CHAPTER - VI

MONEY, OUTPUT AND PRICES : JORDANIAN EXPERIENCES

6.1 Introduction

Among economists, there are many views and that there is no consensus on how changes in money supply ultimately affects the economy. On one hand the classicalists view that a change in money supply results into changes in the price level in an equi-proportional manner and on the other the Keynesian theory views that the full impact is seen only on output if the conditions of less than full employment prevails in the system. These two, represent two extreme outcomes between which the real system normally lies. In a realistic approach, the mechanism linking the quantity of money with money income must be able to differentiate between its impact on output and prices.

The interaction between money, output and prices can be explained by the equation which can be expressed as real money demand function $M/P = f(RY, i)$. Where M stand for nominal money held by the public, P is price level, RY is real income and 'i' is interest rate. M/P gives the real money balances held by the public which is a function of real income and return on alternative financial assets.

Assuming that demand function for money is stable and the influence of interest rate is not much significant, the demand function for money can be expressed in the form of price equation as follows :

$$P = f(RY, M)$$

more specifically, $P = a - bRY + eM$

Which implies that, RY and price are inversely related while money supply and price level are directly related i e an increase in RY depresses the price level and an increase in money supply raises the price level

The precise nature of inter-relationships between money, output and prices has remained an area of controversy despite ample research that has taken place in this area As against the conventional belief that money stock influences output and/or prices, it has been argued that the causation runs in the opposite direction i e that money stock simply accommodates price changes Many researchers have favoured intermediate positions too They say that there is a possibility of "bi-directional" causation, especially between money and prices.

The aim of this chapter is to study the relation between money, output and prices in the Jordanian economy For this, analysis is done taking money measures as independent variables however this would give only partial explanation for the causation Further empirical investigation of causality between money and output and money and prices is conducted using Granger and Sim's tests using appropriate time lags In section two of the chapter the literature survey is presented In section two the relative growth of money and income is analysed This section also presents the regression results with money supply as an independent variable. In the section four the results of the causality tests are presented followed by conclusion

6.2 Literature Survey

There are basically two ways to classify the sources of covariation between money and business activity One is to examine the factors affecting the amount of money supplied This has been dealt in detail in the previous chapter. An alternative approach is to examine the affects of changes in the money stock on the economic activity These affects, though studied extensively, have proved difficult to trace. This is mainly because there are likely to involve time lags so as to affect various parts of the economy. Identifying cause and effect precisely is then very difficult and complex.

However many researchers have tried to explore the relationship between money supply and prices Some of the leading works in this direction are by Friedman - Schwarts[1], Klein[2], Friedman[3], Cramp[4], most of these studies have concluded that price rise is a monetary phenomenon. Therefore an essential requirement for the evidence of either high inflation or deep deflation is to regulate money supply adequately, so that system can enjoy relative price stability In the Indian context, studies by G.S Gupta[5] (1984), Ray and Namboodiri(1987)[6], Singh 1989[7] are note worthy in this direction. These studies provide an indirect evidence in favour of the causality running from money to output and/or prices as expected. Another work of importance is by C Rangarajan and R.R Arif[8] on money, output and prices, a macro econometric model of the Indian economy The author has heavily depended on these works.

The study by Rangarajan and Arif emphasises the interrelationship among money output and prices According to them the stock of money varies endogeneously through the feedback from reserve money Since government revenue collections do not keep

pace with government expenditures as nominal income rise, the resource gap widens during a period of continued price increases The policy simulation shows that while a substantial increase in government capital expenditure increases output, its impact on output and prices also depends on the extent of the resources gap met by borrowing from the reserve bank. As the proportion of the resources gap met by borrowing from Reserve Bank increases, the trade off between output and prices worsens sharply.

There are many empirical studies on causality between money, output and prices. However there are cross country differences as far as their outcome is concerned The conflicting conclusions are reported regarding money - nominal income causality in the US as found by Sim's[9] and in the UK as found by Williams, Goodhart and Gowland[10] Similarly different outcomes on money - prices causality between US and Canada have been explained by Barth and Bennet[11]. These differences were sought to be explained by the latter studies[12] taking into consideration three specific factors namely, nature of exchange rate regime, degree of openness of the economy and nature and target of monetary policy followed by the Central Bank, as these factors will have a strong influence on the direction of causality between money, output and prices

There is very little work done in this area on the Jordanian Economy, so the author depends largely on works done on other economics Here, studies on India are of relevance and have been extensively made use of. The studies have been quoted in the text as and when required

6.3 Relation Between Money - Prices and Output

Keeping in mind the complexity of the relation the researcher has tried to study the relative influence of money growth on income and prices behaviour in Jordan during 1964-1995 in addition to the causality tests As already presented (Chapter V) the stock of money varies endogeneously through the feedback from RM, which changes mainly due to inflow of foreign exchange to take care of revenue deficit of the government The price level is determined by money supply and output. The output is influenced, along with other factors, by changes in real money supply and its relative distribution to the various sectors of the Jordanian economy

The Real Gross National Product (RGNP) increased at an average rate of 2.81 per cent per annum during 1964 to 1995 (see Table 6.1) The rate of increase in RGNP has been found to be highly unstable. During 1964-1975, its growth was negative (-0 82) Between 1975-84, it grew at a significantly high rate (7.64%), but once again fell during 1985-95. The average growth rate fell down to 1.73% during 1985-95. Reasons for such fluctuating growth rates have already been explained in Chapter II.

