Inflation, Globalization and Interest Rate Nexus to Curb Price volatility: An Empirical Cross-Country Analysis

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Abstract   *The aim of the present study is to investigate the long run impact of monetary policy and globalization on inflation in the selected South and South East Asian countries. The study measures the impact of monetary policy variables on inflation, ignoring random shocks as these are considered fewer fractions for the inconsistency of the policy instruments. Two exclusive dimensions, defacto and dejure measure of globalization, are taken into account. The study also employed Hodrick Prescott filter to calculate the domestic output gap in order to assess that still changes in domestic output gap is relevant to inflation variation. It employed structural modeling dynamic heterogeneous Panel data estimation technique, which accounts for endogeneity and serial correlation issues. The results of the study confirm that both global and domestic factors have significant and descriptive power for domestic inflation and interest rate is found to be a best nominal anchor to effect inflation.*

Key Words: Globalization, Inflation, Monetary Policy, Output Gap

JEL Classification: F02, E31, E52, E32

Introduction

The closing decades of the past century witnessed the episode of an integrated system of economics, politics and culture due to the revolutionary developments introduced in the fields of transportation and information technology. This development gave birth to a new phenomenon named globalization which received a new impetus in the form of internet revolution and better transportation. Furthermore, a considerable decline in the cost of communication and transportation apart from increasing the interaction among the various cultures of the world actualized the very notion of global market.

The changing pattern of monetary policy and increasing integration has been witnessed as major unsettled issues around the globe during the previous decade. The suspected collapse of the money-inflation nexus, steadiness of money demand in several economies and the usefulness of the Phillips curve recently called fourth unending debates among researchers. All of these issues do encompass some implications to carry out monetary policy in an integrated environment.

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Economists have been wondering about the role of globalization in keeping down inflation. It relates mainly to the hot discussion of whether the credit goes to domestic macroeconomic policies to maintain minimum and steady inflation in many developed, industrialized or emerging economies, or it attributes simply to the mounting worldwide provision of low-priced manufactured goods from some fast developing economies such as Japan, Korea and China etc.

This study has been conducted with the major intention to investigate the role of globalization as a major factor in driving the radical transformation in the behavior of monetary policy. In other words, to explore the changing pattern of inflation and monetary policy within the sample of selected Asian countries as they liberalize their economies and become a part of integrated global village. The basic intension of conducting this systematic investigation is to verify Romer's (1993) hypothesis that there exists an inverse relationship between inflation and openness. However, following [Poon and Tong, (2009)], and [Huseynov and Jamilov, (2013)] the study further takes into account the issue of the selection of best nominal anchor in globalized era.

Review of Literature

Empirical Evidence Based on Globalization and Inflation

Existing literature on the issue of openness and inflation has found mixed evidence rather it is better to describe it as contemporary puzzle. For example, Romer (1993), Mukhtar (2012) and Sikdar et al. (2013) provided empirical evidence that confirms inflation dampening influence of openness/integration on inflation while, the investigations conducted by Lotfalipour, Montazeri and Sedighi (2013) and Munir, Hasan and Muhammad (2015) exhibited that inflation increases with openness.

Initially, Romer (1993) asserted that increasing global integration proxied by trade and financial openness is associated with lesser inflation. The study used average inflation, imports share in GDP, per capita income to represent development, dummy variables for the members of OECD and other regions, dummy variables for CPI or GDP deflator, central bank dependence, political instability index and area of land were used to check robustness. The results of the study propounded that increasing integration leads to dampen inflation. Berument and Dougan (2003) investigated the influence of openness on the efficiency of monetary policy for Turkey and established that openness is significant variable of monetary policy. Moreover, results revealed that openness and inflation were negatively related. In his eminent work, Ball (2006) analyzed the association of openness and rate of inflation. The data of 14 industrial countries over the period 1985-2005, with and without foreign output gap, were used by focusing on variables such as inflation and output gaps. He found that foreign output variations placed insignificant influence on the domestic inflation. Mukhtar (2012) analyzed association of openness and inflation by revisiting the Romer's supposition for economy of Pakistan by employing annual data from 1960-2007. The study utilized the VECM approach and results validated the Romer's (1993) supposition. Samimi et al (2012) confirmed Romer's (1993) hypothesis by utilizing ARDL estimation strategy on Iranian economy. They employed both openness to trade and globalization as measured by KOF as the explanatory variable while Money growth, size of government and per capita GDP as the explanatory variables. The

empirical outcomes of the study suggested that openness can best be proxied by index of globalization. In another study, Mazumder (2017) examined the association of growing integration with inflation in "developing and emerging economies" by incorporating both global and domestic output gap in order to assess the traditional and open-economy description of the Phillips curve for 189 developing economies by applying pooled OLS regression procedure of estimation. The findings of the study revealed mixed results about the influence of globalization on domestic inflation in the concerned countries.

