to serve the main purpose which is to stimulate economic growth. The study suggests that money demand will depend positively on the level of real GDP due to the demand for transactions. In respect of the 2nd variable, money demand will depend negatively on average interest rates due to speculative concerns (Johansen, 1988).

3.5 Estimations

Unfortunately, the currency in circulation data (which is a component of M1) is not recorded, so the study took the estimate done by the Palestinian monetary authority3, assuming that the Palestinian consumer behavior is relevant to the Jordanian one, thus it has used the data published in the Jordanian central bank to complete the required analysis.

A simple formula is made for the estimation where:

 $CC(PT) = \frac{CC(JD)}{DD(JD)} \times DD(PT)$

CC: currency in circulation

DD: demand deposit (which consist of current and saving accounts)

PT: stands for Palestine

JD: stand for Jordan

³ https://www.pma.ps/ar/Statistics//MonthlyStatisticalBulletin

Chapter Four

Data Analysis and Discussion

This chapter analyses the data required to estimate money demand function in Palestine, including the effect of each independent variable, several tests are addressed to proceed with the research objectives, finally and most important is to check the stability of money demand by interpreting the research empirical results.

Both M1 and M2 are considered through the whole analysis, this is done by developing two separate models, using M1 refers to the first model, while considering M2 refers to the second model), hence informing authorities about such comparable statistics could help in controlling the right stable variables, this can further contribute to implement effective monetary policies.

This paper follows step by step procedure in order to make the research more inclusive, hence model selection and results interpretation can be well justified.

4.1 Unit Root Test

Some conditions must be met before choosing the right model, in this study unit root test is applied using e-views program, more specifically Augmented Dickey- fuller (ADF) test is used to check the stationary of the given variables, where differencing is the way to check the integration order for nonstationary variables.

The theory of ADF test says that when P value is higher than 5% in level, and t- statistical value in magnitude is less than the critical value at 5%, this means that the null hypothesis cannot be rejected, thus variables are non-stationary in this situation.

After applying ADF test using Schwarz criterion (SIC), it turns out that none of (Log M1/P, Log M2/P, LOG Real GDP) variables are in stationary form except for Interest rate which is stationary at level I(0), hence the research will move to the 2nd step of the test, which is taking the first difference for each. Refer to Appendix A.

4.2 Cointegration & model selection

None stationary variables become stationary only after differencing but using differenced variables for regressions leads to loss of relevant long run information, ARDL cointegration technique makes it possible to retrieve the relevant long run information of the relationship between variables , as it integrates short run dynamics with long run equilibrium, this cointegration technique is reliable in giving a meaningful forecast and policy implementation, since it involves realistic estimates of the model.

As mentioned earlier ARDL model can deal with variables of different or same integration order, the existing study shows that all listed variables (Log M1/P, Log M2/P, LOG Real GDP) become stationary at first difference while interest rate is stationary at level, for that ARDL method has been adopted.

Moreover, the ARDL is basically more flexible to small sample sizes than any other techniques, the study has only included 46 observations because of data limits, however, ARDL is chosen as it retains the usual interpretation under stationary even if the variables are I(1) and I(0), (Pesaran and Shin, 1997).

4.3 Bounds Test

Now that research can proceed with ARDL model, considering monetary aggregates (M1), and (M2), the first step to see if there is a single long run relationship between variables, so bounds testing is applied.

Both Hossain (1994) and Khan (1992) documented the stability of the demand for money in Pakistan; they interpreted the results of cointegration as a sign of stable long-run relation.

The Null Hypothesis says that no long run relationships exists among variables, according to the ARDL hypothesis when F- statistic is higher than the upper bound at 5% we reject the null hypothesis, based on the bound testing procedure, the results confirm the theory of null hypothesis, where money demand is not stable in Palestine, (Refer to Appendix B).

