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ABSTRACT

This study extends the analysis of causality by Husain and Rashid (2006) by taking care of the shift in the variables due to the price hikes in the early 1970s. We investigate the causal relations between real money and real income, between nominal money and nominal income, and between nominal money and prices using the annual data set from 1959-60 to 2003-04, examining the stochastic properties of the variables used in the analysis and taking care of the expected shifts in the series through dummy/ies. The analysis indicates significant shifts in the variables during the sample period. In this context, the shift of the early 1970s seems to be more important to be incorporated in the analysis. The study finds an active role of money in the Pakistani economy, as it is found to be the leading variable in changing prices without any feedback. In the case of income, the study finds the feedback mechanism of money, which is generally missing in the earlier studies probably because of not taking care of the shift in the macroeconomic variables in Pakistan in the early 1970s.

JEL classification: E3, E4, N3

Keywords: Money, Income, Prices, Price Hikes, Causal Relations, Pakistan

I. INTRODUCTION

Money, Income, and Prices are important macroeconomic variables which play crucial roles in an economy. In this context, the role of money in the determination of income and prices has long been debated particularly between the Keynesians and the Monetarists who hold opposite views on the role of money. The Monetarists claim that money plays an active role and leads to changes in income and prices. In other words, changes in income and prices in an economy are mainly caused by the changes in money stocks. That is, the direction of causation runs from money to income and prices without any feedback. The Keynesians, on the contrary, argue that money does not play an active role in changing income and prices. In fact income plays the leading role in changing money stocks via demand for money implying that the direction of causation runs from income to money without any feedback. Similarly, changes in prices are mainly caused by structural factors.

The empirical evidence in this regard also remains inconclusive. For example, Sims (1972) examining the causal relationship between money and income in the US economy found the evidence of a uni-directional causality from money to income. Similarly, Brillembourg and Khan (1979) using a longer data set found a unidirectional causality from money to income and prices in the U.S as claimed by the Monetarists. However, the other studies on the issue reported opposite or different results. For example, Williams, Goodhart, and Gowland (1976) found unidirectional causality from income to money in the UK economy

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as suggested by the Keynesians. On the other hand, Barth and Bannett (1974), Lee and Li (1983), Joshi and Joshi (1985) found the evidence of a bi-directional causality between income and money in the economies of Canada, Singapore and India.

Regarding Money-Prices causality, however, the evidence seems to be consistent as the results of Williams, Goodhart, and Gowland (1976) and Lee and Li (1983) are similar to that of Brillembourg and Khan (1979), that is, a unidirectional causality from money to prices.

In Pakistan too the issue has long been investigated but with different results. For example, Khan and Siddiqui (1990) found uni-directional causality from income to money and bi-directional between money and prices. On the other hand, Bengali, Khan, and Saddaqat (1999) found a bi-directional causality between money and income and uni-directional from money to prices. Abbas (1991) also found bi-directional causality between money and income in Pakistan while performing the causality test in Asian countries. Jones and Khilji (1988) while analysing causal relationship between money and prices in Pakistan found the evidence of a bi-directional causality with money supply leading. But Khan and Siddiqui (1990) found bi-directional causality between the two with prices leading. Finally, Husain and Rashid (2006) in a comprehensive investigation on the issue which covers a longer data set, uses both the real and nominal terms of money and income, and takes care of the shifts in the series due to the economic liberalisation programme, found the evidence of a uni-directional causality from income to money and from money to prices. The study does not find the role of money in increasing National Income even after taking care of liberalisation measures.

This study, extending Husain and Rashid (2006), attempts an investigation of the causal relationship between money and income and between money and prices taking care of another important shift in the economic data in Pakistan. The Price Hikes in the early 1970s, generally termed as Oil Price Shocks, had significant impacts not only on the economy of Pakistan but also the

economies around the globe. Following Husain and Rashid (2006) we investigate the causal relations between real money and real income, between nominal money and nominal income, and between nominal money and prices using the data set from 1959-60 to 2003-04 and taking care of the stochastic properties of the variables used in the analysis. In addition, we take care of the two shifts, that is, the shifts due to price hikes as well as due to economic reforms together.

