The Effect of Money Supply (M2) on Real Magnitudes in the Economy of Jordan: A Rational Expectations Approach.

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Abstract

This study applies a neo - classical model to test the impact of anticipated and unanticipated growth in money supply (M2) on some key economic variables in the Jordan economy for the period (1968:1 - 1988:4). The model consists of four equations: (i) the money supply growth equation; (ii) the growth in unemployment rate equation; (iii) the real growth in GNP equation; and (iv) the growth in price level equation (inflation rate).

The study investigates the relationships and hypotheses using the two stage least square method which is applied at the first difference logarithm structural equations. The first stage is

applied to the money supply (M2) growth equation in order to divide the actual growth of money supply into anticipated (predicted) and unanticipated (unpredicted) values. The second stage is applied to estimate the reactions of key economic variables (real GNP, growth in price level, and growth in unemployment rate) to the anticipated and unanticipated money supply growth.

The major results of this study can be summarized as follows: (i) anticipated money supply growth, or the systematic policy in the growth of money supply, affects the real key economic variables in the direction of the policy goal, while the unanticipated growth in money supply mostly gives an uncertain direction of its impact on the key economic variables included in the study; (ii) fiscal policies have a greater impact than monetary policies in reducing unemployment rate; and (iii) lagged real GNP growth and price level growth have a strong expansionary impact on money supply, whereas the impact of lagged unemployment rate on the expansion of money supply is rather weak.

ملخص

تم تطبيق نموذج نيوكلاسيكي في هذه الدراسة لاختبار اثر كل من النمو المتوقع والنمو غير المتوقع لعرض النقد (ع٢) على المتغيرات الاقتصادية الكلية للاقتصاد الاردني للفترة (١٩٦٨:١ - ١٩٨٨:٤) ويتكون النموذج من أربع معادلات هي:(١) معادلة نمو عرض النقد (ع٢)،(٢) معادلة نمو الناتج القومي الاجمالي الحقيقي، (٣) معادلة النمو في معدل البطالة، (٤) معادلة النمو في مستوى الاسعار (معدل التضخم).

ولاختبار (فحص) العلاقات والفرضيات، تم استخدام طريقة المربعات الصغرى ذات المرحلتين لتقدير المعادلات البنائية للفرق اللوغاريتمي الأول، وطبقت المرحلة الأولى منها لمعادلة عرض النقد (ع٢) وذلك لتقسيم قيم النمو الفعلي في عرض النقد إلى نمو متوقع ونمو غير متوقع، وطبقت المرحلة الثانية لتقدير معادلات رد الفعل للمتغيرات الاقتصادية الكلية (النمو الحقيقي للناتج القومي الاجمالي، والنمو في مستوى الاسعار، والنمو في معدل البطالة) للنمو المتوقع والنمو غير المتوقع لعرض النقد.

اما ابرز نتائج الدراسة فهي: (١) يؤثر النمو المتوقع لعرض النقد (ع٢) أو النمو المنتظم لعرض النقد على المتغيرات الإقتصادية الكلية باتجاه الاهداف المطلوبة؛ (٢) إن تأثير السياسات المالية في تخفيض النمو في معدل البطالة أفضل من السياسات النقدية؛ (٣) قوة أثر النمو في الناتج القومي الإجمالي الحقيقي والنمو في مستوى الاسعار لفترة سابقة على التوسع في عرض النقد وضعف أثر معدل البطالة لفترة سابقة على التوسع في عرض النقد.

1. Introduction:

Economists generally disagree among themselves about the role of stabilization policy. Nonmonetarists argue that private enterprise economy needs to be stabilized, can be stabilized, and therefore, should be stabilized using both monetary and fiscal policies. Opposed to that argument, the monetarists claim that there is no serious need for stabilization, and even if there is, it cannot be done and will destabilize the economy; moreover, the government should not be trusted with such a task(1). Therfore, monetarists suggest the constant growth rate rule, which implies that money supply should grow at a constant rate(2).

Rational Expectations hypothesis supports the constant growth rate rule. It advocates that economic agents will base their expectations on full knowledge about the economy, therefore, these expectations are always realized(3), and hence, money supply will be neutral in both the short and the long run, i.e., any change in money supply will be directly reflected in a change in the price level(4).

Empirical studies based on rational expectations emphasized the effect of monetary policy on different real magnitudes in the economy, through classifying money supply into predicted and unpredicted components and testing the effect of both components on these magnitudes(5).

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(1) Franco Modigliani, "The Monetarist Controversy of Should We Forsake Stabilization Policies", ***American Economic Review,*** Vol. 69,1977 pp 1 - 2.
(2) Miltion Friedman, "The Role of Monetary Policy", ***American Economic Review*** Vol. 58, 1968, pp 15 - 17.
(3) Thomas Sargent and Neil Wallace, "Rational Expectations And The Theory Of Economic Policy", ***Journal of Monetary Economics,*** Vol. 2, 1976, pp 169 - 183.
(4) Rudiger Dornbusch and Stanley Fischer, ***Macroeconmics,*** 4th. ed. McGraw Hill, NY, 1987, pp 521 - 532.
(5) Peter Kretzmer, "The Cross - Industries Effects of Unanticipated Money in an Equilibrium Cycle Model, "***Journal of Monetary Economics,*** Vol. 1989, pp. 275 - 297.

2. Purpose of the study:

This study aims to investigate the effects of the growth in money supply measured as (M2) on three indicators of the economy of Jordan, viz. real GNP, Unemployment rate and, inflation rate. It also intends to estimate the reaction of these three economic indicators to the anticipated (predicted) and unanticipated (unpredicted) growth in money supply.

3. Methodology:

Empirical estimation of the proposed relations is conducted using the Two Stage Least Square technique (2SLS). In order to minimize estimation bias of the coefficients and to overcome autocorrelation problems, first difference logarithmic structural equations are used.

The money supply equation is estimated in the first stage, then the resultant predicted value is used as a proxy variable for the anticipated part of the money supply, while the residuals are considered as the unanticipated part. In the second stage, reaction functions for real GNP, the inflation rate and the unemployment rate are estimated as functions of both the predicted and unpredicted (residual) parts of money supply.

In estimating the above mentioned relationships, quarterly data is used for the period 1968 - 1988. Acquiring quarterly data for some variables proved to be problematic, therefore, the annual data available for GNP, price level and unemployment rate were transformed into quarterly data using the Diz approach (see appendix 1). Section four presents a descriptive analysis of the main variables included in the study; section five sets for the theoretical and empirical background of the study; section six discusses the empirical results of the reaction functions and the response of the inflation rate, the real GNP and the unemployment rate to money supply changes. The final section presents the conclusions of the studies.

4. Money Supply (M2) and some economic indicators:

Money supply (M2) increased from JD 354.5 million in 1968 to JD 1898.2 million in 1988 at 1980 prices (table 1), this increase reflects an annual average growth rate of 8 %. However, table (2) shows that (M2) growth rate was positive throughout the period of study (1968 - 1988) except the year 1971 wherein the growth rate in (M2) was negative.

During the Three - year plan (1973 - 1975) period, growth rate of (M2) rose sharply in response to the major objective of the plan of reactivating the economy(6). (M2) growth averaged 10.7 annually over the Three - year plan period. The rising trend of M2 growth was sustained during the first five year plan (1976 - 1980). Over this period the annual growth rate of M2 growth assumed a declining trend. This is not surprising as this period was characterized by world recession beginning in the early 1980s which is reflected in a decrease in workers' remittances in addition to sluggish economic activities domestically. The average annual growth of M2 dropped to 7.1 % over this period. In 1986 M2 growth rate shot up again to 10.5 % and further to 14.7 % in 1987, only to sharply dive to 3.8 % in 1988 (see table 2).