4.4 Lag length

The second step of this method is estimating the conditional ECM model from which the long-run and short-run coefficients can be obtained, the lag length of the ARDL model could be chosen by any criteria, but when the sample size is small (less than 60), Akaike Information Criterion (AIC) is recommended for the determination of optimal lags, since it has superiority over any other criteria (Enders 2010); it has the highest adjusted R^2 and also the best scores for estimating the relative quality of statistical models among others, consequently this criteria will behave better.

The lowest (AIC) value shows the lowest number of parameters used (less complexity) and thus the most preferable model with lag length to be considered; AIC is low for models with high log-likelihoods (the model fits the data better). Refer to Appendix C.

4.5 Error Correction Model

The Error Correction Model (ECM) can be derived from ARDL model through a simple linear transformation, which integrates short run adjustments with long run equilibrium without losing long run information, but according to F bound test, there is no long run relationship among variables for both models, so the study will only show the short run model, Refer to Appendix D.

4.6 Interpretations

The ECM results for the short-run reveal that money demand in form of M1 is affected by the lagged value of the dependent variable(log M1/P), Real GDP and interest rate, with lag length of (1,0,0) respectively, hence the model suggests that the demand for real money balances depends on one lag period (quarter) of the dependent variable, which is the current quarter , considering M2 as form of money the model depends exactly on the same lag order as the previous model.

The real GDP in both models has a significant relationship with real money demand, but without a positive sign, and according to Keynes theory any increase in real income would have a positive effect on the demand for real money balances, and hence giving the consumer a higher purchasing power.

According to Appendix D results, the research cannot reject the null hypothesis, where the sign of real GDP is opposite to the research hypothesis, with p < 0.05, therefore, the interpretations for such result present that the Palestinian market is in-efficient, hence available data has sort of distortion, and secondly, this also refers to not having a domestic currency where the demand for money is dependent on the supply of variant foreign currencies that are incontrollable.

Additionally, the study used limited data due to lack of currency circulation component, thus it used estimated CC based on Jordanian trend to proceed with the analysis, Nevertheless, the demand for money can be inform of various assets that households can hold instead of money, this refers to money demand dependency on both risk and return.

Moreover, Palestinian is an open economy, so other limitations are related to other variables that affects the real money demand like cost of living, wealth and inflation. In relation to the economic importance of the obtained coefficients, the modeling of narrow and broad money results reveal that the coefficient of real GDP is inelastic, where money is treated as a necessity and not as a commodity (store of value), this suggests that the demand for real money in both models serve for transaction purposes and not considered as an asset. This is also in align with the study of "Demand for money in Macedonia", (Petrevski and Jovanovski, 2010).

Estimation results of the ARDL model show that interest rate has a negative relationship with both (M1) and (M2) money demand as expected; in other words this relation shows the forgone opportunity of holding money, where any increase in interest rates gives the money holder the motive to invest and get return, hereupon the research rejects the null hypothesis with p value < 0.05.

Regarding interest rate variable, the coefficient value gives indication about liquidity preference for money demand, where as in both models, the money demand is inelastic to changes in interest rate, hence economic agents are not much affected by the change of interest rate; households don't tend to economize on their money holdings.

This means, that both precautionary and transaction motive overtakes the speculative motive for holding money inform of M1 & M2; in other words money is preferably held to cover daily transactions plus securing enough money for contingencies or unforeseen circumstances arising in the course of economy.

Finally, the ECM for both models gives 99% of R^2 value, meaning that 99% of the changes in the dependent variable are explained by the influence of the independent variables . Furthermore, all coefficients in the regression models are statistically significant with p-value less than 5%.

4.7 Research suspected errors

Residual diagnostics are applied to check the validity of the empirical model, so if the regressions results are free of errors this means that such a model is both accurate and highly reliable.

4.7.1 Serial Correlation

"Serial correlation is the relationship between a given variable and itself over various time intervals', and since the research follows the ARDL model, correlation test is crucial, where the major assumption in ARDL is that enough lags have been used to handle endogeneity and autocorrelation.