The rest of the paper is organised as follows. The next section discusses the data and outlines the methodology to test the stochastic properties of the variables and their interrelationship. Section III presents the descriptive statistics regarding money, income, and prices as well as the stochastic properties of these variables. Sections IV, V, and VI examine causal relations between real money and real income, nominal money and nominal income, and nominal money and prices respectively. The final section contains the summary and conclusions.

II. DATA AND METHODOLOGY

We use annual data from 1959-60 to 2003-04 to investigate the causal relations of money with income and prices in Pakistan. Gross National Product (GNP) at current prices and constant prices of 1980-81 are used as nominal and real income, broad measure of money (M2) and GDP Deflator with base 1980–81 are used as Money and Prices, respectively. Finally, real money is obtained by deflating M2. The principal data source is the *National Accounts of Pakistan*, prepared by the Federal Bureau of Statistics. The other data sources include *Economic Surveys* by the Finance Division and *Annual Reports* by the central bank, State Bank of Pakistan.

We start by presenting the descriptive statistics that show the basic characteristics of the variables used in the analysis. The formal investigation, however, starts with examining the stochastic properties of the variables used in the analysis. Hence, the Unit Root Test is performed on the variables to test the stationarity of the variables. In this context, the widely used Augmented Dickey

Fuller (ADF) test is used. We also use Phillips-Perron (PP) tests which is robust to a wide variety of serial correlation and heteroskedasticity, where the truncation lag parameters are determined following Schwert's (1987). Next, we apply the Engle-Granger Co-integration test to explore the long run relations among the variables. Finally, the causal relationships between these variables are examined through Granger causality and/or Error Correction Models (ECM). In all cases lag lengths are decided on the basis of Log Likelihood, Akaike information criteria, and Bayesian information criteria.

The sample period, 1959-60 to 2003-04, has been subjected to various changes due to economic and political events. In this context an important event that is likely to significantly affect the variables used in the analysis is the economic liberalisation programme started in the early 1990s. Husain and Rashid (2006) taking care of the event did not find any significant change in the role of money in the causality analysis. We extend their analysis by taking care of another event that significantly affected the macro variables in Pakistan in the early 1970s. The Price Hikes that in fact affected the economy significantly around the world. Moreover, we take care of both the events together. Hence we include a dummy from 1972-73 onwards to take care of the effects of price hikes and a dummy from 1991-92 onwards in the case of economic reforms.

III. MONEY, INCOME, AND PRICES IN PAKISTAN

We start by presenting the descriptive statistics of the variables used in the analysis in Table 1.

The table shows an average annual expansion of around 13 percent in nominal money. With an expansion of around 7 percent in prices, the real money has expanded by 6 percent. Similarly, nominal and real incomes have increased over time with an expansion of 12.6 percent and 5.4 percent respectively. The table further shows the descriptive statistics for the two sub-samples. Sub-sample I cover the period before the price hikes whereas sub-

Table 1

Descriptive Statistics for Growth in Money, Income, and Prices

	Real Money	Nominal Money	Real Income	Nominal Income	Prices
Full Sample: (1960-61—2003-04)					
Mean	0.0605	0.1325	0.0540	0.1262	0.0720
Std. Dev.	0.0697	0.0541	0.0242	0.0491	0.0499
Observations	44	44	44	44	44
Sample I: (1960-61—1971-72)					
Mean	0.0728	0.1010	0.0646	0.0910	0.0282
Std. Dev.	0.0434	0.0385	0.0263	0.0326	0.0332
Observations	12	12	12	12	12
Sample II: (1972-73—2003-04)					
Mean	0.0559	0.1444	0.0500	0.1394	0.0885
Std. Dev.	0.0774	0.0548	0.0225	0.0481	0.0451
Observations	32	32	32	32	32
Equality of Means and Variances					
Mean (*t*-value)	0.91	2.94**	1.70	3.81**	4.83**
Variance (*F*-value)	3.18**	2.02*	1.36	2.17**	1.84

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

sample II represent the periods after the price hikes. Moreover, we also conduct the tests for equality of means and variances between the two sub-samples. The results indicate significant increase in the means of the two nominal variables along with prices. In fact, the average expansion in prices has increased by three times in the second sample. The table also indicates significant increase in variations in real money as well as in the two nominal variables.