The broad money (M_2) increased at an average rate of 16 15% during 1964-1995. In case of money supply too its growth was relatively less during 1964-1974 and 1985-1995, it was 15 36% and 10 36% respectively Its growth was highest during 1975-84 On an average during 1964-95 it grew at the rate of 23 32% In this respect as mentioned in the earlier chapters, inflow of foreign currency by way of aid and foreign loans were the most important sources of reserve money expansion Though in recent years credit to government have also become an important source of RM variation The high growth of

M_2 during the period of this study can be attributed to high growth of demand deposits and a substantial high growth of QM (Saving + Time deposits) in Jordan mainly after 1971 The relatively high growth of deposit money has changed the composition of broad money by a sizeable extent Total deposits money (DD + SD + TD) used to constitute 38 56% of M_2 in 1971 By the year 1981 the relative share of total deposit money increased to 64 24% and further it went up to 72.65% by 1991 and by 1995 the relative share of deposit money to total money supply touched 81 15%

The inflation rate, as measured by the consumers price index was 8 08 on an average during 1964-95 The inflationary pressures witnessed by Jordan were high During the period of analysis there are very few years with zero or negative inflation rate. There are quite few years with double digit inflation Out of the 31 years of study 10 years exhibited double digit inflation which is considered high by any standards The average rise in prices during 1964-1974 was 8.36% which went slightly up to 9 41% during 1975-1984, and then there was drop in the price rise to 6.61% during 1985-95. If one looks at the annual price growth rate, one finds 20% or higher for the years 1974, 1989 and 1990. These can be called exceptionally higher inflation years. Between 1973 to 1980 the inflation rate was more than 10% for a long period except for the year 1978 (7 0%) So this period can be termed as high inflation period While for the rest of the years the inflation rate was around 5%, which is highly significant from this analysis that Jordan faced a high degree of inflation between the period 1973 to 1982 It is only during 1974 to 1984, that the real growth of GNP was positive throughout for a long time Moreover, the annual growth of RGNP for the years 1976, 1979 and 1981 was very high

and was 13.7%, 10.1% and 16 77% respectively It can also be seen that the average real GNP growth between 1975-1984 was 7 64%, however it is during the same period Jordanian economy experienced a relatively high rate of inflation of 9.41% on an average The main reason for such an outcome may be the fact that during 1975-1985 the growth of money supply in Jordan was very high. It was 23 22% between 1975-1984. A high degree of inflation during this period was mainly due to expansion of money supply in Jordan between 1975-1984.

An increase in real income, other things remaining same, necessitates an increase in the demand for real money balances and as long as money supply expands to this extent, there is no increase in price level. On the basis of above relationship. the Jordanian economy's experience during the period of this study reveals that along with increase in real output, the increase in money supply was more rapid, and hence the outcome was continuous inflationary situation experienced by the Jordanian economy. The comparative picture is presented in the following Tables 6 2 and 6 3. By indexing the real output, real money stock and prices, one can have a fair comparison amongst these variables Table 6 2 presents a comparative picture of Real Money Stock, Real GNP and prices considering 1964 as the base year Hence for the year 1964 real money index, real GNP index and price index is denoted as 100. The comparative picture of the three series generated, clearly shows that relative increase in real money stock is much more higher than the growth in RGNP and so does the Price Index reflects a very high increase Though over years the real money stock have increased by nine fold, the RGNP just doubled during the same period and as a result of this the price index have shown more

than 10 fold rise One may feel that comparing 1995 based on 1964 is not very fair, but this a realistic comparison as all the comparable variables are in real terms The researcher has made an attempt to present a relatively recent picture by taking 1980 as the base year. This was attempted to over come the limitation of the overall comparison because between 1964 to 1973 in which the growth of RGNP was mostly negative. Table 6 3 presents the comparative picture of real money stock, RGNP and PI taking on 1980 as the base. The three indices for the year 1980 are denoted as 100. It may be noted that since 1980 it is observed that an increase in real money stock is by 110 54% accompanied by 49 11% increase in RGNP resulted in to a net increase in prices by 148 86% So, quantitatively it seems that an increase in money stock brings about higher variation in price level as compared to real output. This phenomenon is true comparing the Indices growth from 1964 to 1980 which is taken as 100

