

The background features several large, overlapping, semi-transparent swirls in shades of purple, green, and blue. Scattered throughout are numerous small, yellow, triangular shapes, some pointing towards the center and others pointing outwards, creating a dynamic and abstract visual effect.

Money, Income, and Prices in Pakistan: An Investigation of Causal Relations with shifts

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Monetarist claim that money plays an active role and leads to changes in Income and Prices

Keynesians argue that money does not play an active role but Income leads to changes in Money through Money Demand

Investigation of causal relations started with Sims(1972) who found evidence of unidirectional causality from Money to Income in USA

Subsequent studies report different results

Previous Studies in Pakistan

Khan and Siddiqui (1990) found unidirectional from Income to Money and bi-directional between money and Prices

Bengali, Khan, and Sadaqat (1999) found bi-directional between Money and Income and unidirectional from money to prices

Abbas(1991) found bi-directional between Income and Money

Jones and Khilji (1988) found bi-directional between Money and Prices

Siddiqui(1989) found bi-directional between Money and Prices

This Study

A green balloon with a yellow string and three yellow triangular flags, positioned to the left of the first text block.

Investigates causal relations between

- Real Money and Real Income
- Nominal Money and Nominal Income
- Nominal Money and Prices

A blue balloon with a yellow string and three yellow triangular flags, positioned to the left of the second text block.

Take care of shifts in Variables

- Economic reforms (1990s)
- Price Hikes (1970s)

A purple balloon with a yellow string and three yellow triangular flags, positioned to the left of the third text block.

Take care of Stochastic Properties



Sample: 1959/60 to 2003/04

Variables



Income: GNP at current prices

Money: M2



Prices: GDP Deflator (base 1980/81)

Real Income: GNP at constant prices of 1980/81

Real Money: M2 deflated



Sources:

National Accounts

Statistical Bulletins

A decorative background featuring a green balloon at the top left, a blue balloon in the middle left, and a purple balloon at the bottom left. Yellow streamers and triangular flags are scattered throughout the scene.

Table 1: Descriptive Statistics for Growth in Money, Income, and Prices

Full Sample: (1960/61 - 2003/04)					
	Real Money	Nominal Money	Real Income	Nominal Income	Prices
Mean	0.0605	0.1325	0.0540	0.1262	0.0720
Std. Dev.	0.0697	0.0541	0.0242	0.0491	0.0499
Skewness	-1.72	0.05	0.50	0.79	0.76
Kurtosis	5.29	-0.36	0.77	0.63	1.49
Observations	44	44	44	44	44

Table 2: Correlations Among Money, Income, and Prices (in growth terms)

Full Sample: (1960/61 - 2003/04)						
	Nominal Money	Nominal Income	Prices		Real Money	Real Income
	NM	NY	DF		RM	RY
NM	1.000			RM	1.000	
NY	0.250	1.000		RY	0.450 ^{***}	1.000
DF	0.102	0.887 ^{***}	1.000			

Note: ^{***}, ^{**}, and ^{*} represent significance at 1%, 5% and 10%

Table 3: Lagged Correlations Among Money, Income, and Prices (in growth)

	Full Sample: (1960/61 - 2003/04)					
	NY	NM	DF		RY	RM
NY(-1)	0.483***	0.086	0.567***	RY(-1)	0.020	0.071
NY(-2)	0.192	0.330**	0.203	RY(-2)	0.226	-0.289
NY(-3)	0.192	0.574***	0.096	RY(-3)	0.115	0.041
NY(-4)	0.038	0.110	-0.006	RY(-4)	0.232	-0.016
NY(-5)	-0.080	0.093	-0.185	RY(-5)	0.149	-0.111
NM(-1)	0.214	0.249	0.214	RM(-1)	0.123	0.239
NM(-2)	0.108	0.085	0.094	RM(-2)	0.036	-0.160
NM(-3)	-0.045	0.113	-0.036	RM(-3)	-0.145	-0.132
NM(-4)	-0.043	-0.068	0.022	RM(-4)	-0.137	-0.116
NM(-5)	-0.040	-0.223	-0.044	RM(-5)	-0.089	-0.276
DF(-1)	0.387**	0.049	0.491***			
DF(-2)	0.111	0.454***	0.168			
DF(-3)	0.140	0.492***	0.098			
DF(-4)	-0.010	0.132	0.015			
DF(-5)	-0.179	0.098	-0.235			