The formal investigation is done through Co-integration and Error Correction Model framework. At the first step, the variables are tested for the unit roots by applying both the ADF and PP tests. The results are reported in Table 2 which indicate that the variables are, in general, first differenced stationary, i.e., I(1).

Table 2

Unit Root Tests for Money, Income, and Prices

	Levels		First Difference	
ADF	W/O Trend	W. Trend	W/O Trend	W. Trend
Real Money	–0.490	–3.303	–4.957**	–4.365**
Real Income	–2.837	–1.006	–6.119**	–6.666**
Nominal Money	0.314	–3.507	–5.012**	–4.488**
Nominal Income	–0.399	–1.455	–3.661**	–3.711**
Prices	0.089	–2.563	–3.548**	–3.558**
	Levels		First Difference	
PP (W/O Trend)	(l=3)	(l=9)	(l=3)	(l=9)
Real Money	–0.214	–0.103	–4.886**	–4.763**
Real Income	–3.104**	–2.930**	–6.211**	–6.745**
Nominal Money	0.844	1.021	–5.014**	–4.888**
Nominal Income	–0.151	–0.162	–3.612**	–3.540**
Prices	0.487	0.469	–3.489**	–3.309**
	Levels		First Difference	
PP (W Trend)	(l=3)	(l=9)	(l=3)	(l=9)
Real Money	–2.540	–2.152	–4.823**	–4.682**
Real Income	–0.457	–0.556	–7.325**	–7.290**
Nominal Money	–2.600	–2.433	–5.006**	–4.852**
Nominal Income	–1.788	–1.992	–3.553*	–3.457*
Prices	–2.779	–2.727	–3.488*	–3.295*

Note: ** and * represent significance at 5 percent and 10 percent.

We now proceed to investigate the causal relation between the two variables by estimating the co-integrating regression suggested by Engle-Granger. If co-integration is found, the Error Correction Models are estimated. Other wise, the Granger causality equations are estimated. In all cases lag lengths are decided on the basis of Log Likelihood, Akaike information criteria, and Bayesian information criteria. The next three sections investigate the causal relations between real money and real income, nominal money and nominal income, and nominal money and prices.

IV. CAUSALITY BETWEEN REAL MONEY AND REAL INCOME

We start by looking at the causal relation between the two real variables, real money and real income, reported in Table 3(a).

Table 3(a)

Causality between Real Money and Real Income

	Cointegration (Engle-Granger)				
	Const.	Coeff.	ADF	PP(l=3)	PP(l=9)
RM on RY	–1.345***	1.035***	–1.092	–1.387	–1.358

Conclusion: No Co-integration

Granger Causality			**Granger Causality**		
Lag 1	DRY	DRM	Lag 3	DRY	DRM
DRY(–1)	–0.032	–0.115	DRY(–1)	–0.132	–0.348
DRM(–1)	0.059	0.270	DRY(–2)	0.267	–0.731
F-Value	**0.917**	**0.055**	DRY(–3)	0.321	0.729
			DRM(–1)	0.086	0.394*
			DRM(–2)	–0.012	–0.089
			DRM(–3)	–0.916	–0.117
			F-Value	**1.313**	**1.328**

Conclusion: No Short run Causality upto three lags

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

The ADF and PP tests in co-integrating regression are insignificant rejecting any long run relation between real money and real income. Similarly, the F-values in the Granger equations are insignificant rejecting any short run causal relation between the two real variables. This suggests that real money and real income are independent of each other both in the short and long runs. However, as pointed in Husain and Rashid (2006) the result is not consistent with economic theory and is possibly affected by the shifts in variables during the sample period. In this context, Husain and Rashid (2006) found significant impacts on the relations among variables of the shift due to the start of the economic reforms in the 1990s. In this study we take care of another important shift during the sample period, the shifts due to price hikes in early 1970s.