To have a proper prospective of linkages of money (M_2) with RGNP and price level the researcher has made an attempt to find out the elasticities between these macro variables. The regression results with log of money supply (Log M_2) as independent variables are presented below

(i) Money and Output

Log RGNP = f (log M_2)

$$\text{Log (RGNP)} = 5\ 703 + 0\ 199 \log (M_2)$$
$$(11\ 07)^{**}$$

$R^2 = 0\ 803$ DW = 0 374 F ratio = 122 545**

Log RGNP = f (log RM_2)

Log (RGNP) = 4.244 + 0.412 log (RM_2)
(12.422)**

R^2 = 0 837 DW = 0 402 F ratio = 154.303**

(ii) Money and Prices

Log PI = f (log M_2)

Log (PI) = 1 114 + 0 507 log (M_2)
(55 578)**

R^2 = 0 990 DW = 0 416 F ratio = 3088 93**

Log PI = f (log RM_2)

Log (PI) = -2 338 + 1 007 log RM_2
(27 124)**

R^2 = 0.961 DW = 0 411 F ratio = 735 70**

** - Significant at 1% level

The responsiveness of change in price to changes in money supply is higher than that of RGNP, whether one takes money supply in nominal or in real terms In fact the responsiveness of price and RGNP is much stronger in terms of real money balances and are statistically more significant So the responsiveness of price to given changes in real money balance is almost unitary (1 007) while in the case of RGNP it is only 0 412 For these regression equations the DW statistic is quite low indicating existence of auto correlation For all the above equations the t-values are significant at 1% level, so are the F-statistics

It may be noted that the relationship of money supply, real income and prices for the same year has little relevance . In case of monetary variables it takes lesser time for them to adjust in the aggregate analysis i e effect can be felt in the same year . So monetary aggregates can be compared without any time lapse As against this, real sector takes more time to adjust to the changes in monetary sector, hence the data of the same year becomes noncomparable. Therefore, to enable the comparison between monetary adjustment and real sector adjustment, sometime lag is necessary Keeping this very fact in mind, the researcher tried to analyse, the lagged effect of money supply on output and prices In order to study the impact of money supply variation on price level, the researcher have taken price level in the time 't' as a function of previous year's money supply (t-1)

i e $\quad \text{Log } PI_t = f(\log M_{2(t-1)})$

Same way, to study the effect of money supply variation on the real output, the equation fitted is

$$\text{Log RGNP}_t = f[\log M_{2(t-1)}]$$

The lagged partial adjustment estimate have been worked out in nominal as well as in real money stock terms

From the regression analysis undertaken, the following observations can be made regarding money output and money price relationship in the double log form

(i) $\quad \text{Log (RGNP)} = 5\ 675 + 0\ 208\ \text{Log } (M_2)_{-1}$
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (11\ 674)^{**}$

$R^2 = 0\ 825 \qquad$ DW = 0 407 $\qquad$ F ratio = 136 278**

(ii) $\text{Log (RGNP)} = 4\ 210 + 0\ 420\ \text{Log}\ (RM_2)_{-1}$
$(12\ 193)^{**}$

$R^2 = 0.837$ DW = 0 416 F ratio = 148 675**

** - significant at 1% level.

The above estimated regression equations show the responsiveness of real GNP to a given change in nominal stock of money of the previous year and as well to the real money stock of the previous year As expected the responsiveness of RGNP to a given change in real money stock in the previous year is higher than that of nominal money stock. The result is statistically more significant in case of $RM_{2\ (t-1)}$ In nominal terms of money, the lagged responsiveness is 0 208 while the same in terms of real money balance is 0.42 which is more than double At the same time the RGNP responsiveness to previous year money stock variation is higher as compared to same year variation in money stock

The relation between money supply and prices is presented in the following equations

(a) $\text{Log (PI)} = 1.242 + 0.499\ \text{Log}\ (M_2)_{-1}$
$(44\ 788)^{**}$

$R^2 = 0\ 986$ DW = 0 351 F ratio = 2005 982**

(b) $\text{Log (PI)} = -2.125 + 0\ 987\ \text{Log}\ (RM_2)_{-1}$
$(25\ 104)^{**}$

$R^2 = 0\ 956$ DW = 0 302 F ratio = 630 199**

** - significant at 1% level

The above double log regression estimates of PI in terms of previous years nominal money stock $(M_2)_{-1}$, and previous year's real money stock $(RM_2)_{-1}$, represent that the responsiveness of price to a given change in previous year's money stock are significant These results are much higher than the elasticities with respect to RGNP, whether it is in nominal terms or in real terms of money stock The above results also state that responsiveness of prices is much more stronger in case of previous year's nominal money stock