The null hypothesis says: that no serial correlation exists

Table 4.5 (Model one) Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.80E-05	Prob. F(1,39)	0.9966
Obs*R-squared	2.08E-05	Prob. Chi-Square(1)	0.9964

Table 4.6 (Model two) Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test:				
F-statistic	0.186299	Prob. F(1,39)	0.6684	
Obs*R-squared	0.213938	Prob. Chi-Square(1)	0.6437	

Source: Done by the researcher.

Both models have p-value higher than 5%, so we cannot reject the null hypothesis, meaning that there is no serial correlation among variables.

Another clue about the existence of serial correlation, is that Durbin–Watson test stat is about (2) in both models, meaning that there is no autocorrelation.

4.7.2 Heteroskedasticity

Heteroskedasticity simply refers to data with unequal variability, or when the variance of the error term differs across observations.

This test is important for regression analysis, since data that shows heteroskedasticity will give biased coefficients, and hence the model forecast would be unreliable.

So in order to see whether the error terms are normally distributed, heteroskedasticity test is applied.

The null hypothesis says that the data is **homoscedastic**.

Table 4.7 (Model one) Heteroskedasiticity Test: Breusch-Pagan-Godfrey

F-statistic	1.222964	Prob. F(4.40)	$\begin{array}{c} 0.3164 \\ 0.2973 \\ 0.5008 \end{array}$
Obs*R-scuared	4.903642	Prob. Chi-Sauare(4)	
Scaled explained SS	3.351319	Prob. Chi-Sauare(4)	

Table 4.8 (Model two) Heteroskedasiticity Test: Breusch-Pagan-Godfrey

F-statistic	1.586637	Prob. F(4.40)	0.1966
Obs*R-squared	6.162156	Prob. Chi-Sauare(4)	0.1874
Scaled explained SS	3.877345	Prob. Chi-Sauare(4)	0.4229

Source: Done by the researcher.

Both models have p-value higher than 5%, so we cannot reject the null hypothesis, meaning that the data set has no heteroskedasticity.

4.9 Graphs

The Research includes a graph with brief analysis for each variable, as this would help in observing their

trend over time and thus their effect on the Palestinian economy, Refer to Appendix E.

4.10 CUSUM Test

The CUSUM test was introduced by Brown et al. (1975) for the study of structural change using the cumulative sum of recursive residuals or the cumulative sum of OLS residuals to determine whether there is a structural break, it can be applied to money demand cointegration regression leading to a consistent residual-based test for the ARDL hypothesis of cointegration.

The stability of money demand function is essential to formulate effective monetary policies in which desired objectives can be well achieved, the empirical study tests this stability by incorporating CUSUM and CUSUMSQ tests into cointegration analysis, more precisely these tests are applied to the residuals of each model to test for stability of long run elasticity, with also considering the short run dynamics. In short, CUSUM is used to test the randomness of a sequence series, the graph of CUSUM shows whether the series behaves as ARDL hypothesis has predicted or not.

Refer to Appendix F, Figures (4.7 and 4.8) show that the blue line (CUSUM) is within the two red lines (at 5% of significance), therefore the null hypothesis is rejected, concluding that a stable long-run relationship exists between Real (M1/P, M2/P) and their determinants: real income, interest rates without a structural break.

In (Figures 4.9 and 4.10) the blue lines are within the two red bounds (at 5% of significance), confirming that the parameters of both models are stable on the long-run, thus the study assures that both models are adequate and reliable to be used in forecasting.

Even though both models are stable, the study recommends using the 2nd model which is more inclusive. This final conclusion corresponds with the study entitled "Is Demand for Money Stable in Pakistan" results (Anwar and Asghar, 2012), where broad money is recommended to be used in conducting monetary policies rather than narrow one.

Chapter Five

Conclusions and Recommendations

5.1 Empirical Results

In this research, the demand for money in Palestine has been estimated using the (ARDL) approach to cointegration, the empirical analysis have shown a significant relationship exists between real money demand in both forms (M1, M2) and their determinants; (real income and real interest rate), and hence the both models were used to describe the money demand function.