Shifts in Real Money and Real Income Due to Price Hikes

To take care of the shifts in real variables due to the price hikes we introduce a dummy variable in the analysis that takes the value of one from 1972-73 onwards. The results are reported in Table 3(b).

Table 3(b)

Causality between Real Money and Real Income (Prices)

	Cointegration (Engle-Granger)					
	Const.	D	Coeff.	ADF	PP(l=3)	PP(l=9)
RM on RY	–3.863***	–0.428***	1.259***	–4.943***	–4.864***	–4.940***

Conclusion: Evidence of Co-integration

Error Correction Causality			**Error Correction Causality**		
Lag 1	DRY	DRM	Lag 3	DRY	DRM
D	0.059***	0.017	D	0.003	0.009
e(–1)	–0.008	–0.728***	e(–1)	0.062	–0.752***
DRY(–1)	–0.081	–0.446	DRY(–1)	–0.180	–0.293
DRM(–1)	0.058	0.369	DRY(–2)	0.334	–0.206
F-Value	**0.711**	**1.474**	DRY(–3)	0.299	–0.334
			DRM(–1)	0.087	0.295*
			DRM(–2)	–0.019	0.058
			DRY(–3)	–0.093	–0.044
			F-Value	**1.078**	**0.632**

Conclusion: Uni-directional Causality from Income to Money in the long run
No Short run Causality

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

The dummy variable in the co-integrating regression is highly significant indicating significant shift in the relation between real variables. The ADF and PP tests are also highly significant indicating the existence of a strong relation between real money and real income in the long run. The error term in money equation is also highly significant thus verifying the strong long run relation between real variables. Finally, the analysis indicates a uni-directional causality from real income to real money in the long run. In the short run the real variables do not seem to affect each other.

Shifts in Real Money and Real Income Due to Both Prices and Reforms

To take care of both the shifts, price hikes and economic reforms, we include another dummy, D2, which takes the value of one from 1991-92 onwards in addition to the dummy for prices, D1. The results are shown in Table 3(c).

Table 3(c)

Causality between Real Money and Real Income (Prices and Reforms)

	Cointegration (Engle-Granger)						
	Const.	D1	D2	Coeff.	ADF	PP(l=3)	PP(l=9)
RM on RY	–2.735***	–0.353***	0.124***	1.163***	–5.238***	–5.093***	–5.008***
Conclusion: Evidence of strong Co-integration							
Error Correction Causality							
Lag 2	DRY	DRM					
D1	0.003	0.004					
D2	–0.026*	0.005					
e(–1)	0.051	–0.929***					
DRY(–1)	–0.338	–0.186					
DRY(–2)	0.012	0.171					
DRM(–1)	0.099	0.381**					
DRM(–2)	0.022	0.082					
F-Value	**1.137**	**0.211**					
Conclusion: Uni-directional Causality from Income to Money in the long run No Short run Causality							

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

Both the dummies are significant where the dummy for prices has a greater magnitude. The results remain the same as in the case where only the dummy for prices is included, that is, a uni-directional causality from real income to real money in the long run with no short run causality.

V. CAUSALITY BETWEEN NOMINAL MONEY AND NOMINAL INCOME

We now turn to examine the causal relation between the two nominal variables using the same procedure adopted earlier. The first set of results is shown in Table 4(a).

Table 4(a)

Causality between Nominal Money and Nominal Income

	Cointegration (Engle-Granger)				
	Const.	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on NY	–1.100***	1.016***	–1.859*	–1.525	–1.451
Conclusion: weak evidence of Co-integration					

Error Correction Causality			**Granger Causality**		
Lag 2	DNY	DNM	Lag 2	DNY	DNM
e(–1)	–0.037	–0.201*			
DNY(–1)	0.520**	-0.311	DNY(–1)	0.495***	–0.196
DNY(–2)	–0.012	0.125	DNY(–2)	–0.060	0.401**
DNM(–1)	0.085	0.208	DNM(–1)	0.115	0.261
DNM(–2)	0.019	–0.017	DNM(–2)	–0.009	–0.052
F-Value	**0.182**	**1.061**	**F-Value**	**0.371**	**2.346**
Conclusion: Weak Evidence of Uni-directional Causality from income to money					