Once again as expected, the responsiveness of prices to changes in money stock on year to year basis is higher than the lagged response On year to year basis the prices responsiveness to change in nominal money stock is 0 507, while in case of lagged effect it is 0 499 Similarly in terms of real money stock the prices responsiveness is 1 008 on year to year basis, where as in case of lagged effect the same is 0 987 The relative fall is due to the fact that a part of price rise is taken care by the rise in production in the current year

Though the inducement of increase in Real Money Stock (RM_2) is favourable to bring about an increase in RGNP, as 1% increase in (RM_2) in the previous year leads to 0 42% increase in RGNP in the current year But, it is not sufficient enough, as percentage increase in RGNP in the current year is less than the percentage increase in real money stock in the past year i.e $(\% \Delta RGNP_t < \% \Delta RM_{2(t-1)})$

In fact, the lower responsiveness of output to a given change in money stock even after one year lag leads to an imbalance in the real and monetary sectors adjustments which ultimately results into price rise in Jordan The estimated responsiveness of prices

with one year lag to the real money stock is not only positive but relatively very high (0.987).

In this section an attempt has been made to analyse the responsiveness of Income and Prices to changes in the money stock Economists are also of the view that causation is not necessarily unidirectional To test for the causation and the direction the following section makes use of some tests developed by the economists

6.4.1 Causality Tests : Theoretical Background

In the absence of any causality test various causal hypothesis were analysed with the help of conventional regression analysis, where in the direction of caution is implicity taken for granted on a priori grounds Apparently, the emergence of mutually conflicting paradigms in economic thinking brought the need for regorous causality tests Till the late 1960s statistical techniques for measuring causality among economic variable were not well developed

It was Granger's (1963)[13] notion of causality which paved way for causality test in economic relationships Granger's definition of causality is expressed in terms of predictability. Granger defines simple causality as follows X causes Y, if knowledge of past X reduces the variance of the errors in forecasting Y as compared to the variance of the error which would be made from knowledge of past Y alone

Over the years, a wide range of causality tests have been developed The attention here is focused mainly two tests (i) Granger Test and (2) Sims Test A brief explanation of these tests are presented below

(i) Granger Test

The test procedure developed by Granger (1969) is based on the axiom that only the past causes the future In testing the direction of causation between two variables X and Y, the test involves estimates of the following regressions

$$Y = f(Y_{-1}, Y_{-2} \text{ ------ } Y_{-m}) \qquad \text{G-1}$$

$$Y = f(Y_{-1}, Y_{-2} \text{ ---- } Y_{-m}, X, X_{-1}, X_{-2} \text{ ---- } X_{-n}) \qquad \text{G-2}$$

$$X = f(X_{-1}, X_{-2} \text{ ---- } X_{-m}) \qquad \text{G-3}$$

$$X = f(X_{-1}, X_{-2} \text{ ---- } X_{-m}, Y, Y_{-1}, Y_{-2} \text{ ---- } Y_{-n}) \qquad \text{G-4}$$

Where m and n are suitably chosen lag lengths Equations G 1 and G 3 are restricted and equations G 2 and G 4 are unrestricted To test whether causation runs from X to Y the equations G 1 and G 2 are used

In principle, X is said to cause Y if the current and lagged values of X are significant in explaining variations in Y If the coefficients of all explanatory X variables (in equation G 2) as a group are statistically significant in explaining Y This is tested by using the F-test which is explained below

In exactly similar manner, causation from Y to X is determined by equations G 3 and G 4

The four possible outcomes and their implications are as follows

(i) X causes Y, but Y does not cause X i e unidirectional causation from X to Y

(ii) X does not cause Y but Y causes X i e unidirectional causation from Y to X

(iii) X causes Y and Y causes X i e bi-directional causation between X and Y

(iv) X does not cause Y, and Y does not cause X i e X and Y are independent

Any two variables under consideration can be classified into one of the four possible out comes depending up on the results The Granger's test explained above is based on the axion that only the past causes the future The test proposed by Sims takes into consideration the past as well as the future

(ii) Modified Sims Test

This test mechanism developed by Sims (1972)[14] is based on the principle that the future does not cause the past It involves regressing Y on past, present and future values of X and regressing X on the past, present and future values of Y

The Sims test is applied on prefiltered values of X and Y The variables X and Y are prefiltered to make them covariance stationary, Sims has originally used $(1-0.75L)^2$ to filter the series Various studies have used modified techniques to suit their requirements. Various studies have taken different lead/lags depending upon the nature of data at hand.