Inflation rate averaged 7.8 % per annum over the study period 1968 - 1988. It reached double - digit figures during the subperiod 1973 - 1980 except for 1978. The highest inflation rate recorded was 19.3 % in 1974. During the 3 - year plan period (1973 - 1975) and the first five year plan (1976 - 1980), annual inflation averaged 15.6 % and 11.6 % for the two periods respectively. Prior to and after those two periods, inflation was running at a below the overall average for the whole study period (see table 2).

(6) National Planning Council, ***Three Year Development Plan 1973 -1975*** [N.D]. pp 25 - 33.

Table (1)
Real GNP, Real Money Supply (M2) and Price Level (1968 - 1988), (1980 = 100)

Million JDs

Year	Price Level	Real Money Supply (M2)	Real Gross National Product (GNP)
1968	30.7	354.5	542.2
1969	32.8	362.5	602.4
1970	35.0	369.1	534.6
1971	36.7	368.4	543.8
1972	38.8	378.0	570.3
1973	43.2	407.9	559.4
1974	51.5	426.8	542.4
1875	57.7	499.5	651.2
1976	64.4	587.7	873.7
1977	73.7	634.2	895.3
1978	78.9	768.6	989.4
1979	90.0	859.1	1023.8
1980	100.0	984.8	1190.1
1981	107.7	1095.8	1377.0
1982	115.7	1212.5	1445.9
1983	121.6	1328.4	1456.0
1984	126.3	1392.0	1468.0
1985	130.0	1441.7	1447.1
1986	130.0	1593.7	1476.0
1987	129.8	1827.9	1439.3
1988	138.4	1898.2	1348.4

Source: Central Bank of Jordan, ***Yearly Statistical Series (1964 - 1989)***, Department of Research and Studies, Oct., 1989.

Table (2)

Percentag Real Growth in Gross National Product, Real Growth in Money Supply (M2), Growth in Price Level and Unemployment Rate (1968 - 1988).

Year	Real growth in M2	Real growth in GNP	Unemployment rate	growth in price level
1968	-	-	9.9	-
1969	2.2	11.1	11.8	6.8
1970	1.8	-11.3	13.7	6.7
1971	-0.2	1.7	13.8	4.8
1972	2.6	4.9	14.0	5.7
1973	7.9	-1.9	11.1	11.4
1974	4.6	-3.0	8.0	19.3
1975	17.0	20.1	4.9	12.1
1976	17.7	34.2	1.611.5	
1977	7.9	2.5	2.2	14.5
1978	21.2	10.5	2.9	7.1
1979	11.8	3.5	3.5	14.0
1980	14.6	16.2	3.5	11.1
1981	11.3	15.7	3.9	7.7
1982	10.6	5.0	4.3	7.5
1983	9.6	0.7	4.8	5.1
1984	4.8	0.8	5.4	3.9
1985	3.6	-1.4	6.0	3.0
1986	10.5	2.0	8.0	0.0
1987	14.7	-2.5	8.3	-0.2
1988	3.8	-6.3	9.0	6.6

Source: 1. Central Bank of Jordan, ***Yearly Statistical Series (1964 - 1989)***, Department of Research and Studies, Oct., 1989.
2. Royal Scientific Society, ***Current and Future Jordanian Labour Market***, third part, Dec. 1989.

Table (2) and figure 1 demonstrate that there is a positive relation between M2 growth and a one - year lagged inflation rate for the whole study period except the year 1986. For while M2 increased in 1986, price level remained stable in 1987, This stability, however, is a reflection of the decline in the "real estate and housing" price index that may be attributed to the downturn in that sector. Available evidence shows that residential and non - residential construction had declined from 2,266,000 sq. m. in 1986 to 2,067,000 sq. m. in 1987 reflecting an 8.8 % decline over the course of one year(7). There was also a decline in the "food items" price index, and, albeit to a lesser extent in the "Other items" price index for 1987(8).

The positive relation between M2 growth and the one - year lagged inflation rate is most evidently clear for the years 1973 - 1980.

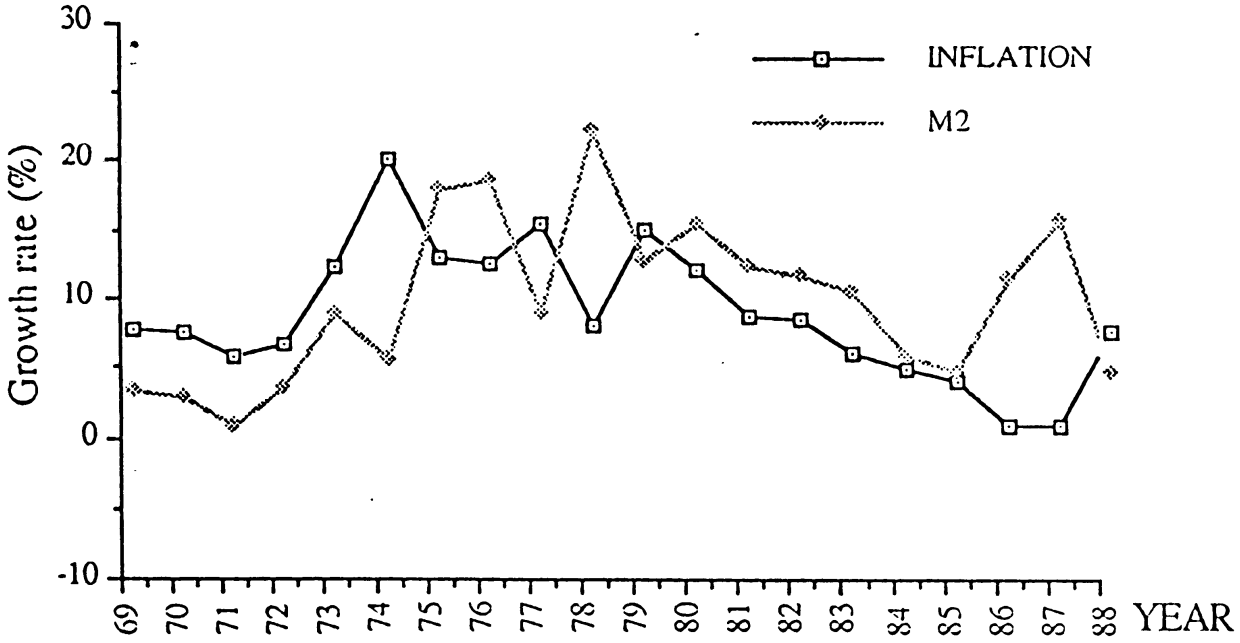

Fig. 1: Real Growth Rate in M2 and Price Level, 1969 - 1988.

(7) For more information see: Central Bank of Jordan, ***Yearly Statistical Series (1964 - 1983)***, Special Issue, table No. 23.
(8) For more information see Central Bank of Jordan, ***Yearly Statistical Series (1964 - 1989)***, Special Issue, Oct. 1989, pp. 60 -61.

Real GNP growth in Jordan averaged 5.125 % over the period 1968 - 1988. But as evident from table (2) this growth fluctuated widely in the subperiod 1974 - 1981 and assumed a declining trend thereafter. In 1970, 1973, 1974, 1985, 1987, and 1988, growth in real GNP was negative.

According to Attfield et.al.'[9] part of the increase in real M2 will lead to an increase in GNP if real M2 growth is not fully expected. Attfield's hypothesis seems to hold for Jordan. Table (2) and figure (2) clearly show that real M2 growth has a positive and direct effect on real GNP growth either in the current year or over a one - year lag. An exception to that is year 1987 where M2 growth was accompanied by a decline in real GNP growth. A large reduction in net factor income from abroad for 1987 may be partly responsible for the actual absolute decline in GNP for that year[10].