Note: ***, **, and * represent significance at 1%, 5% and 10%

Table 4: Unit Root Tests for Money, Income, and Prices

ADF				
	Levels		First Difference	
	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**

PP (W/O Trend)				
	Levels		First Difference	
	(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**

PP (W Trend)				
	Levels		First Difference	
	(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% and 10%

Table 5(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 Cointegration					
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
Lag length: BIC(1), AIC(3)					
Conclusion: No Short run Causality upto three lags					

Note: ***, **, and * represent significance at 1%, 5% and 10%

Table 5(b): Causality between Real Money and Real Income (reforms)

Cointegration (Engle-Granger)						
	Const.	D	Coeff.	ADF	PP(l=3)	PP(l=9)
RM on RY	0.137	0.269***	0.911***	-2.061**	-2.317**	-2.108**
Conclusion: Evidence of Co-integration						
Error Correction Causality			Error Correction Causality			
Lag 1	DRY	DRM	Lag 2	DRY	DRM	
D	-0.025**	0.010	D	-0.028**	-0.030	
e(-1)	0.027	-0.270*	e(-1)	0.035	-0.267*	
DRY(-1)	-0.337	-0.212	DRY(-1)	-0.371	-0.608	
DRM(-1)	0.110	0.380*	DRY(-2)	-0.076	-1.182	
F-Value	2.827	0.122	DRM(-1)	0.111	0.437**	
			DRM(-2)	0.039	0.086	
			F-Value	1.437	1.461	
Lag length: BIC(1), AIC(2)						
Conclusion: Unidirectional Causality from Income to Money in the long run						
No Short run Causality						

Note: ***, **, and * represent significance at 1%, 5% and 10%

Table 5(c): 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
Lag length: BIC(1), AIC(3)						
Conclusion: Unidirectional Causality from Income to Money in the long run						
No Short run Causality						

Note: ***, **, and * represent significance at 1%, 5% and 10%

Table 5(d): Causality between Real Money and Real Income (prices & 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					
Lag length: BIC(2), AIC(2)							
Conclusion: Unidirectional Causality from Income to Money in the long run							
No Short run Causality							

Note: ***, **, and * represent significance at 1%, 5% and 10%

Table 6(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 Cointegration					
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
Lag length : BIC(2), AIC(2)					
Conclusion: Weak Evidence of Unidirectional 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: Unidirectional Causality from income to money at 3 years lag					

Note: ***,**,and * represent significance at 1%, 5% and 10%

Table 6(b): Causality between Nominal Money and Income (reforms)

Cointegration (Engle-Granger)						
	Const.	D	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on NY	-0.460***	0.290***	0.958***	-2.183**	-2.412**	-2.157**
Conclusion: Evidence of Co-integration						
Error Correction Causality			Granger Causality			
Lag 2	DNY	DNM		Lag 2	DNY	DNM
D	-0.016	-0.004		D	-0.015	0.008
e(-1)	-0.174	-0.307				
DNY(-1)	0.531**	-0.321		DNY(-1)	0.479***	-0.187
DNY(-2)	0.156	-0.002		DNY(-2)	-0.074	0.408**
DNM(-1)	0.102	0.204		DNM(-1)	0.124	0.257
DNM(-2)	0.033	-0.018		DNM(-2)	0.009	-0.062
F-Value	0.301	0.970		F-Value	0.455	2.365
Lag length : BIC(2), AIC(2)						
Conclusion: Weak Unidirectional Causality from Income to Money in the long run with no Short run Causality						
Error Correction Causality			Granger Causality			
Lag 3	DNY	DNM		Lag 3	DNY	DNM
D	-0.004	0.017		D	-0.014	0.012
e(-1)	-0.383	0.049				
DNY(-1)	0.690***	-0.051		DNY(-1)	0.484***	-0.080
DNY(-2)	0.235	0.125		DNY(-2)	-0.124	0.105
DNY(-3)	0.431	0.701**		DNY(-3)	0.139	0.530**
DNM(-1)	-0.025	-0.007		DNM(-1)	0.072	0.095
DNM(-2)	0.057	0.006		DNM(-2)	0.032	0.012
DNM(-3)	-0.051	-0.027		DNM(-3)	-0.102	-0.063
F-Value	0.075	2.702*		F-Value	0.285	4.122**
Conclusion: Unidirectional Causality from income to money at 3 years lag						