Empirical Evidence Based on Inflation and Monetary Policy

The path of monetary policy through which it impacts monetary as well as real side of the economy is considered as a black box. There are various channels through which monetary policy may work, such as interest rate, exchange rate, wealth effect, credit channel but which path is considered the most effective is a bone of contention. The present study also intends to gather the efforts of decades of theoretical and empirical evidences on the channels of monetary transmission to construct a comprehensive appraisal in the light of openness for selected Asian economies. Khalid (2005) explored the factors of inflation in order to examine the suitability of these for economy of Pakistan for the adoption of inflation targeting. The results of the analysis concluded that foreign variables also significantly contributed to inflation along with domestic variables. However, the unavailability of quarterly data for the predictive performance of inflation forecast was the major shortcoming of the study. Asgharpur , Kohnehshahri and Karami (2007) examined theoretical and empirical aspects of the relationship between interest rates and inflation in developing countries. The study explored the causal relationship between interest rate and inflation rate in a panel of 40 selected Islamic countries over the 2002 – 2005 periods. The policy recommendation extended by the authors for Islamic countries is that there should be reduction in interest received from private and public loans without lowering the interest paid to depositors. Farah Dina (2016) explored the relationship between inflation and its major determinants in ASEAN countries using panel data analysis. He used panel data covering the period from 1990 to 2014. This study supported the Post Keynesians view of inflation and put forward important implications and recommendations for the conduct of monetary policy.

Methodology and Data Source

In dynamic panel estimation procedure the researchers prefer Generalized Methods of Moments (GMM) technique proposed by Arellano and Bond (1991), when units of time span are smaller than the number of entities. These estimators allow the constant term to vary across cross-sections by pooling individual cross sections. However, such studies are criticized on the basis of smaller observations and the assumption of slope coefficient homogeneity is unsuitable in case of large entities (N). So, to lessen the bias the researchers were in an effort to develop a technique that considered the above mentioned points into account. Hence, [Pesaran and Smith (1995) and Peasarn et al.1997 and,1999] came up with an important estimation technique i.e Panel ARDL model which is comprised of three estimators known as Mean Group (MG), Pool Mean Group (PMG) and dynamic fixed effect (DFE) estimator to tackle the issue of heterogeneous slopes.

Hence, we will proceed initially by investigating the problem of testing unit root by applying panel unit root tests. Then we will examine the level of co integration among variables. Then we will perform panel ARDL model via three different estimators i.e Pool Mean Group Estimator (PMG), mean group (MG) and dynamic fixed effect (DFE). The latest researchers including Samargandi, (2015) utilized dynamic heterogeneous panel estimation procedure but there was found no single evidence; which has incorporated defacto and dejure measure of globalization along with overall globalization to examine their effect on inflation and monetary policy. The latest method of causality in panel procedure is also utilized in this systematic investigation and it has been supported and utilized by previous researchers. We intend to observe the long run nexus among globalization, inflation and the monetary policy in selected countries of Asia utilizing data on various variables from 11 Asian economies from 1981 to 2016. The economies covered in our study include Bangladesh, Bhutan, India, Nepal, Pakistan, Indonesia, Malaysia, Philippine, Korea, Singapore and Thailand.

Table 1. Description/Construction/source of Variables

Notation	Variable Name	Description/Source of Variable	Proxy For
INF	Inflation	This variable has been taken from world development indicators.	Macro variable
YD	Domestic output gap	This variable is composed by taking difference of real output with potential output through applying Hodrick-Prescott filter. The data of GDP was taken from World Development Indicators (CD – ROM 2015) in constant dollar form.	Domestic or foreign output gap influence and taken as control variable
IR	Interest Rate	Real interest rate. This variable has been taken from International Financial Statistics database	Monetary Policy Instrument
OG	Globalization	The variables represent globalization has been taken from "KOF globalization index of globalization prepared at the Swiss Federal Institute of Technology" [(Dreher,	Globalization/Integration
OGDJ	De jure index of globalization		

		2006;updated in Gygli, Savina, Florian and Jan-Egbert sturm 2019].
OGDF	De facto index of globalization	

Model Specification: Inflation, Interest Rate and Globalization Nexus

Panel Auto Regressive Distributed Lag (ARDL) system of equations would be as follows

$$INF_{it} = \sum_{j=1}^{p} \alpha ij INF i, t-j + \sum_{j=1}^{q} \beta ij Xi, t-j + Wi + \varepsilon it \qquad (1)$$