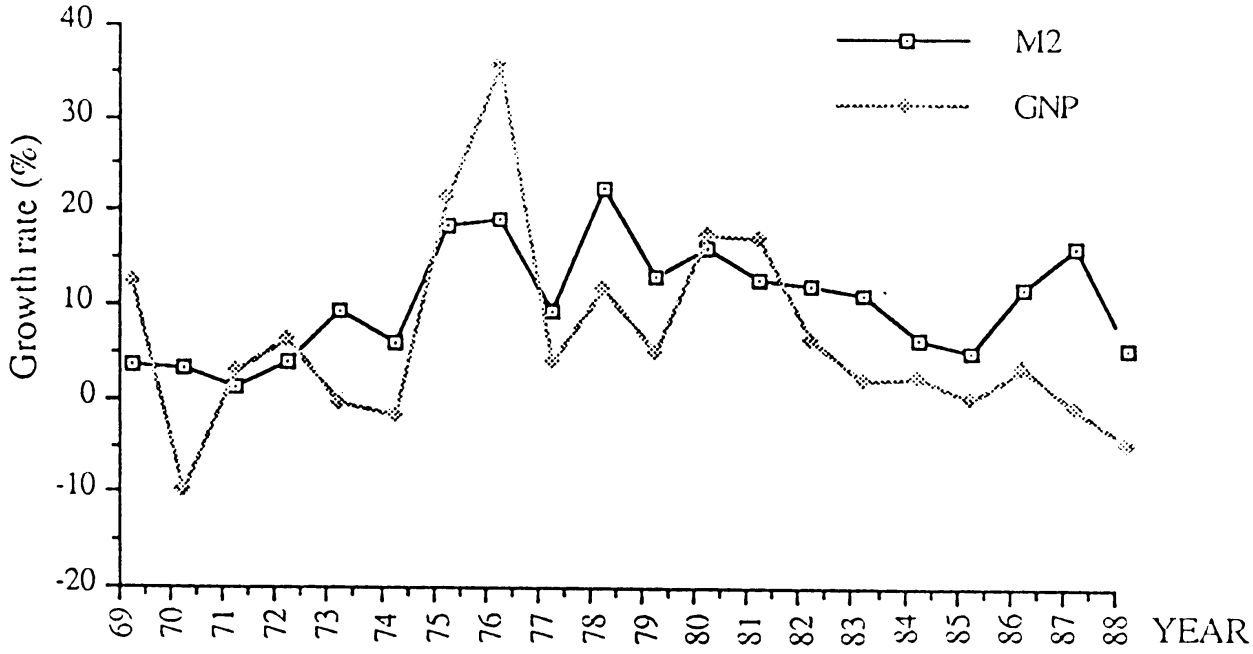

Fig. 2: Real Growth Rate in M2 and GNP, 1969 - 1988.

(9) Attfield et. al., "A Quarterly Model of Unanticipated Monetary Growth, Output and Price Level in UK 1963 - 1978 ." ***Journal of Monetary Economics*** Vol. 8, 1981b,. p. 333.

(10) Net factor income declined from JD - 17.4 million in 1986 to JD - 50.1 million in 1987.

During the study period 1968 - 1988, the highest unemployment rate was recorded in 1972. The late Sixties and early Seventies were characterized by high unemployment (table 2). After 1972, the unemployment rate gradually declined to reach its lowest level of 1.6 % in 1976. This may be a direct result of the 3 - year plan's major objective to create 70,000 new job opportunities[11]. Low and acceptable rates of unemployment were also sustained during the period of the first five year plan that followed. The highest unemployment rate in that period was 3.5 % in 1979 and 1980. The second half of the Seventies witnessed a boom in economic activities and a noticeable increase in emigration of Jordanians to work in the oil - exporting countries in the region[12].

During the Eighties, unemployment rate rose again to reach 9.0 % in 1988 . The increase in unemployment rate in the 1980s may be attributed to a let up in demand for labour caused by sluggish economic activity, and crowding out effect of guest workers[13].

Table (2) and figure (3) reveal a negative relation between real growth in M2 and current and lagged unemployment during the study period except for 1978. In that year, both M2 and unemployment had increased. This may be explained by the large inflow of guest workers[14].

(11) National planning Council, ***Three Year Plan,*** op. cit., p. 25.
(12) The number of Jordanian workers abroad increased from 305.000 . . . in 1979 to 330,000 in 1987, which constitutes 42.9 % of Jordan's total labour force in 1979 and 37.3 % in 1987.
(13) The number of guest workers increased from 41,042 worker in 1979 to 200.000 in 1989.
(14) The average yearly growth of guest workers between 1979 and 1989 was 17.2 %.

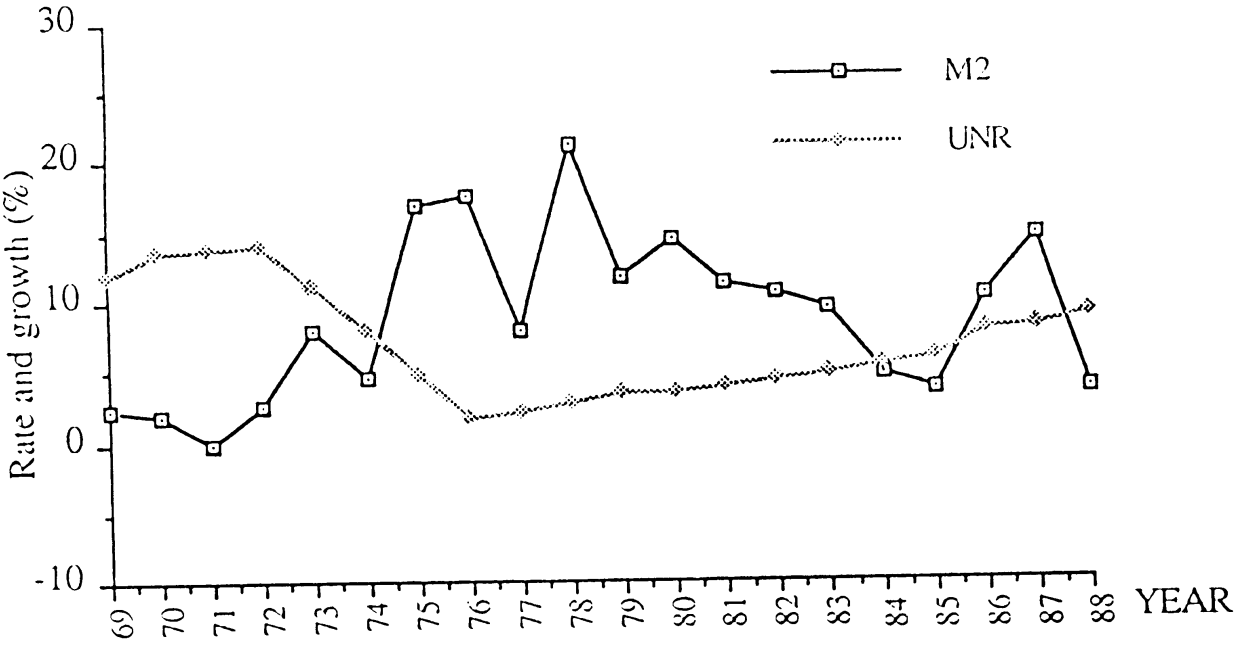

Fig. 3: Unemployment Rate and Real Growth Rate in M2, 1969 - 1988.