The test procedure involves the following regressions

$Y = f(X_{-m} \text{------} X_{-1}, X)$ S-1

$Y = f(X_{-m} \text{------} X_{-1}, X, X_1 \text{-----} X_m)$ S-2

$X = f(Y_{-m} \text{------} Y_{-1}, Y)$ S-3

$X = f(Y_{-m} \text{------} Y_{-1}, Y, Y_1 \text{----} Y_m)$ S-4

Where m is suitably chosen lead and lag length In this case, X is said to cause Y if coefficients on the future values of Y, as a group, are statistically significant in explaining

variations in X, like wise Y is said to cause X if coefficients of the future values of X, as a group are statistically significant in explaining variation in Y.

According to the test procedure[15], X is said to cause Y unidirectionally if

(i) Future values of all Y variables, as a group are statistically insignificant in explaining Y, and

(ii) Future values of all Y variables, as a group are statistically significant in explaining X.

The first condition is verified from equation S.1 and S 2 while the second one is verified on the basis of equation S 3 and S 4 The other possibilities of causation, i e unidirectional from Y to X, bi-directional and independence could be examined similarly

In the case, Y is said to cause X unidirectionally if

(i) Future values of all Y variables, as a group are statistically insignificant in explaining X, and

(ii) Future values of all X variables, as a group are statistically significant in explaining Y.

The first condition is verified from equations S 3 and S 4 while the second one is verified on the basis of equations S.1 and S.2

The present study uses modified Sims test which has gained wider acceptability among researchers For this test the study takes 3 past lags and 3 future lags or leads The variable under consideration i e. money, real output, and prices have been filtered using the

$$X_t^* = (X_t - 1\ 5,\ X_{t-1} + 0\ 5625\ X_{t-2})$$

Using this method all the three series are filtered This method would make the variables covariance stationary[16] The results of the test are presented in the following paragraphs The results are tested using the F-test presented below

6.4.2 Results of Causality Tests

F-Test : For evaluating the results of the causality tests one does not make use of the conventional t - statistic or coefficient of determinant (R^2) but the F-test is made use of The significance of individual parameters is not of any significance The F-statistic is estimated using the formula

$$F = \frac{(RRSS - URSS) / r}{(RRSS - URSS) / N\text{-}K}$$

where,

RRSS - residual sum of squares from the restricted equation

URSS - residual sum of squares from unrestricted equation

K - number of parameters

r - number of linearly independent restrictions.

N - total number of observations.

The hypothesis is accepted of rejected comparing the calculated value of F with that of table value at the appropriate degrees of freedom (r, N-K). The results of the Granger's test and modified Sims test are presented in the following paragraphs

6.4.2.1 Granger Test : Causality Between Money and Output

Here money is measured by broad money (M_2) and output in terms of real GDP The results are presented in Table (6-4). The numbers given in the columns are coefficient associated with corresponding lags of the explanatory variables The proposition that money causes output is supported by the results.

The F-statistic corresponding to the Granger test that 'Money causes Output' is 11 71 which is significant at 1% level There is no support for reserve causality i.e. from output to money as the Granger F-value is very low 1 04 and is not significant But at the same time weak reserve causation is not entirely ruled out. Therefore it can be concluded that there is unidirectional causality from Money to Output

Table 6.4 : Granger Test (Causality Between Money and Output)

Explanation variables	Whether Money causes Output (Y)		Whether Output causes Money (M_2)	
	Constrained equation	Unconstrained equation	Constrained equation	Unconstrained equation
M_t		0 18440		
M_{t-1}		0.41610	1 25389	0 75321
M_{t-2}		-0.72219	- 0 20421	0.26497
M_{t-3}		0.23779	0 01666	-0.05568
Y_{t-1}	1 34239	1.08436		-0 69514
Y_{t-2}	0 05351	0.23767		-0 08134
Y_{t-3}	-0 36816	-0.52411		0.28122
Y_t				0 70410
Summary Statistics	F = 11 71**		F = 1 04	

* - significant at 5% level of significance.

** - significant at 1% level of significance

6.4.2.2 Granger Test : Causality Between Money and Prices

As mentioned earlier money is measured by broad money M_2 and price level is measured by CPI. The numbers given in columns are coefficient associated with corresponding lags of the explanatory variables The results from Table 6 5 show that the proportion that money causes prices is strongly supported by the Granger test wherein the relevant F statistics placed at 6.825 which is significant at 1% level There is much stronger support for the reverse causality i e from price to money as the F value is higher (12 933) and is much more significant

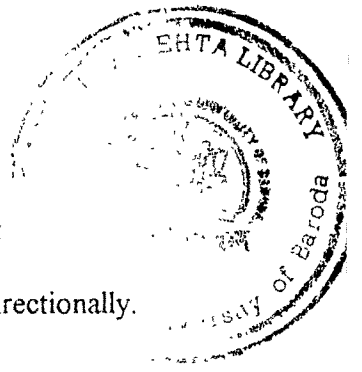
This implies that in the case of Jordanian economy the causality between money and prices is bi-directional.