Where subscript i represents the cross sections (countries), i=1,2,3,…..11 and t indicates time duration. $X_{i, t-j}$ indicates all the explanatory variables which include domestic output gap, foreign output gap, monetary policy variables, globalization index (Overall, Defacto and Dejure), w_i represents group specific effect and the term ε_{it} is the white noise error term. A main attribute of cointegrated variables is that they rejoin to every deviation if any, from long run. So we re-parameterize our aforementioned equation into error correction form as below

$$INF_{it} = \theta_i INF_{i,t-1} - \theta_i \beta X_{i,t-1} + \sum_{j=1}^{p-1} \alpha ij INF_{i,t-j} + \sum_{j=1}^{q-1} \beta_{ij} X_{i,t-j} + W_i + \varepsilon_{it} \quad (2)$$

The error correction parameter θi designate the speed of adjustment. Variables have no long-run association if θi = 0. Under the prior supposition that in case of any disturbance, variables will congregate reverse to their long period stability. So, it is expected that the error correction parameter should be statistically significant and contain inverse symbol.

Panel Unit Root Stationarity Tests

In regression estimation procedure, the foremost step is to examine the fluctuations, trend and non-stationarity in the data which describe the analysis of the existence of unit root or stationarity among variables. In the presence of unit root the ordinary least squares (OLS) technique will generate biased outcomes. Issues of stationarity always exist in large panel data. There are many estimation procedures in econometric literature to tackle the issues of non-stationary of data series. Hence, in this study two of the tests, Levin and Lin test and Im, Pesaran and Shin test were utilized to assess the existence of unit root. Not any variable found stationary at second difference. Hence, the null hypothesis about the existence of unit root is discarded.

Dynamic Heterogeneous Panel Estimation

For analyzing the null hypothesis regarding no association among inflation rate, overall, defacto and dejure measures of globalization and real interest rate. We conducted cointegration analysis by applying Pedroni, Kao and Westerlund Residual based Panel cointegration test. The results of cointegration have been presented in Table 2 .The results provide support to confirm the cointegration among inflation rate, real interest rate and real globalization.

Table 2. Results of Co integration Test

Models	A	B	C
	Alternative Hypothesis: Cointegration is Present		
Kao			
T	-3.3794 (0.000)	-3.2426(0.000)	-3.2640(0.000)
	Alternative Hypothesis : Cointegration with Common AR Coefficients		
Pv	2.8384(0.023)	2.1736(0.150)	2.3035(0..11)
Prho	-5.0603 (0.000)	-4.7361 (0.000)	-5.1358 (0.000)
Ppp	-7.9784 (0.000)	-7.5333 (0.000)	-8.2236 (0.000)
Padf	-8.6333 (0.000)	-7.3781 (0.000)	-8.2049 (0.000)
Pedroni	Alternative Hypothesis: Cointegration with Individual AR Coefficients		
Grho	-4.0797 (0.000)	-3.7781 (0.000)	-4.1769 (0.000)
Gpp	-9.5426 (0.000)	-8.7473 (0.0000)	9.7659 (0.000)
Gadf	-8.6334 (0.000)	-8.0047 (0.000)	-9.0081 (0.000)
	Alternative Hypothesis: Cointegration is Present		
Gt	-4.439 (0.000)	-4.480 (0.000)	-4.601 (0.000)
Ga	-18.623 (0.000)	-18.680 (0.000)	-18.616 (0.000)
Westerlund			
Pt	-14.618 (0.000)	-14.900 (0.000)	-15.234 (0.000)
Pa	-18.201 (0.000)	-18.313 (0.000)	-18.140 (0.000)

Note: Values reported in brackets are p values
Group statistics are denoted by Gt and Ga while panel statistics are denoted by Pt and Pa
Source: computed by the author

Lag Length Determination

The decision regarding Lag Length Determination also plays an important role in the estimation procedure. Hence, order of lag determination is an important task to carry on. The study is based upon annual observations. Hence, to examine the joint significance of variables in their lagged form, four lags can be established on the first-difference of each incorporated variable. The numerical values of AIC criterion can also provide some helpful information for deciding the appropriate lag length as illustrated in Table 3 below .It revealed from the numerical values that minimum value of AIC is established at '1' lags.