To further illustrate the relationship between real growth in M2 and unemployment rate a semi - logarithmic equation was estimated. The general form of the equation is:

$$UNR_t = e^{\infty} + \alpha_1 GM2_t + E_t \quad \text{.....(1)}$$

where:

UNR_t = unemployment rate over time.

$GM2_t$ = real growth in M2.

E_t = error term $\sim (0, \sigma^2)$.

$\alpha 0$, α_1 = parameters to be estimated with the expectation that ($\alpha_1 < 0$).

The result of Estimating equation (1) is:

$$LN (UNR_t) = 2.444 - 0.07533\ M2. \quad \text{.....(2)}$$

SE (0.452) (0.0172)

$R^2 = 0.517$

The estimated equation is significant at all levels. The direction of the relation between real growth in M2 and unemployment rate is indicated by the negative sign of α_1 while its value reflects the real growth M2 elasticity of the rate of unemployment.

5. Review of theory and empirical studies

Most behavioural relations in macroeconomic theory depend to a large extent, on the public's expectations of future changes in economic variables. At the same time in many cases we lack sufficient data on the nature of these expectations. Even when we do have survey or other data which purport to represent expectations, Shiller sceptically suggests that if these expectations are endogenous in a model, then the determination of these expectations must still be modelled[15].

The works of Lucas and Prescott[16], and Grossman[17] proposed the following definition of rational expectations: "in a model in which human behaviour at time t is supposed to depend on the subjective probability distribution held by market participants of future economic variables (not just its mean), rational expectations require that this subjective distribution be the same as the true conditional distribution based on all information available at time *t*". Prior to the development of the rational expectations models, the characterization of the human behaviour in macroeconomic literature depended on simple expectations of future variables. The new assumption that

(15) Robert Shiller, "Rational Expectations and the Dynamic Structure of Macroeconomic Models: A Critical Review", ***Journal of Monetary Economics,*** Vol. 4, 1978, pp 1 - 44.

(16) Lucas and Presscot "Investment Under Uncertainity", ***Econometrica,*** Vol. 39, 1971, pp. 659 - 682.

(17) Sanford Grossman, ***Self Fullfilling Expectations and the Theory of Random Markets,*** University of Chicago, 1973.

these expectations are true mathematical expectation represents a rational on the growth of macroeconomic literature[18]. Therefore, preceding the natural expectations models, macroeconomists interested in short - run policy evaluation and forecasting, had to do with the problem of modelling expectations by guessing the way be which people actually form their expectations and then attempt to quantify this behaviour. Forecasting future inflation rates, for instance, was quantitatively represented as follows: individuals expect future inflation rates to behave like a wighted average of recent past inflation rates. The weighted average may then be included in the quantification of the behavioural relation instead of the actual expectations, which may be unknown[19].

Macroeconomic models were developed by incorporating expectations, which are known as rational expectations. In this approach expectations are not arbitrarily represented, but mathematically modeled to depend on all variables in the model which are known to the public at time t[20].

At this juncture, it seems appropriate to present a summary of the main assumptions on which the rational expectation theory is based. These assumptions are[21]:

1) Availability of full historical (time - series) information as regards macroeconomic variables.

2) Public's behaviour is based on rationally formed expectations as to the future economic variables. Such behaviour is also being closely observed by the policy - makers because: (i) the

(18) Robert Shiller, (1978), op. cit., pp. 1 - 4.
(19) Ibid., p. 2.
(20) Thomas Sargent and Neil Wallace, "Rational Expectations and the Dynamics of Hyperinflation", ***International Economics Review,*** Vol. 14, 1973, pp. 328 - 350.
(21) For more information see, Thomas Sargent and Neil Wallace, "Rational Expectations and the Theory of Economic Policy", ***Journal of Monetary Economics,*** Vol. 2, (1976), pp. 169 - 183.

economic structure is characterized by extensive simultaneity, that is changes impinging on one macroeconomic variable are also impinging on most other variables; (ii) the effects of changes in lagged variables on endogenous variables are distributed over time, or in other words, the impact of lags is not instantaneous; and (iii) the coefficients of the lagged variables are assumed to be constant over time.

3) There must be a market clearing price, that is, prices are determined through market mechanism in all markets.

The second assumption suggests that a policy rule can be described as a function from observed economic variables controlled by policy makers representing their behaviour. The effect of a policy rule will be projected through the model assuming that individuals have learned how the policy rule affects the time path and random properties of economic variables, this is called the long - run policy analysis[22].

If a policy rule is followed consistently over a long period of time, rational individuals will eventually learn how that policy rule has affected the random character of economic variables, and if these individuals are truly rational, their expectation will not substantially form "optimal" forecasts. After the adoption of a policy rule, individuals' forecasts will be mere guesses, and since these guesses may affect the stochastic properties of the endogenous variables, we might enter into a chaotic period immediately after the adoption of a policy rule. However, after a transition period, the economy will converge on a dynamic path whose expectations mechanisms are involved in determining rational expectations, in this case the economy will have reached what is called "rational expectation equilibrium"[23].

(22) Benjamin Friedman, ***Rational Expectations are Rearly Adaptive After All,*** Harvard University Press, 1975.
(23) Roy Radner, ***Rational Expectations Equilibrium with Price Information,*** University of California, 1976.

Therefore, rational expectations advise that when considering *alternative policy rules,* it is essential to focus on the resulting stochastic behaviour of the economic variables in the ultimate rational expectations equilibrium.

Empirical studies based on ratoinal expectations followed basically one approach in which a two stage least squares method is used and facused on the effect of money supply and the monetary policy on real economic indicators.

In the first stage these studies estimated a money growth determination equation in which the growth in money supply is estimated as a function of multi - period lagged independent variables in addition to other variables such as: lagged unmployment rate(24); lagged government spending or GNP; and lagged exports(25). Other studies used lagged public sector borrowing and real current account balance in addition to lagged growth in money supply(26). This money growth equation is used to approximate the anticipated money growth as the predicted value and to approximate the unanticipated money growth as the residual.

In the second stage of all these studies, reaction functions of unemployment(27), and real GNP, as a measure of output, were estimated(28).

This paper will follow the methodology outlined above where

(24) See for instance: Robert Barro, "Unanticipated Money Growth and Unemployment in the United States", ***American Economic Review,*** Vol. 67, 1977, pp. 459 - 580; and Peter Kretzmer, 1989, op. cit.

(25) Gillian Wogin, "unemployment and Monetary Policy Under Rational Expectations: Some Canadian Evidence", ***Journal of Monetary Economics,*** Vol. 15, 1980, pp. 59 - 68.

(26) See Attfield et. al., "Unanticipated Monetary Growth, Output and The Price Level: U.K. 1946 - 1977", ***European Economic Review,*** Vol. 16, 1981a, pp. 367 - 385.

(27) See Robert Barro (1977), op. cit., and Gillian Wogin (1980), op. cit.

(28) Attfield et. al., (1981a). op. cit., and Peter Kretzmer, (1989), op. cit.

the two stage least squares method is used to investigate the effect of both the anticipated and unanticipated growth in (M2) on the unemployment rate (UNR), real GNP and the price level (PRL).

In the first stage of the estimation, the logarithm change in M2 was regressed depending upon one period lag of itself and lagged regressors of log change of UNR, log change of PRL and log change of real GNP. The stockatic errors, or the residuals, of this regression, were considered as measure of the unanticipated money growth, while the predicted values were considred to be a measure of anticipated money growth.

The values of anticipated and unanticipated M2 growth were entered as regressors in the second stage, in which logarithm change in UNR, real GNP and PRL were the dependent variables.

Such a test will determine whether the model can account for the dynamic reaction of UNR, real GNP and PRL to the measure of anticipated and unanticipated M2 growth[29].