Table 6.5 : Granger Test : Causality Between Money and Prices

Explanation variables	Whether Money causes Prices		Whether Price causes Money	
	Constrained equation	Unconstrained equation	Constrained equation	Unconstrained equation
P_t				8 7954
P_{t-1}	1 88241	1.66867		-14.05505
P_{t-2}	-1 34935	- 1 61761		19 26747
P_{t-3}	0 49130	0.62884		- 9.47223
M_{t-1}		-0 02048	1.25389	0 71804
M_{t-2}		0 00962	- 0.20421	- 0.13789
M_{t-3}		- 0.03153	0 01666	0.34725
M_t		0 04950		
Summary	F - ratio = 6 825**		F - ratio = 12 933**	

* - significant at 5% significance level.

** - significant at 1% significance level



6.4.2.3 Modified Sims Test : Causality Between Money and Output

In this case, the proposition that money (M_2) is said to cause GDP unidirectionally. This is proven by the fact that

(i) Future values of all M_2, as a group are statistically insignificant in explaining GDP as indicated by low F-ratio. The F-ratio is 0 7205

(ii) Future values of GDP as a group are statistically significant in explaining M_2 This is indicated by high F-ratio The ratio here is 8 9419 which is significant at one percent level

This implies that in case of Jordanian economy the causality between money and output is unidirectional See Table (6-6)

Table 6.6 : Sims Test - Causality Between Money and Output

Explanatory variables	Whether Money causes Output		Whether Output causes Money	
	Constrained equation	Unconstrained equation	Constrained equation	Unconstrained equation
$M_{(t-3)}$	0 0784	-0 6826	0 17732	-0 2693
$M_{(t-2)}$	-0 0093	0 2479	0 16284	- 0 0433
$M_{(t-1)}$	0 5036	0 6439	- 0 18214	0 0151
$M_{(t+1)}$	0 0771	0 1546		
$M_{(t-2)}$		0.16387		
$M_{(t+3)}$		-0 1768		
$Y_{(t-3)}$	0 2586	0.2727	0 11230	0 8294
$Y_{(t-2)}$	0 2336	0 5237	0 36700	0 1247
$Y_{(t-1)}$	- 0 3309	- 0 2217	0 2760	- 0 1171
$Y_{(t+1)}$			0 4062	1 0744
$Y_{(t-2)}$				- 0 0129
$Y_{(t-3)}$				0 2526
Summary Statistics	F- ratio = 8 9419**		F- ratio = 0 7205	

** - significant at 1% level

6.4.2.4 Modified Sims Test : Causality Between Money and Prices

In this case money (M_2) is said to cause prices unidirectional. This is proven by the fact that

(i) Future value of all M_2, as a group are statistically insignificant in explaining prices if the F ratio is small and insignificant (F = 2.5744)

(ii) Future value of prices, as a group are statistically significant in explain (M_2) if F ratio is high and significant Here the F - ratio is 4 6653 which is significant at 5% level.

Hence it can be concluded that one way causality exist i e money causes prices See Table (6-7)

Table 6.7 : Sims Test - Causality Between Money and Prices

Explanation variables	Whether Price causes Money		Whether Money causes Prices	
	Constrained equation	Unconstrained equation	Constrained equation	Unconstrained equation
$P_{(t-3)}$		7 5645	-0 2349	- 0 2624
$P_{(t-2)}$		8 9684	- 0 4708	- 0 1044
$P_{(t-1)}$		- 2 9332	0 1587	0 4419
$P_{(t-1)}$		1 9892		
$P_{(t-2)}$		5 0962		
$P_{(t-3)}$		1.3335		
$M_{(t-3)}$	0 4476	-0.0068		- 0 02797
$M_{(t-2)}$	0 1188	0 7522		0 03154
$M_{(t-1)}$	0 0432	- 0 3706		0.01251
$M_{(t-1)}$				-0 02154
$M_{(t-2)}$				0 02993
$M_{(t-3)}$				0 01206
Summary Statistics	F - ratio = 2 5144		F - ratio = 4 6653*	

* Significant at 5% level of significance

6.5 Conclusion

The above analysis reveals that changes in money stock in both nominal and real terms have positive influence over national production, nominal as well as real The point worth noting at this stage is that, the responsiveness of output to change in money stock is not as strong as it should have been Hence, a continuous fall in the value of Jordanian Dinar due to high price rise is the experience of the Jordanian economy during the last three decades

The lagged effect of real money balance over RGNP was slightly better than the effect for the same year (on year to year basis) which is evident from the above analysis The RGNP responsiveness improved slightly from 0 412% to 0 42% as we move from year to year to lagged relationship Similarly the experience in terms of price change has not changed much The price responsiveness to money stock was 1 008 on year to year basis, while lagged relationship showed a marginal fall to 0 987 All these figures are statistically significant