Table 3. Akaike Information Criteria (Model A, B, C)

	A			B			C	
Model	AIC	Specification	Model	AIC	Specification	Model	AIC	Specification
1	4.3866	ARDL (1, 1, 1, 1)	**1**	4.4173	ARDL (1, 1, 1, 1)	**1**	4.3706	ARDL (1. 1. 1. 1)
3	4.3880	ARDL (2, 1, 1, 1)	**3**	4.4196	ARDL (2, 1, 1, 1)	**3**	4.3763	ARDL (2, 1, 1, 1)
2	4.4092	ARDL (1, 2, 2, 2)	**2**	4.4428	ARDL (1, 2, 2, 2)	**2**	4.4108	ARDL (1, 2, 2, 2)
4	4.4301	ARDL (2, 2, 2, 2)	**4**	4.4658	ARDL (2, 2, 2, 2)	**4**	4.4283	ARDL (2, 2, 2, 2)

Source: computed by the author

Long Run Regression Results and Discussion

The outcomes of the model based on interest rate as nominal tool have been presented in Table 4. The findings illustrate that interest rate and globalization hold inverse but significant effect on inflation in the long duration, which show that inflation dampens due to openness and increase in interest rate, which leads to slow down the pace of economy. On the other hand, domestic output gap positively and significantly influences inflation in the long period of time. The value of the coefficient of interest rate states that with a unit rise in interest rate, inflation will be dampened by 0.369, 0.326 and 0.356 unit respectively. Lower interest rate in an economy leads to increased money in circulation that raises aggregate demand resultantly it ends the channel with increased inflation found in the economy. On the contrary, the higher interest rates are lead to enhance the cost of doing business; hence less money will be circulated in an economy. Consumers possess a smaller amount of money to spend, the economy slows down hence, inflation decreases. Moreover, the value of coefficient is quite strong that depicts the strong role of interest rate, hence it can be accorded as the best nominal tool. The coefficient of globalization and that of its other measures have also contributed significantly in reducing inflation. The results show that a unit increases in globalization leads inflation to be reduced by 0.092, 0.086 and .090 units on average in model a, b and c respectively. Our findings are similar to the results of Saleem (2010) that both inflation and interest rate are significantly and inversely associated. The study concluded that "the interest rate does affect the inflation rate." The inverse relation between inflation and rate of interest rate is according to the available literature on this topic. The coefficient of domestic output gap exhibits the augmented effect on inflation which states that a unit increase in net domestic output gap, leads inflation to increase by 0.115, 0.148 and 0.091 unit on average.

Table 4. Dynamic Heterogeneous Panel Long- Run Results with different specifications of globalization

Variables	A			B			C		
CPI	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**
	-0.369	-0.504	-0.352	-0.326	-0.445	-0.331	-0.356	-0.518	-0.358
IR	[0.056]	[0.123]	[0.066]	[0.057]	[0.130]	[0.067]	[0.053]	[0.115]	[0.064]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
OG	-0.092	-0.096	-0.099	-	-	-	-	-	-

Variables	PMG	MG	DFE	PMG	MG	DFE	PMG	MG	DFE
	[0.015]	[0.037]	[0.022]						
	(0.000)	(0.010)	(0.000)						
OGDF	-	-	-	-0.086	-0.089	-0.089	-	-	-
				[0.017]	[0.044]	[0.026]			
				(0.000)	(0.044)	(0.001)			
OGDJ	-	-	-	-	-	-	-0.090	-0.088	-0.096
							[0.014]	[0.032]	[0.019]
							(0.000)	(0.006)	(0.000)
YD	0.115	0.090	0.195	0.148	0.118	0.212	0.091	0.052	0.185
	[0.044]	[0.101]	[0.063]	[0.047]	[0.100]	[0.065]	[0.043]	[0.104]	[0.062]
	(0.009)	(0.369)	(0.002)	(0.002)	(0.235)	(0.001)	(0.035)	(0.613)	(0.003)
Hausman Test		0.777	0.878	-	0.849	0.947	-	0.618	0.727

The value of Hausman test is demonstrating that PMG is preferable over MG and DFE estimation. Standard Error[] and P-Values () in parenthesis.
Source: computed by the author

Short Run Results and Discussion

The outcomes regarding error correction mechanism are reported in Table 5. The coefficient of error correction term is significant and holds the expected sign. It validates that a long-run association exists among the variables. The value of the coefficient of error correction term is the indication that the adjustment is relatively speedy. About 61 %, 59% and 63% respectively, disequilibrium in past inflation rate from its equilibrium path will be converged back in the present year.