Error Correction Causality			**Granger Causality**		
Lag 3	DNY	DNM	Lag 3	DNY	DNM
e(–1)	0.066	–0.075			
DNY(–1)	0.569**	–0.159	DNY(–1)	0.504***	–0.097
DNY(–2)	–0.069	–0.005	DNY(–2)	–0.115	0.097
DNY(–3)	0.209	0.559**	DNY(–3)	0.150	0.520**
DNM(–1)	0.020	0.034	DNM(-1)	0.061	0.104
DNM(–2)	0.049	0.017	DNM(–2)	0.019	0.022
DNM(–3)	–0.095	–0.025	DNM(–3)	–0.111	–0.056
F-Value	**0.148**	**2.503***	**F-Value**	**0.288**	**4.034****
Conclusion: Uni-directional Causality from income to money at 3 years lag					

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

The PP tests in Co-integrating regression are insignificant rejecting any long run relation between the two nominal variables. However, the ADF test is significant at 10 percent level of significance. Hence, we can say that there is a weak evidence of any long run relation between the two nominal variables. The Error Correction equations verify the weak long run relation where the error term is significant at 10 percent in money equation. The equations indicate a weak evidence of uni-directional causality from nominal income to nominal money in the long run with no short run causal effects. If we assume no Co-integration the Granger equations show the evidence of income affecting money at 2nd lag although the F-test is not statistically significant.

Following Husain and Rashid (2006) we report the analysis for the 3rd lag too. The results show that the error term in error correction equations has become insignificant implying no long run relation between money and income. The equations further show the significant effects of income on money at 3rd lag verified by *F*-value. Same result is shown by Granger equations if we ignore the error term.

Hence, there is evidence of a one-way causation from nominal income to nominal money although the existence of a long run relation between the two nominal variables is not clear. There is also persistent evidence of nominal income affected by its own first lag and affecting money at three years lag. We now proceed to take care of the shifts in nominal variables during the sample period.

Shifts in Nominal Money and Nominal Income Due to Price Hikes

The results taking care of the shifts in nominal variables due to the price hikes in the early 1970s are reported in Table 4(b).

Table 4(b)

Causality between Nominal Money and Income (Prices)

	Cointegration (Engle-Granger)					
	Const.	D	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on NY	–1.846***	–0.393***	1.097***	–4.631***	–4.479***	–4.407***

Conclusion: Evidence of Co-integration

Error Correction Causality			**Error Correction Causality**		
Lag 2	DNY	DNM	Lag 3	DNY	DNM
D	0.066**	0.060*	D	0.056*	0.050
e(–1)	–0.369***	–0.449***	E(–1)	–0.474***	–0.359**
DNY(–1)	0.239	0.046	DNY(–1)	0.236	0.045
DNY(-2)	0.205	0.018	DNY(–2)	0.098	–0.075
DNM(-1)	–0.072	0.317**	DNY(–3)	0.370*	0.324
DNM(-2)	–0.041	–0.011	DNM(–1)	–0.214	0.191
F-Value	**0.230**	**0.063**	DNM(–2)	0.000	0.018
			DNM(–3)	–0.118	–0.065
			F-Value	**1.082**	**0.753**

Conclusion: Bi-directional Causality between Income and Money in the long run
No Short run Causality

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

The table shows that as in the case of real variables the shift in the relation of nominal variables due to the price hikes is very significant. Once again, the ADF and PP tests have become highly significant indicating strong evidence of a long run relation between the two nominal variables. However, the most significant change occurs in the direction of causality. Now the results show the bi-directional causality between nominal money and nominal income in the long run. In the short run, however, no causal relation between the two still prevails. Following the procedure adopted previously, we do the analysis for the third lag that also indicates significant change. The persistent three years lag effects of income on money now disappears.

Hence by taking care of the shifts in the nominal variables due to the price hikes we have found the feedback mechanism of money in changing income in Pakistan. It may be mentioned here that Husain and Rashid (2006) in a similar kind of analysis but taking care of the shift due to the economic reforms did not find such mechanism of money. We now take care of both the shifts, the shifts due to the price hikes and the economic reforms, together to further explore the issue.