6. REACTION FUNCTIONS: AN EMPIRICAL TEST

6.1 Model Specification:

One of the most difficult problems in macroeconomic models is the need to model the mechanism by which the public forms its expectations of future economic variables. The following model might be expected to reflect the effects of expectation of M2 changes on the key economic variables:

(29) William Haraf, "Test of Rational Expectations Structural Neutrality Model with Persistent Effect of Monetary Disturbances", ***Journal of Monetary Economics,*** Vol. 18, 1983, p 106.

$$gm_t = \alpha 0 + \alpha 1 gm_{t-1} + \alpha 2 gp_{t-1} + \alpha 3 gy_{t-1} + \alpha 4 gu_{t-1} + e_{1t} \quad \ldots\ldots(3)$$

$$gy_t = \beta 1 \hat{gm}_t + \beta 2 \hat{gm}_{t-1} + \beta 3(gm_t - \hat{gm}_t) + \beta 4(gm_{t-1} - \hat{gm}_{t-1}) + \beta 5 gy_{t-1} + \beta 6 gp_{t-1} + \beta 7 gu_{t-1} + e2t \quad \ldots\ldots(4)$$

$$gu_t = \gamma 1 \hat{gm}_t + \gamma 2 \hat{gm}_{t-1} + \gamma 3(gm_t - \hat{gm}_t) + \gamma 4(gm_{t-1} - \hat{gm}_{t-1}) + \gamma 5 gy_{t-1} + \gamma 6 gp_{t-1} + \gamma 7 gu_{t-1} + e3t \quad \ldots\ldots(5)$$

$$gp_t = \theta 1 \hat{gm}_t + \theta 2 \hat{gm}_{t-1} + \theta 3(gm_t - \hat{gm}_t) + \theta 4(gm_{t-1} - \hat{gm}_{t-1}) + \theta 5 gy_{t-1} + \theta 6 gp_{t-1} + \theta 7 gu_{t-1} + e4t \quad \ldots\ldots(6)$$

where:

gm_t = log of proportional growth in M2 at time (t).

gp_t = log of proportional growth in PRL at time (t).

gu_t = log of UNR rate at time(t).

$\hat{gm}_t$ = anticipated growth in M2 at time (t).

$gm_t - \hat{gm}_t$ = unanticipeted growth of M2 at time (t).

e_1t, e_2t, e_3t, e_4t uncorrelated random errors with mean zero and variance σ^2

This model reflects: (i) that the growth in real gross national product, growth in UNR, and growth in PRL were affected by both aniticipated and unanticipated M2 growth; (ii) that the model consists of four equations, the grwoth in M2 equation, the growth in PRL equation, the growth in GNP equation and growth in UNR rate equation. This model assumes that the systematic (anticipated) changes has real effect on maroeconomic variables such as GNP and UNR and may cause these variables to deviate from their natural level because the Jordanian economy is operating below the full employment level, in addition to data constraints and inaccuracy.

6.2 Variables Justification

Money Growth Equation (equation No.3):

Equation (3) measures the proportionate growth in M2 and e_{1t} which is the random variable or the unpredicted growth of M2 at time(t). The equation includes lagged UNR which is expected, to positively affect M2 growth through the response of M2 to the level of economic activity, especially in the economic cycle, and an increase in the UNR in time(t), the monetary authority is expected to increase M2 in the next period (t+1) in order to reduce UNR.

The lagged growth of PRL is expected to have a negative effect on the growth of M2. While the lagged growth of income (GNP) will have a positive effect on the growth of M2, the growth in GNP will increase the demand for money, which will cause the interest rate to increase. The rate of interest in Jordan during the period under study was managed by the monetary authority, who, in order to maintain the same rate of interest, increased the money supply only. The lagged growth in GNP consists of private consumption, government expenditure, investment and the net result of the balance of payment.

GNP Equation (equation No. 4)

The GNP equation, which depends on lagged UNR, is entered to investigate the trade - off between real GNP and UNR rate, since there is a negative relationship between real GNP and UNR.

In addition, the inflation rate (proportional growth in PRL), which measures the efficiency in the economy through real GNP

will have a negative effect on GNP. Lagged growth in real GNP is included to capture the auto - correlation in the GNP equation.

Unemployment Rate Equation (equation No. 5)

In this model, UNR rate equation includes lagged PRL and real GNP since there is a trade - off between these two variables and UNR. Therefore, UNR will be reduced at higher growth in PRL and higher growth in real GNP.

6.3 The Empirical Results:

Money Supply Equation:

The structural form of the M2 growth equation is:

$$DM2 = \alpha 0 + \alpha 1 DM2_{t-1} + \alpha 2 DGNP_{t-1} + \alpha 3 DUNE_{t-1} + \alpha 4 DINF_{t-1} + e1t \quad .....(7)$$

where:-

DM2 = The first difference logarithm of M2.

$DM2_{t-1}$ = One period lag of DM2, to measure its effect on DM2 in the next period.

$DGNP_{t-1}$ = One period lag of the first difference logarithm of real GNP, to measure its impact on DM2 in the next period.

$DUNE_{t-1}$ = One period lag of the first difference logarithm of the UNR, to measure its impact on DM2 in the next period.

$DINF_{t-1}$ = One period lag of the first difference logarithm of the PRL, to measure its impact on DM2 in the next period.

e_{1t} = The error term which measures the unanticipated part of the growth in M2, which is characterized by zero mean and finite variance.

Each of the preceding independent variables coefficients

measure the behaviour of the growth on the dependent variable (DM2), and expected to have a positive effect, that is, $\alpha 1$, $\alpha 2$, $\alpha 3$, and $\alpha 4 \geqslant 0$.

The outcome of the estimation of the M2 equation based on quarterly data for period (1968 - 1988) was:

DM2 = 0.013 + 0.349★DM2t-1 + 0.285★DGNPt-1.....(8)

t-value (2.410) (2.182) (2.726)

+ 0.025 DUNEt-1 + 0.517★ DINFt-1

t-value (0.931) (3.885)

R-2 = 0.437 DW = 2.1136 F-value = 15.5479

★ Significant at 5% level or less.

Equation (8) shows that the impact of the independent variables was as expected, that is, the impact of $DM2_{t-1}$, $DGNP_{t-1}$, $DUNE_{t-1}$, and $DINF_{t-1}$ have a positive and statistically significant effect on M2 growth. Moreover, the explanatory variables explained 43.7 % of the total variations of DM2.

The main conclusion derived from equation (8) is that the lagged logarithm in the PRL has the greatest impact in the next period on $DM2_t$ followed by $DM2_{t-1}$, $DGNP_{t-1}$, while $DUNE_{t-1}$ has weak impact.

Unemployment rate reaction equation:-

The UNR reaction equation structural form depends on the first logarithm difference structural equation. A set of estimations were taken to investigate the hypothesis that the unanticipated and anticipated M2 reduce the UNR.

The UNR reaction equation's general structure form is:-

$$DUNE = \beta_1 DUNE_{t-1} + \beta_2 EDM2_t + \beta_3 EDM2_{t-1} + \beta_4 EDM2_{t-2} + \beta_5 EDM2_{t-3} + \beta_6 DM22_t + \beta_7 DM22_{t-1} + \beta_8 DM22_{t-2} + \beta_9 DM22_{t-3} + \beta_{10} DGNP_{t-1} + \beta_{11} DINF_{t-1} + e_{2t} \quad \text{.....(9)}$$

Where:-

$DUNE_t$ = Current first logarithm difference of UNR.

$DUNE_{t-1}$ = One - period lag of DUNE, to measure the impact of the lagged logarithm difference of UNR on the logarithm difference of UNR on the next period.