Note: ***, **, and * represent significance at 1%, 5% and 10%

Table 6(c): 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
Lag length : BIC(2), AIC(2)						
Conclusion: Bidirectional Causality between Income and Money in the long run						
No Short run Causality						

Note: ***, **, and * represent significance at 1%, 5% and 10%

Table 6(d): Causality between Nominal Money and Income (prices & 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*		DNM(-1)	0.407**	0.279	
DNM(-2)	-0.028	-0.002		DNM(-2)	-0.239	0.201	
F-Value	0.250	0.209		F-Value	1.352	0.522	
Lag length : BIC(2), AIC(2)							
Conclusion: Bidirectional Causality between Income and Money in the long run							
No Short run Causality							

Note: ***, **, and * represent significance at 1%, 5% and 10%

Table 7(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 Cointegration					
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			
Lag length : BIC(2), AIC(2)					
Conclusion: Unidirectional from money to Prices in the long run					

Note: ***, **, and * represent significance at 1%, 5% and 10%

Table 7(b): Causality between Money and Prices (reforms)

Cointegration (Engle-Granger)						
	Const.	D	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on DF	3.920***	0.0550	1.678***	-3.758***	-2.716***	-2.510***
Conclusion: Evidence of Co-integration						
Error Correction Causality						
Lag 2	DDF	DNM				
D	-0.008	-0.003				
e(-1)	-0.307***	-0.062				
DDF(-1)	0.584***	-0.349				
DDF(-2)	0.208	0.515*				
DNM(-1)	0.163	0.168				
DNM(-2)	0.005	0.049				
F-Value	0.884	2.403				
Lag length : BIC(2), AIC(2)						
Conclusion: Unidirectional from money to Prices in the long run						

Table 7(c): 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				
Lag length : BIC(2), AIC(2)						
Conclusion: Unidirectional from money to Prices in the long run						

Note: ***, **, and * represent significance at 1%, 5% and 10%

Table 7(d): Causality between Money and Prices (prices & 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 Cointegration							
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					
Lag length : BIC(2), AIC(2)							
Conclusion: Unidirectional from money to Prices in the long run							

Note: ***, **, and * represent significance at 1%, 5% and 10%

Main Findings

Significant shifts in annual series of Money, Income, and Prices

A unidirectional causality from real income to real money in the long run (after taking care of shifts) with no short run causality

A weak evidence of unidirectional causality from nominal income to nominal money in the long run with no short run causality

Persistent evidence of Income affecting Money at three years lag.

A bi-directional causality between money and income in the long run with no short run effects if we take care of shifts due to price hikes

A unidirectional causality from Money to Prices in the long run with the indication of Prices affecting money at two years lag

Extensions

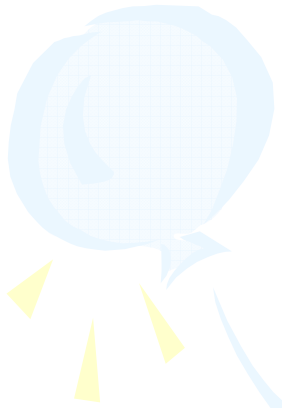
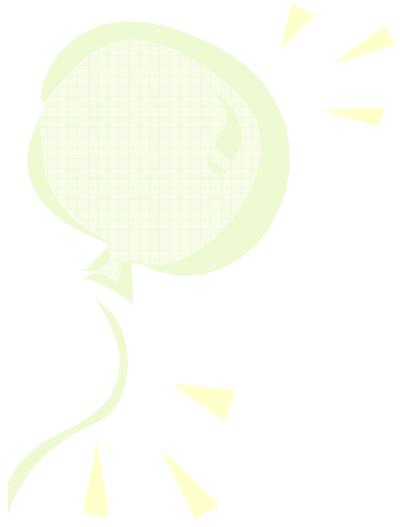
The background features several large, overlapping, curved arrows in shades of green, purple, and blue. Scattered throughout are numerous small, yellow, triangular arrowheads pointing in various directions.

More Variables, e.g., Interest Rates

Multivariate Analysis

Quarterly Data

**Advanced Econometric Tools that
take care of structural shifts**



Thank You