From the analysis done, one can say that, in case of Jordanian economy, the increase in money supply has a strong positive impact on national output and price level The Jordanian economy's experience also highlight, that the price effect of increase in money supply is more stronger than the output effect during the period of our study

The results of the causality tests indicate that the money causes prices as well as GDP The results of the Granger's test indicate bi-directional causality between money

and prices. This test also indicate unidirectional causality running between money and GDP. The results of modified Sim's test indicate that causality is unidirectional which runs from money to GDP and from money to prices However the reverse causality can not be completely ruled out Combining the results of both the causality tests it can be concluded that causation runs from Money to Output and that it also runs from Money to Prices

References

1. Friedman M and A J Schwarts. (1963) *A Monetary History of the United States, 1867 - 1960*. Princeton University Press, Princeton and

_____. (1982) *Monetary Trends in the United States and the United Kingdom. Their Relation to Income, Prices and Interest Rates*, 1987-1975. NBER - The University of Chicago Press, London

2 Klein J.J (1956) German Money and Prices 1932-44 in Milton Friedman's (ed.) "*Studies in The Quantity Theory of Money*", University of Chicago Press, pp 121-159

3 Friedman M (1956) The Quantity Theory of Money A Restatement in Friedman's (ed) *Studies in the Quantity Theory of Money*, University of Chicago Press.

4 Cramp A B (1961) "How Much Does Money Matter", *The Bankers Magazine*, London, England. Vol.192, (October 1961), pp 242-247

5 Gupta G S (1964). *Monetary Target Setting* - Mimeo, Indian Institute of Management, Ahmedabad, India

6 Ray and K S. Nambordri. (1987). "Granger's Causality - An Indian Experience", *Journal of Quantitation Economics*, No.4

7. Singh B (1989) "Money Supply - Price Causality Revisited", *Economic and Political Weekly*, No 24

8 Rangarajan and R R Arif. (1990). Money, Output and Prices A Macro Economic Model, *Economic and Political Weekly*, April-21, 1990, pp 837-852

9 Sims C A. (1972) "Money, Income and Causality", *American Economic Review*, Vol 62, pp 540-552

10 Williams D , C A E Goodhart and D H Gowland (1976) "Money, Income and Causality the U K. Experience", *American Economic Review*, Vol.66, pp417-423

11 Barth J R and J T Bennett. (1974) The Role of Money in Canadian Economy An Empirical Test", *Canadian Journal of Economics*, Vol 7, pp 306-311.

12 Putnam B H and D S Wilford (1978). Money, Income and Causality in the United States and the U.K "A Theoretical Explanation of Different Findings", *American Economic Review*, Vol 68, pp 423-427

13. Granger C W J (1963). "Economic Processes Involving Feedback", *Information and Control*, Vol 6, pp 28-48.

(1969) "Investigating Causal Relations by Econometric Models and Cross-spectral Methods", *Econometrica*, Vol.37, No.3, pp.424-438.

14 Sims C A (1972). "Money, Income and Causality", *American Economic Review*, Vol.62, pp.540-552

15. Narendra Jadav (1994) "*Monetary Economics for India*", MacMillan India Ltd , Delhi

16 Chow Peter C Y (1987). "Causality between Export Growth and Industrial Development Empirical Evidence from NIC is", *Journal of Development Economics*, Vol 26, No 1, June 1987

Table 6.1 : Money Output and Price Behaviour in Jordan (1964-1995) (JD Million)