$EDM2_t$ = Current unanticipated part of the first difference logarithm M2 to measure the current impact of unanicipated part on UNR at time(t).

$EDM2_{t-1}$ = Lagged EDM2, to measure its impact on the first difference of logarithm UNR at time(t). (lagged one period residual values).

$EDM2_{t-2}$ = Two - period lag of EDM2.

$EDM2_{t-3}$ = Three - period lag of EDM2.

$DM22_t$ = The current anticipated part of the first difference logarithm of M2 at time(t), to measure its impact on the first difference logarithm unemployment at time(t), (current predicted values).

$DM22_{t-1}$ = One period lag of DM22t.

$DM22_{t-2}$ = Two period lag of DM22t.

$DM22_{t-3}$ = Three period lag of DM22t.

$DGNP_{t-1}$ = Lagged logarithm first difference of real GNP at time (t-1), to measure its impact on the first logarithm difference of UNR at time(t).

$DINF_{t-1}$ = Lagged logarithm difference of PRL at time(t-1), to measure its impact on first logarithm difference of UNR at time(t).

e_{2t} = Serially uncorrelated random variable with mean zero and finite variance, and independent of e1t.

$\beta 1$, $\beta 2$, ... $\beta 11$ are coefficients to be estimated.

The first estimation of DUNE depends on lagged first difference logarithm of UNR (DUNEt-1), and current and three lags of anticipated and unanticipated of first difference logarithm of M2 growth.

The OLS estimation of equation (9) is presented in table (3). In the first estimation, the hypothesis under investigation is: *the unanticipated and anticipated M2 growth reduce the growth in UNR*. The results of the first estimation indicates that the current unanticipated M2 growth has the strongest impact in reducing the growth in UNR and is equal to -0.9128 %.

The impact of unanticipated M2 growth reversed after the first period lag of unaticipated M2 growth by 0.502 %. The strongest impact of anticipated M2 growth occurred at current anticipated M2 growth and is equal to -3.61 %, and the total impact of unanticipated M2 growth on the growth of UNR, which is equal to the sum of the coefficients $\beta 2$, $\beta 3$, $\beta 4$ and $\beta 5$ is about -.011 % .

The total impact of anticipated M2 growth on the growth of UNR, which is the sum of $\beta 6$, $\beta 7$, $\beta 8$ and $\beta 9$ is approximately 2.019%.

Table (3)

Estimations of the reaction function for the growth in UNR byanticipated and unanticipated M2 growth.

Dependent variable: DUNE.

Independent Variable	1st estimation	2nd estimation	3rd estimation	4th estimation
β_1 $DUNE_{t-1}$ t - value	.7134 (9.0689)★	.7060 (8.4021)★	.7113 (9.002)★	
β_2 EDM2 t - value	-.9128 (-2.8822)★	-.9518 (-2.9705)★	-.9518 (-2.9705)★	-.9518 (-2.9706)★
β_3 $EDM2_{t-1}$ t - value	.5022 (1.0899)★★★	.7232 (1.4582)★★	.7965 (1.2383)★★★	-9.1426 (-7.1409)★
β_4 $EDM2_{t-2}$ t - value	-.3319 (-.7971)★★★	-.5495 (-1.2453)★★★	-.5495 (-1.2453)★★★	-.5495 (-1.2453)★★★
β_5 $EDM2_{t-3}$ t - value	.4331 (1.2218)★★★	.8409 (1.8188)★	.8409 (1.8188)★	.8409 (1.8188)★
β_6 DM22 t - value	-3.6143 (-4.1584)★	-4.057 (-4.369)★	-4.267 (-3.0889)★	24.1968 (6.7293)★
β_7 $DM22_{t-1}$ t - value	1.7172 (2.4966)★	2.7483 (2.4966)★	2.8215 _(2.3720)★	-7.1175 (-4.7119)★
β_8 $DM22_{t-2}$ t - value	1.9584 (2.028)★	-1.4626 (-1.3557)★★	-1.4626 (-1.3557)★★	-1.4626 (-1.3557)★★
β_9 $DM22_{t-3}$ t - value	1.9584 (3.2308)★	2.7024 (3.3454)★	2.7024 (3.3454)★	2.7024 (3.3454)★
β_{10} $DGNP_{t-1}$ t - value		-.0597 (-.2462) †		-8.1113 (-9.0020)★
β_{11} $DINF_{t-1}$ t - value			.1085 (.2462) †	-14.6192 (-8.4021)★
F - value	18.9599	15.433	15.433	15.4333
R^2	.7132	.7254	.7234	.7234
R-2	.6756	.6766	.6766	.6766
DW	1.8682	1.8566	1.8566	1.8566

★ significant at 0.05 level.
★★ significant at 0.10 level.
★★★ significant at 0.25 level.
† insignificant.

Note: Many forms with multiple lags were tested, it appeared that the most appropriate number of lags were three.

The second and third estimations are to examine alternative hypothesis, that is, *the anticipated and unanticipated M2 growth, growth in real GNP, or growth in PRL (inflation)reduce the growth in UNR.*

The result of the second and third estimations show that the current and second lag of unanticipated growth of M2 negatively affect the growth in the UNR, i.e. reduce the growth in UNR by 0.952 %, 0.550 % respectively, while the impact of EDM2t-1 on DUNEt is reversed in EDM2t-1 and EDM2t-3.

The current anticipated M2 growth reduces the growth in UNR by 4.06 % and 4.27% in the second and third estimations respectively.

The three lags of anticipated M2 growth reduces the growth in UNR by 1.46 % while the one and three lags of anticipated M2 growth reverse their impact.

The impact of the growth in real GNP reduces the growth in UNR by 0.06 % approximately in the second estimation, while the growth in PRL positively affects the growth in UNR.

The total impact of unanticipated M2 growth on the growth of UNR is approximately 0.062% in the second estimation and 0.136 % in the third estimation. While the total impact of anticipated M2 growth on the growth of UNR is 0.030% in the second estimation and - 0.106 % in the third estimation. But the total impact on the growth of UNR in the second estimation, by adding the impacts of unanticipated and anticipated M2 and growth in real GNP, is 0.1066 %. In the third estimation also, by adding the growth in PRL (inflation) to the impact of anticipated and unanticipated M2 growth, is 0.039%.

The fourth estimation investigates the hypothesis that lagged growth in real GNP and lagged growth in inflation rate, besides

the growth in unanticipated and anticipated M2 growth, reduce growth in UNR.

The results of the fourth estimation show that the current, first and second lag of unanticipated growth in M2 negatively affect the growth in UNR. the strongest impact occured after the first lag of unanticipated M2 growth by - 9.143 % while the impact of unanticipared M2 growth reversed it's impact in the three-period lag.

The strongest impact of anticipated M2 growth on the growth of UNR occurred after the first period lag and was equal to -7.118%.

The lagged real economic variables, i.e lagged real GNP growth and lagged PRL growth, have a negative effect on UNR equal to - 8.11% and -14.62 % respectively. While the total impact of unanticipated M2 growth vatiables on the growth (anticipated and unanticipated) impact on the growth of UNR is 6.514 %. Real economic variables impact on the growth of UNR is -8.111 % for real GNP growth and -14.619 % for growth in PRL.

The independent variables in the first estimaion explained about 67.56 % of total varition in the dependent variable (growth in UNR) and around 67.66 % in the other three estimations.

Therefore, the additional variables of real GNP growth, or the growth in PRL, or even both variables added only a small contribution to the explanatory power of the equation. The F-value which indicates the adequacy of the whole equation is significant at all levels, and the Durbin-Watson (DW) test - which measures autocorrelation between the error term and the independent variables - indicates no autocorrelation problem.