The ARDL bound test was used to examine the money demand stability in Palestine, whereby the empirical results show that there isn't a long-run relationship between money demand and its determinants, hence the research conclude that money demand is not stable in Palestine as the monetary authority should use interest rate as the most appropriate instrument for the conduct of monetary policy.

The results from the error-correction model revealed a short-run relationship between variables. The sign of real GDP coefficient in both models oppose Kynes theory, in which real income has a positive impact on the demand for real money, this case is similar to a developing country like Rwanda, that has weak financial system and reliant on imports for many of its consumables, Bambujijumugisha, T. (2016).

Again, this indicates that data available has some sort of distortion, where not all cash flows (money supply) are formally incorporated through the authorized financial system. Furthermore, the research acknowledges that unauthorized money supply can be inform of assets and not limited to cash balances only.

In regard of interest rate as explanatory variable, it affects negatively on both dependent variables (M1/P) and (M2/P) for speculative concerns, where if interest rates are likely to rise, the opportunity cost of holding money will be higher, thus diminishing the speculative motive for money demand. Similarly, expectations of high inflation point to a great reduction in the purchasing power of money and consequently reducing the speculative motive of money demand (Steven, 2003).

Moreover, log-linear model results reveal that the demand for real money balances of M1& M2 is inelastic to any changes in the real GDP, meaning that money demand isn't highly affected by the changes of real income, which shows that money is a necessity good that people hold for both precautionary and transaction motive.

Regarding the interest rate inelasticity, the study shows that in case of M1& M2 models, the demand for real money is inelastic to changes in the real interest rate, this justifies the consumer behavior of people as they don't tend to economize on their money holdings when interest rate increase, so the speculative demand for money is minor even after including time deposits account which bears interest.

Relating to money demand theories, it appears that the empirical model supports Baumol-Tobin framework, where people holds money in cash for convenience, but the opportunity cost in terms of forgone interest, which they would have earned if they had deposited this money in saving accounts is very high, in this regards people will hold monetary and non-monetary assets to maximize their utility.

Concerning these models, where demand for money is interest inelastic, the study suggest using monetary policies rather than fiscal policies as they would be more effective in stabilizing the economy, hence an increase in the money supply will cause a significant drop in the interest rate, that in turn will yield for large accelerated influence on investment, consequently income will rise achieving the desired economic growth.

In the absence of having a Palestinian currency, the monetary authority would be able to control inflation by increasing or decreasing the required reserves; lowering the required reserve level will put downward pressure on interest rate which will encourage consumer and business spending thus stimulating economic activity.

Finally, by applying the CUSUM and CUSUMSQ tests, it appears that M1, M2 money demand models are both stable in Palestine, so one might say that M1 is more flexible and easier to control, however it is inadequate method to capture all the information of the financial system.

Therefore, the respective monetary authorities may consider targeting M2 monetary aggregate which seems to be more inclusive with wider range of financial instrument in their conduct of monetary policy; as it statistically contribute in forecasting, evaluating and in stimulating such policies, yet it's less sensitive approach to market operations.

According to this empirical research, the results show that households keep extra money in case unforeseen situation requires a capital outlay with a precautionary motive in order to cover unexpected events, such circumstance are likely to happen in developing countries with unstable economy like Palestine, specially being under occupation without control over its assets, therefore people tend to save extra money to secure themselves for uncertain situations e.g. getting unemployed, pay for medical bills, accidents, war & displacement...

5.2 Recommendations to PMA

1. Regarding money demand stability model, the research suggests to consider M2 money aggregate while conducting monetary policy, which is more stable and inclusive.