Year	M2	GNP	RGNP	PI 1980=100	Annual Growth Rate M2	GNP	RGNP	PI
1964	53.60	203.00	869.75	23.34				
1965	64.20	217.20	858.50	25.30	19.78	7.00	-1.29	8.40
1966	75.80	239.20	872.04	27.43	18.07	10.13	1.58	8.42
1967	94.00	229.90	749.35	30.68	24.01	-3.89	-14.07	11.85
1968	108.90	205.70	670.47	30.68	15.85	-10.53	-10.53	0.00
1969	119.00	256.30	783.07	32.73	9.27	24.60	16.79	6.68
1970	129.10	235.10	671.71	35.00	8.49	-8.27	-14.22	6.94
1971	135.10	247.50	676.41	36.59	4.65	5.27	0.70	4.54
1972	146.60	285.70	738.43	38.69	8.51	15.43	9.17	5.74
1973	176.10	316.70	733.44	43.18	20.12	10.85	-0.68	11.61
1974	219.90	394.80	765.26	51.59	24.87	24.66	4.34	19.48
1975	288.40	449.50	778.62	57.73	31.15	13.86	1.75	11.90
1976	378.40	569.40	885.26	64.32	31.21	26.67	13.70	11.42
1977	467.60	698.30	948.26	73.64	23.57	22.64	7.12	14.49
1978	606.70	802.40	1017.50	78.86	29.75	14.91	7.30	7.09
1979	773.10	1008.20	1120.22	90.00	27.43	25.65	10.10	14.13
1980	984.80	1213.70	1213.70	100.00	27.38	20.38	8.34	11.11
1981	1179.90	1526.80	1417.25	107.73	19.81	25.80	16.77	7.73
1982	1403.30	1765.50	1526.19	115.68	18.93	15.63	7.69	7.38
1983	1615.20	1877.90	1544.45	121.59	15.10	6.37	1.20	5.11
1984	1757.70	1995.00	1581.58	126.14	8.82	6.24	2.40	3.74
1985	1874.80	2015.50	1550.38	130.00	6.66	1.03	-1.97	3.06
1986	2072.40	2146.30	1651.00	130.00	10.54	6.49	6.49	0.00
1987	2372.20	2158.40	1663.25	129.77	14.47	0.56	0.74	-0.18
1988	2646.80	2175.90	1572.07	138.41	11.58	0.81	-5.48	6.66
1989	2971.10	2180.70	1254.29	173.86	12.25	0.22	-20.21	25.61
1990	3122.60	2428.80	1202.08	202.05	5.10	11.38	-4.16	16.21
1991	3717.50	2634.00	1204.72	218.64	19.05	8.45	0.22	8.21
1992	4193.00	3306.80	1455.01	227.27	12.79	25.54	20.78	3.95
1993	4481.80	3662.30	1559.95	234.77	6.89	10.75	7.21	3.30
1994	4841.50	4039.20	1660.99	243.18	8.03	10.29	6.48	3.58
1995	5159.80	4503.60	1809.69	248.86	6.57	11.50	8.95	2.34
					Annual Average Growth Rate			
1964-95					16.15	10.98	2.81	8.08
1964-74					15.36	7.53	-0.82	8.36
1975-84					23.32	17.81	7.64	9.41
1985-95					10.36	7.91	1.73	6.61

Table 6.2 : Index of Money, Output and Prices (1964 =100)

Year	Index of Real Money	Index of Real GNP	Price Index (1964=100)
1964	100.00	100.00	100.00
1965	110.50	98.71	108.40
1966	120.33	100.26	117.52
1967	133.42	86.16	131.45
1968	154.56	77.09	131.45
1969	158.32	90.03	140.23
1970	160.62	77.23	149.96
1971	160.78	77.70	156.77
1972	165.00	84.90	165.77
1973	177.59	84.33	185.00
1974	185.61	87.99	221.04
1975	217.54	89.52	247.34
1976	256.18	101.78	275.58
1977	276.50	109.03	315.51
1978	335.01	116.99	337.87
1979	374.05	128.80	385.60
1980	428.83	139.55	428.45
1981	476.92	162.95	461.57
1982	528.24	175.47	495.63
1983	578.45	177.57	520.95
1984	606.78	181.84	540.45
1985	627.98	178.26	556.98
1986	694.17	189.82	556.98
1987	796.00	191.23	556.00
1988	832.70	180.75	593.02
1989	744.14	144.21	744.90
1990	672.97	138.21	865.68
1991	740.38	138.51	936.76
1992	803.38	167.29	973.74
1993	831.28	179.36	1005.87
1994	866.94	190.97	1041.90
1995	902.85	208.07	1066.24

Table 6.3 : Index of Money, Output and Prices (1980 =100)

Year	Index of Real Money	Index of Real GNP	Price Index (1980=100)
1964	23.32	71.66	23.34
1965	25.77	70.73	25.30
1966	28.06	71.85	27.43
1967	31.11	61.74	30.68
1968	36.04	55.24	30.68
1969	36.92	64.52	32.73
1970	37.46	55.34	35.00
1971	37.49	55.73	36.59
1972	38.48	60.84	38.69
1973	41.41	60.43	43.18
1974	43.28	63.05	51.59
1975	50.73	64.15	57.73
1976	59.74	72.94	64.32
1977	64.48	78.13	73.64
1978	78.12	83.83	78.86
1979	87.23	92.30	90.00
1980	100.00	100.00	100.00
1981	111.21	116.77	107.73
1982	123.18	125.75	115.68
1983	134.89	127.25	121.59
1984	141.50	130.31	126.14
1985	146.44	127.74	130.00
1986	161.88	136.03	130.00
1987	185.62	137.04	129.77
1988	194.18	129.53	138.41
1989	173.53	103.34	173.86
1990	156.93	99.04	202.05
1991	172.65	99.26	218.64
1992	187.34	119.88	227.27
1993	193.85	128.53	234.77
1994	202.16	136.85	243.18
1995	210.54	149.11	248.86