Shifts in Nominal Money and Nominal Income Due to Both Reforms and Prices

The results taking care of both the shifts are reported in Table 4(c).

The table shows that, as in the case of real variables, the two dummies are significant and the dummy for prices has greater magnitude. It can be seen that the result regarding causality is similar to the one when only one dummy, the dummy for prices, is included.

Hence, the analysis indicates, as in the case of real variables, significant shifts in the nominal variables during the sample period. Similarly, the shift occurred in the early 1970s due to price hikes seems to be very crucial to be incorporated in the analysis as it significantly changes the results. The results

Table 4(c)

Causality between Nominal Money and Income (Prices and Reforms)

	Cointegration (Engle-Granger)						
	Const.	D1	D2	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on NY	–1.451***	–0.321***	0.117**	1.059***	–4.597***	–4.411***	–4.226***

Conclusion: Strong evidence of Co-integration

Error Correction Causality			Error Correction Causality		
Lag 2	DNY	DNM	Lag 3	DNY	DNM
D1	0.080***	0.064*	D1	0.064**	0.054
D2	–0.022	–0.015	D2	–0.012	–0.007
e(–1)	–0.442***	–0.549***	e(–1)	–0.600***	–0.438**
DNY(–1)	0.186	0.001	DNY(–1)	0.193	0.010
DNY(–2)	0.252	–0.132	DNY(–2)	0.192	–0.157
DNM(–1)	–0.076	0.312*	DNY(–3)	0.407**	0.279
DNM(–2)	–0.028	–0.002	DNM(–1)	–0.239	0.201
F-Value	**0.250**	**0.209**	DNM(–2)	0.003	0.021
			DNM(–3)	–0.098	–0.081
			F-Value	**1.352**	**0.522**

Conclusion: Bi-directional Causality between Income and Money in the long run
No Short run Causality

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

indicate the existence of a long run relation between nominal money and nominal income where the two variables seem to affect each other in the long run. In the short run, however, the two nominal variables, as the real variables, appear to be independent of each other.

VI. CAUSALITY BETWEEN NOMINAL MONEY AND PRICES

Finally, we investigate the causal relation between nominal money and prices using the similar procedure adopted in the previous sections. The first set of results is reported in Table 5(a).

Both the ADF and PP tests are highly significant indicating the existence of a long run relation between money and prices in Pakistan. The error correction equations suggest a uni-directional causality from money to prices in the long run. However, in the short run there is evidence of prices affecting money at 2nd lag although *F*-value is not significant. Once again as in the case of

Table 5(a)

Causality between Nominal Money and Prices

	Cointegration (Engle-Granger)				
	Const.	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on DF	3.850***	1.697***	–3.696***	–2.687***	–2.477**
Conclusion: Strong evidence of Co-integration					
Error Correction Causality					
Lag 2	DDF	DNM			
e(–1)	–0.314***	–0.071			
DDF(–1)	0.589***	–0.349			
DDF(–2)	0.216	0.496*			
DNM(–1)	0.163	0.167			
DNM(–2)	0.003	0.045			
F-Value	**0.898**	**2.446**			
Conclusion: Uni-directional from money to Prices in the long run					

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

nominal income we do the analysis for the 3rd lag. However, the result (not reported here) shows no significant lags in either equation indicating no short run causal effects. However, it verifies the uni-directional causality from money to prices in the long run.

Shifts in Money and Prices Due to Price Hikes

The results taking care of the shifts in the two variables due to the price hikes in the early 1970s are reported in Table 5(b).