- 2. Since real money demand is interest inelastic, using monetary policies e.g. issuing governmental securities can enable the monetary authority to have more control over money supply beside her control over the required reserve rate, but the question here can the government commit the payback.
- In respect of money demand determinants, the research recommends to study the purchasing power of money by considering: cost of living, inflation rate, and wealth and tax rate as main measures.
- 4. With reference to monetary stabilization, additional research should be conducted to examine the issuance of a national currency, since it would enable the Monetary Authority to have a control over the interest rate. And to investigate whether the new currency should have a floating or fixed exchange rate.
- 5. In terms of liquidity management, additional research should be conducted to investigate whether the loans are given for investment or consumption purposes and its effect on managing money liquidity, monetary stability and economic growth.

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Appendix A

Table 4.1 Augmented Dickey–Fuller test

	Unit root I(0)				
Variable	Log (M1/P)	Log (M2/P)	Log Real GDP	Real Interest rate	
T -Statistics at Constant	-1.780802	-1.740185	-2.421842	-3.566330	
P Value	0.6974	0.7166	0.3639	0.0455	
5% Critical Value	-3.513075	-3.513075	-3.513075	-3.523623	

	Unit root I(1)					
Variable	Log (M1/P) Log (M2/P) Log Real GDP Real Inter					
T -Statistics at Constant	-6.921593	-6.977951	-6.526074	-8.028749		
P Value	0	0	0			
5% Critical Value	-3.515523	-3.515523	-3.520787	-3.515523		

Notes:

1. The model for each variable was chosen based on significance level of 5%

Source: Done by the Researcher

Appendix B

Table 4.2 ARDL Bound Test for both Models

		5% Critical value Bounds		
Dependent Variable	F - Statistic	Lower Bound	Upper Bound	
		I (0)	I (1)	
Log M1/P	5.748755	4.87	5.85	
Log M2/P	4.463141			

		5% Critical value Bounds		
Dependent Variable	T - Statistic	Lower Bound	Upper Bound	
		I (0)	I (1)	
Log M1/P	-2.972195			
		-3.41	-3.95	
Log M2/P	-2.581226			

Source: Done by the Researcher

Appendix C

Figure 4.1 First Model lag length selection Criteria:



Figure 4.2 Second Model lag length selection Criteria:





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Appendix D

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG_M1_P(-1)	0.740814	0.087204	8.495207	0.0000
LOG_REAL_GDP	-0.154911	0.061901	-2.502545	0.0165
IR	-0.014606	0.006226	-2.345970	0.0240
С	1.030648	0.331525	3.108813	0.0035
@TREND	0.003671	0.000871	4.214700	0.0001
R-squared	0.993209	Mean dependent var		2.075761
Adjusted R-squared	0.992530	S.D. dependent var		0.113598
S.E. of regression	0.009818	Akaike info criterion		-6.304750
Sum squared resid	0.003856	Schwarz criterion		-6.104010
Log likelihood	146.8569	Hannan-Quinn criter.		-6.229916
F-statistic	1462.606	Durbin-Watson stat		1.922467
Prob(F-statistic)	0.000000			

Table 4.3 Error Correction Representations of ARDL (First Model) (1, 0, 0)

Table 4.4 Error Correction Representations of ARDL (Second Model) (1, 0, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG_M2_P(-1)	0.809043	0.073979	10.93611	0.0000
LOG_REAL_GDP	-0.117730	0.057939	-2.031961	0.0488
IR	-0.011426	0.005596	-2.041660	0.0478
С	0.791328	0.310360	2.549709	0.0147
@TREND	0.002767	0.000715	3.871757	0.0004
R-squared	0.994051	Mean dependent var		2.169902
Adjusted R-squared	0.993457	S.D. dependent var		0.108207
S.E. of regression	0.008753	Akaike info criterion		-6.534403
Sum squared resid	0.003065	Schwarz criterion		-6.333663
Log likelihood	152.0241	Hannan-Quinn criter.		-6.459569
F-statistic	1671.085	Durbin-Watson stat		2.072335
Prob(F-statistic)	0.000000			

Appendix E



Figure 4.3 shows a positive trend over time, meaning that the demand for real money balances (M1) has been increasing, this also display the improvements in economic growth of Palestine with higher

transactions.