Real gross national product reaction equation:-

The general form of real GNP reacation equation is:

$$DUNE_t = \gamma 1\ DGNP_{t-1} + \gamma 2\ EDM2_t + \gamma 3\ EDM2_{t-1} + \gamma 4\ EDM2_{t-2} + \gamma 5\ EDM2_{t-3} + \gamma 6\ DM22_t + \gamma 7\ DM22_{t-1} + \gamma 8\ DM22_{t-2} + \gamma 9\ DM22_{t-3} + \gamma 10\ DINF_{t-1} + \gamma 11\ DUNf_{t-1} + e3t \ldots\ldots\ldots (10)$$

where:-

$DGNP_t$ = the first difference logarithm in real GNP at time (t).

$DGNP_{t-1}$ = the first period lagged of $DGNP_t$.

e_{3t} = error term with zero mean and finite variance and independent of e_{1-t}.

The other variables as previously defined in the DUNE equation.

$\gamma 1, \gamma 2 \ldots . \gamma 11$ are coefficients to be estimated.

The OLS estimate of equation (10) is presented in table (4).

The first estimation of first difference logarithm of real GNP depends on its lagged value and current and three lagged anticipated and unanticipated M2 growth, to investigate the hypothesis that *unantidipated growth in M2 increases growth of real GNP, and anticipated M2 growth will have no effect on real GNP.*

The impact of the current unanticipated M2 growth positively affect the growth in real GNP and the amount of th effect varies between the estimated equation according to different variables included in the estimations. The impact varies between 0.236 % and 0.278 %.

The unanticipated M2 growth reversed its impact on the growth of real GNP and reached its strongest reversed impact after

the first lag period and varies between -0.298 % and -0.62 %.

The current and first period lag of anticipated M2 growth positively affect the real growth in real GNP and vary between 1.303 % in the first estimation and 2.120 % in the third estimation for current anticipated M2 growth, while the amount of impact for the first period lag of anticipated M2 growth on the real growth of GNP varies between 0.561 % in the fourth estimation and 0.922 % in the second estimation.

Table (4)

Estimation of the reaction function for the growth in real GNP by anticipated and unanticipated M2 growth

depenedent variable: DGNP

Independent variable	1st estimation	2nd estimation	3rd estimation	4th estimation
γ_1 $DGNP_{t-1}$ t-value	0.2535 (1.9991)★			
γ_2 $EDM2_t$ t-value	0.2356 (1.3177)★★	0.2776 (1.5394)★★	0.2381 (1.3195)★★	0.2377 (1.3277)★★
γ_3 $EDM2_{t-1}$ t-value	-0.4185 (-1.5107)★★	-0.2984 (-1.1015)★★★	-0.6802 (-1.8771)★	-0.6197 (-1.6814)★
γ_4 $EDM2_{t-2}$ t-value	-0.4042 (-1.6404)★★	-0.4187 (-1.6735)★	-0.4016 (-1.6161)★★	-0.4181 (-1.6814)★
γ_5 $EDM2_{t-3}$ t-value	-0.1937 (-0.7545)★★★	-0.2741 (-1.055)★★★	-0.1899 (-0.7314)	-0.2413 (-0.9346)★★★
γ_6 $DM22_t$ t-value	1.3028 (2.5295)★	1.0857 (2.1049)★	2.1196 (2.7420)★	1.8547 (2.3502)★
γ_7 $DM22_{t-1}$ t-value	0.8125 (1.3305)★★	0.9221 (1.4991)★★	0.6055 (0.9117)★★★	0.5614 (0.8546)★★★
γ_8 $DM22_{t-2}$ t-value	0.5514 (-0.9818)★★★	-0.2794 (-0.4705)†	-0.5294 (-0.8712)★★★	-0.4509 (-0.7668)★★★
γ_9 $DM22_{t-2}$ t-value	-0.5149 (-1.1425)★★★	-0.5796 (-1.274)★★★	-0.5473 (-1.2074)★★★	-0.5198 (-1.1575)★★★
γ_{10} $DINF_{t-1}$ t-value	-- --	-- --	-0.4233 (-1.7414)★	-0.3059 (-1.2172)★★★
γ_{11} $DUNE_{t-1}$ t-value		-0.647 (-1.4534)★★		-0.0565 (-1.2192)★★★
F-value	4.4937	4.1652	4.3092	3.7075
R2	0.4027	0.3845	0.3926	0.3859
R-2	0.3130	0.2922	0.3015	0.2818
DW	1.8914	1.6015	1.8317	1.8970

★ significant at 0.05 level.
★★ significant at 0.10 level.
★★★ significant at 0.25 level.
† insignificant.

The impact of anticipated M2 growth on the growth sof real GNP after two-lag periods varies between - 0.279 % in the second estimation and - 0.551 % in the first estimation for the two-lages.

While for the three-lags the impact varies between -0.515 in the first estimatiom and -0.58 % in the second estimations.

The total impact og unanticipated M2 growth on the growth of real GNP is (-0.781 %) in the first estimation, -0.713 % in the second estimation, -1.034 % in the third estimation, and -1.041 % im the fourth estimation.

The total impact of anticipated M2 growth on the growth of real GNP is 1.050 % in the first estimation, 1.149 % in the second estimation, 1.65 % in the third estimation, and 1.444 % in the fourth estimation.

The growth in UNR had a negative impact on the real growth of GNP and equal to -0.065 % as shown in the real growth of GNP was negative and (-0.423 %), as shown in the third estimation.

The impacts of lagged growth in PRL and growth in UNR were negative and equal to -0.306 % and -0.06 % respectively.

From previous diwcussion, the hypothesis that *anticipated growth of M2 has no effect on the growth of real* GNP is rejected at 0.05 level, since the current anticipated growth of M2 positively affect the growth of real GNP, this may be due to the fact that Jordan's economy is operating below full employment level, while the hypothesis that *unanticipated M2 growth positively affect the real growth of* GNP could be rejected at more than 0.05 level, although the current unanticipated M2 growth has a positive impact on real growth of GNP.

The price level reaction equation:

The general form of the PRL reaction equation in the estimation takes the following form:

$$DINF_t = \theta_1 DINF_{t-1} + \theta_2 EDM2_t + \theta_3 EDM2_{t-1} + \theta_4 EDM2_{t-2} + \theta_5 EDM2_{t-3} + \theta_6 DM22_t + \theta_7 DM22_{t-1} + \theta_8 DM22_{t-2} + \theta_9 DM22_{t-3} + \theta_{10} DUNE_{t-1} + \theta_{11} DGNP_{t-1} + e_{4t} \ldots\ldots\ldots (11)$$

Where:-

$DINF_t$ = first difference logarithm of PRL at time (t) and the other variables were the same as previously defined.

Table (5) shows the OLS estimate of equation (11). Which reveals that the current unanticipated M2 growth has a negative effect on the growth of PRL. The amount of the effect varies between -0.113% and -0.077. However, all M2 growth coefficients were insignificant at 5% level. Therefore, rejecting the hypothesis that the unanticipated growth of M2 has a negative impact on the growth of PRL.

The one - period lag anticipated M2 growth has a negative impact on the growth of PRL, and its amount varies between -1.45% in the second estimation and -1.326% in the third estimation.

Other anticipated M2 growth variables have a positive impact on the growth of PRL. The greatest impact emerged in the second lagged period in all estimations. The two - period lag impact varies between 0.846% in the first estimation and 0.901% in the second estimation.