Table 5(b)

Causality between Money and Prices (Prices)

	Cointegration (Engle-Granger)					
	Const.	D	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on DF	3.702***	–0.172**	1.755***	–3.915***	–2.924***	–2.734***
Conclusion: Evidence of Co-integration						
Error Correction Causality						
Lag 2	DDF	DNM				
D	0.097***	0.038				
e(–1)	–0.462***	–0.054				
DDF(–1)	0.393***	–0.324				
DDF(–2)	0.244*	0.490*				
DNM(–1)	–0.002	0.153				
DNM(–2)	–0.046	0.032				
F-Value	**0.130**	**2.068**				
Conclusion: Un-idirectional from money to Prices in the long run						

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

The dummy variable in the co-integrating regression shows the sign of a significant shift in the relation of money and prices. However, the results remain the same, that is, a unidirectional causality from money to prices in the long run with indication of prices affecting money at two years lag.

Shifts in Money and Prices Due to Both Reforms and Prices

Finally, the results taking care of both the shifts are reported in Table 5(c).

Table 5(c)

Causality between Money and Prices
(Prices and Reforms)

	Cointegration (Engle-Granger)						
	Const.	D1	D2	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on DF	3.556***	–0.220**	–0.081	1.799***	–3.953***	–2.993***	–2.787***

Conclusion: Strong evidence of Co-integration

Error Correction Causality		
Lag 2	DDF	DNM
D1	0.102***	0.039
D2	–0.010	–0.008
e(–1)	–0.446***	–0.076
DDF(–1)	0.307**	–0.311
DDF(–2)	0.164	0.452*
DNM(–1)	–0.039	0.162
DNM(–2)	–0.054	0.032
F-Value	**0.350**	**1.777**

Conclusion: Uni-directional from money to Prices in the long run

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

The table shows that the shift in the money-price relationship is significant in the case of price hikes but not in the case of reforms. Once again, the results have not changed. Hence, there is persistent evidence of a uni-directional causality from money to prices in the long run.

Hence, we can say that the relationship between money and prices in Pakistan does not seem to be affected by the shifts in the variables during the sample period. However, the shift occurred in the early 1970s due to price hikes seems to be greater in this case

too. The results indicate the existence of a long run relation between money and prices where money seems to lead prices in the long run. In the short run there is some indication, though not significant, of prices affecting money with two years lag. There is also persistent evidence of prices affected by their own first lag.

VII. SUMMARY AND CONCLUSIONS

The objective of this study is to extend the analysis of causality by Husain and Rashid (2006) by taking care of the shift in the variables due to the price hikes in the early 1970s. Following them we investigate the causal relations between real money and real income, between nominal money and nominal income, and between nominal money and prices using the annual data set from 1959-60 to 2003-04, examining the stochastic properties of the variables used in the analysis, and taking care of the expected shifts in the series through dummy/ies,

The formal analysis indicates significant shifts in the variables during the sample period. These shifts include the price hikes in early 1970s and the start of the economic reforms in early 1990s. In this context, the shift occurred in the early 1970s seems to be more important to be incorporated in the analysis. In particular, it seems to be very crucial in the case of nominal variables as it has significantly changed the results. It may be mentioned here that the significant shifts in the early 1970s may also be due to the separation of the Eastern wing of the country in 1971 affecting macroeconomic variables.

The analysis further indicates the existence of a long run relation between real money and real income provided that shifts in these variables are taken care. Moreover, real income seems to be the leading variable that affects real money in the long run. In the short run the two real variables appear to be independent of each other. Similarly, when money and income are expressed in nominal terms there is evidence of a one-way causation from income to money although the existence of a long run relation between them is not clear.

However, the relationship between the two nominal variables is significantly affected by the shift due to the price hikes in the early 1970s. Taking care of the shift indicates the existence of a strong long run relation as well as the bi-directional causality between nominal money and nominal income. The results do not change if we also include the shift representing reforms. In the short run, however, the two nominal variables, like real variables, appear to be independent of each other.

As regards the money-price relationship in Pakistan, the analysis shows a long run relation between the two where money seems to lead prices in the long run. In the short run there is some indication, though not significant, of prices affecting money with two years lag. These findings regarding money-price relationship are not affected by the shifts during the sample period.

Finally it can be said that the study finds an active role of money in the Pakistani economy as it is found to be the leading variable in changing prices without any feed back. In the case of income, the study finds the feedback mechanism of money, generally missing in the earlier studies which may be because of not taking care of the shift in the macro economic variables in Pakistan in the early 1970s.

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