Log M2/P

Figure 4.4 shows a positive trend over time, meaning that the real purchasing power of (M2) has been increasing, which is a good indicator of development, where real economic activity is also increasing.



Figure 4.5 shows a positive trend over time, Real GDP is increasing, which is a good indicator of

economic growth for Palestine.



Figure 4.6 shows that interest rate has been increasing, meaning that tight monetary policies are used to control inflation and thus to sustain a stable economy.

Source for Appendix E Figures: E-Views Program

Appendix F

1) Cumulative sum test helps to show if the coefficients of regression are changing systematically.



Figure 4.7 Cumulative Sum of Recursive Residuals (M1/P)

Figure 4.8 Cumulative Sum of Recursive Residuals (M2/P)



2) Cumulative sum of square test is helpful to show if the coefficients of regression are changing suddenly.



Figure 4.9 Cumulative Sum of Squares of Recursive Residuals (M1/P)

Figure 4.10 Cumulative Sum of Squares of Recursive Residuals (M2/P)



Source for Appendix F Figures: E-Views Program

نموذج محددات الطلب على النقود في فلسطين خلال الفترة: الربع الثالث من عام 2009 الى الربع الرابع موذج محددات الطلب على النقود في من عام 2020

الملخص

يدرس هذا البحث الطلب على النقود واستقراره في فلسطين من خلال مقارنة النقود المحددة بدقّة M1 (المقتنيات القابلة للاستهلاك المباشر), و النقود بمعناها الأوسع M2, حيث ان الهدف الرئيسي هو تحفيز النمو الاقتصادي باستخدام السياسات النقدية المطلوبة. ومن ثم ، إذا كانت التغيرات في الطلب على النقود متوقعة ، فإن استهداف عرض النقود يمكن أن يكون استراتيجية موثوقة لتحقيق معدل تضخم مستقر.

تم اعتماد طريقة الانحدار الذاتي للفجوات الزمنية الموزعة (ARDL) لشرح إطار التكامل المشترك باستخدام بيانات السلاسل الزمنية خلال فترة الربع الثالث من عام 2009 الى الربع الرابع من عام 2020 المأخوذة من سلطة النقد الفلسطينية والبنك المركزي الأردني.

تظهر نتيجة اختبار الحدود أنه توجد فقط علاقة قصيرة المدى بين الطلب على النقود ومتغيراته المفسرة: الدخل الحقيقي وسعر الفائدة الاسمي. يكشف نموذج تصحيح الخطأ (ECM) عن علامة كل متغير ، ويبدو أن معامل الدخل الحقيقي غير مرن ومع علاقة سلبية على عكس ما هو متوقع ، في حين أن معامل سعر الفائدة الحقيقي غير مرن بشكل مع علاقة سلبية ؛ وهذا يشير إلى أن الأسر تخشى الاستثمار في هذا المسار من الاقتصاد ، حيث يكون الدافع الاحترازي للاحتفاظ بالمال مرتفعًا للغاية.

تأتي مخاطر الاستثمار من عدم وجود عملة محلية مما يخلق بيئة غير مؤكدة لجميع الوكلاء الاقتصاديين ، هذه بدوره يقيد السلطة النقدية الفلسطينية باستخدام الأدوات النقدية اللازمة للتحكم في معدلات التضخم ودفع النمو الاقتصادي وبالتالي استقرار الاقتصاد. أخيرًا ، كشفت الدراسة أن وظيفة الطلب على النقود غير مستقرة في فلسطين ، وبالتالي يجب على السلطة النقدية أن تستخدم سعر الفائدة كأداة مناسبة لتسيير السياسة النقدية, في حين ان الناتج الحقيقي لا يستجيب بشكل فوري للزيادة في العرض على النقود. كما أوصى البحث بأن تستهدف سلطة النقد التضخم عن طريق تحريك متطلبات الاحتياطي ، حيث يمكن أن تؤثر على حجم الإقراض المصرفي للحفاظ على الاستقرار المالي في فلسطين.