Table (5)

Estimations of the reaction function for th e growth in PRL by anticipated and unacticipated M2 growth

Dependent variable: DINF

Independent variables	1st estimation	2nd estimation	3rd estimation	4th estimation
θ_1 $DINF_{t-1}$ t-value		-0.03306 (-0.0218)†		0.0522 (0.4271) †
θ_2 EDM_2 t-value	-0.0818 (-0.5741)†	0.0853 (-0.5718)†	-0.0771 (-0.5536)†	-0.1126 (-0.7708)★★★
θ_3 $EDM2_{t-1}$ t-value	0.1101 (0.5070)†	0.0531 (1.1767)★★★	0.1313 (0.6276)†	0.2734 (1.7068)★
θ_4 $EDM2_{t-2}$ t-value	0.6987 (3.6194)★	0.6979 (3.4752)★	0.6987 (3.6159)★	0.3598 (2.2483)★
θ_5 $EDM2_{t-3}$ t-value	0.1580 (0.7858)★★★	0.1261 (0.1153)†	0.1531 (0.7632)★★★	0.2344 (1.5899)★★
θ_6 DM22 t-value	0.3645 (0.9035)★★★	0.5376 (0.874)★★★	0.3458 (0.8680)★★★	
θ_7 DM22 t-value	-1.3721 (-2.8882)★	-1.45 (-1.1768)★★★	-1.3262 (-2.7935)★	
θ_8 $DM22_{t-2}$ t-value	0.8456 (1.7973)★	0.9014 (0.3633)†	0.8786 (1.9162)★	
θ_9 DM22 t-value	0.3666 (1.0385)★	0.3200 (0.1740)†	0.3461 (0.9851)★★★	
θ_{10} $DUNE_{t-1}$ t-value		0.0037 (0.0974)†	0.0042 (0.1209)†	
θ_{11} $DGNP_{t-1}$ t-value	0.0307 (0.3091)★★★			
F-STAT.	2.8704	2.3029	2.8575	1.89
R2	0.3009	0.3077	0.3000	0.1292
R-2	0.1961	0.1741	0.1950	0.0611
DW	2.0374	2.008	2.0711	1.9219

★ significant at 0.05 level.
★★ significant at 0.10 level.
★★★ significant at 0.25 level.
† insignificant.

Adding the growth of UNR as an explanatory variable in the second estimations shows that there is a positive, but statistically insignificant impact on the growth of PRL of around 0.004%. Moreover, when the gowth in real GNP is added as an explanatory variable in the first estimation it had a positive and statistically insignificant impact on the growth of PRL (0.031%).

7. Conclusion.

In this study, a four equation model, has been tested for the Jordanian economy:

i) M2 growth equation; ii) growth in UNR equation; iii) growth in real gross national product equation; and iv) growth in PRL equation. All the equations were estimated individually.

First logarithm difference structural equation was applied to test the impacts of anticipated and unanticipated M2 growth on the key economic variables that were included in the study depending on the following hypotheses:-

1) *The unanticipated growth in M2 negatively affects growth in UNR.*
2) *The anticipated growth in M2 positively affects growth in real GNP.*
3) *The unanticipated growth in M2 negatively affects growth in PRL.*
4) *The anticipated growth in M2 negatively affects growth in real GNP, if the economy is at full employment.*
5) *The anticipated growth in M2 positively affects growth in PRL.*
6) *The anticipated, growth in M2 negatively affects growth in UNR.*

The anticipated M2 growth was quantified as the predicted value from the M2 growth equation, while the unanticipated M2 growth was the actual growth minus the predicted value, or in other words the unanticipated value of the M2 growth was the unpredicted value (the value of the error term in the M2 growth equation).

The paper reached the following conclusions:

1) There is a weak indication that lagged growth in UNR has caused monetary policy to be more expansionary. The empirical analysis suggests that, while things remain the

same, an increase in the growth of UNR by 1% would cause the rate of money growth to increase by 0.025% in the following period. However, the coefficient is not statistically significant.

2) The lagged growth in real GNP and PRL have caused monetary policy to be more expansionary in order to encounter the deficit gap between the need for money, and the increment in production and PRL.

3) There is evidence that the current anticipated M2 growth has a signigicant negative effect on the growth in UNR. The empirical results yield a significant short - run negative relation between the unanticipated M2 growth and the growth in the UNR. However, the impact of anticipated M2 growth on the growth in UNR is greater than the unanticipated M2 growth.

4) Fiscal policies have a greater impact than monetary policies in reducing the growth in UNR, when joint fiscal policies and monetary policies were applied. This is demonstrated in table (3), where the fiscal policy effect represented in the growth of GNP coefficient is -8.11% and the growth in PRL equation is -14.62%, while the effect of monetary policy variables, which are represented in anticipated and unanticipated M2 growth variables, are -9.6% and 16.32% respectively.

5) All the unanticipated growth in M2 has insignifican impact on the real growth in GNP at the 5% level. The direction of the impact of the lagged unanticipated growth in M2 variables were negative in all estimates - only the current unanticipated M2 growth positively affects the growth in real GNP, but this effect is insignificant at the 5% level.

6) The current and one - period lag of anticipated growth in M2 positively affect the real growth in GNP, but are only significant for the current period at the 5% level. The second and third lags of anticipated M2 growth negatively affect the real growth in GNP, but their impact is statistically insignificant at the 5% level.

7) Growth in lagged PRL and growth in lagged UNR negatively affect real GNP growth, and their impact is insignifican at the 5% level.

8) The lagged unanticipated and lagged anticipated growth in

M2 variables positively affect the growth in PRL. This impact is only significant for the two - period lag of unanticipated growth in M2.

9) The current unanticipated and current anticipated growth in M2 negatively affect the growth in PRL. This impact is only significant for the anticipated growth in M2 variable at the 5% level.

10) The main conclusion is that anticipated M2 growth or the systematic policy in the growth of M2 affect the real key economic variables - such as those included in the study - in the direction of the policy goal while the unanticipated growth in M2 mostly gives an uncertain derection of its impact on these key economic variables.

The monetary authority must, however be aware of the amount of M2 growth, and this growth must encounter the internal Jordanian economic needs. The anticipated M2 growth may affect these key economic variables in the following manner:-

An increase in M2 will increase commercial banks deposits. These deposits will constitute a burden to the banks due to the amount of interest they have to pay to depositors. The interest rate burden may decrease banks profits. Therefore, commercial banks will expand credit facilities to the public, which will be reflected in an increased investment and aggregate demand. This would lead, to an increase in production, and hence in employment rate, or at least, to a decrease in UNR.

Appendix (1)

Diz approach for extrapolated yearly data to a quarterly data depends on the following steps:-

1) $Q_1 = Z_{t-1} + \frac{7.5}{12}(Z_t - Z_{t-1})$

2) $Q_2 = Z_{t-1} + \frac{10.5}{12}(Z_t - Z_{t-1})$

3) $Q_3 = Z_t + \frac{1.5}{12}(Z_{t+1} - Z_t)$

4) $Q_4 = Z_t + \frac{4.5}{12}(Z_{t+1} - Z_t)$

Where

Zt = annual data for year t.

Zt-1 = lagged one year (t-1).

Zt+1 = lead (next year data) t+1.

Qi = The raw data for quarter i before multiplying the value by the correction coefficient for that year, and i = 1,2,3,4.

The next step leads to getthe final value for the puarter data, Xit..

Xit can be obtained by:

$$X_{it} = \frac{4Z}{\Sigma Qi} \times Qi \quad , \quad i = 1,2,3,4.$$

Where:

Xit = Quarterly figure corresponding to the current year.

Z = The annual current value.

Σ Qi = Q1 + Q2 + Q3 + Q4

$\frac{4Z}{\Sigma Qi}$ = The correction factor.

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