Table 5. Dynamic Heterogeneous Panel Short Run Result Error Correction Representation

Variables	A			B			C		
	PMG	MG	DFE	PMG	MG	DFE	PMG	MG	DFE
Ect	-0.6130	-0.7366	-0.6255	-0.5975	-0.7134	-0.6070	-0.6371	-0.7607	-0.6372
	[0.0496]	[0.0391]	[0.0446]	[0.0516]	[0.0410]	[0.0443]	[0.0486]	[0.0413]	[0.0447]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
D(IR)	-0.0451	0.0570	-0.0240	-0.0537	0.0372	-0.0354	-0.0399	0.0663	-0.0175
	[0.0328]	[0.0592]	[0.0360]	[0.0310]	[0.0623]	[0.0361]	[0.0408]	[0.0597]	[0.0360]
	(0.169)	(0.336)	(0.505)	(0.083)	(0.550)	(0.327)	(0.328)	(0.266)	(0.628)
D(OG)	0.1528	0.1989	0.1531	-	-	-	-	-	-
	[0.1019]	[0.0941]	[0.1053]						
	(0.134)	(0.035)	(0.146)						
D(OGDF)	-	-	-	0.0985	0.1298	0.1031	-	-	-
				[0.0742]	[0.0767]	[0.0695]			
				(0.184)	(0.091)	(0.138)			
D(OGDJ)	-	-	-	-	-	-	-0.0067	0.0174	0.0999
							[0.1511]	[0.1410]	[0.0949]
							(0.965)	(0.902)	(0.293)

D(YD)	-0.0484 [0.0540] (0.370)	-0.1025 [0.0821] (0.212)	-0.0929 [0.0451] (0.040)	-0.0614 [0.0563] (0.275)	-0.1086 [0.0784] (0.166)	-0.0941 [0.0453] (0.038)	-0.0494 [0.0517] (0.339)	-0.1142 [0.0789] (0.148)	-0.0966 [0.0450] (0.032)
Constant	7.4014 [0.7120] (0.000)	10.0183 [2.1772] (0.000)	7.7904 [1.0145] (0.000)	7.0329 [0.6585] (0.000)	9.3054 [2.4126] (0.000)	7.2963 [1.0997] (0.000).	7.6188 [0.7637] (0.000)	10.2880 [1.9526] (0.000)	7.7631 [0.9048] (0.000)

The panel reported both the speed of fine-tuning (etc.) and short-run effects calculated on the basis of dynamic heterogeneous estimation techniques. Standard Error[] and P-Values () in parenthesis. Source: computed by the author

Panel Causality

The regression estimation procedures elaborate the influence of relevant independent variables on the regress and for short as well as for long-run. The nature of causation among variables, in time series analysis, is extensively experimented by Granger causality test. In panel framework, the idea of causation is the latest and was presented by Dumitrescu and Hurlin (2012). It utilizes Wald and Z bar statistics to exhibit the nature of causation. The current study examined the nature of causation by engaging the entire variables to examine the causal association. The main intention of the study was to investigate causation from globalization to monetary policy and inflation. The results of bidirectional causality are reported in Table 6 below:

Table 6. Panel Homogeneous Causality Test

Variables	INF Prob.	INF Decision	RIR Prob.	RIR Decision	YD Prob.	YD Decision	OG Prob.	OG Decision	OGDF Prob.	OGDF Decision	OGDJ Prob.	OGDJ Decision
INF	—	—	0.000	Causality exist	0.123	No Causality	0.653	No Causality	0.500	No Causality	0.783	No Causality
RIR	0.023	Causality exist	—	—	0.577	No Causality	0.894	No Causality	0.354	No Causality	0.987	No Causality
YD	0.000	Causality exist	0.006	Causality exist	—	—	0.000	Causality exist	0.000	Causality exist	0.000	Causality exist

OG	.210	No Causality	0.055	Causality exist	0.270	No Causality	-	-	-	-	-	-
OGDF	0.447	No Causality	0.594	No Causality	0.311	No Causality	-	-	-	-	-	-
OGDJ	0.303	No Causality	0.035	Causality exist	0.983	No Causality	-	-	-	-	-	-

The p‹0.05 values in the table indicate significance at 5% level.
Source: computed by the author

It reveals the findings of Panel Homogeneous test of causality. The bi-directional causality is confirmed between rate of interest and inflation rate which states interest rate and inflation rate simultaneously affect each other and can be identified as major monetary policy instrument to be targeted for price stability. There is unidirectional causality between globalization, monetary policy instruments and domestic output gap. Globalization is also a major determinant to be considered while setting of any strategy for stabilization of the inflation because it indirectly causes inflation through the determinants of inflation. This study elaborates that interest rate is the main variable which helps in forecasting the level of inflation.

Conclusion and Policy Implications

This study elucidates that the achievement of the smooth and continuing economic growth depends on the situation which is essential to curb fluctuation in the inflation rate. The monetary authorities may use the instrument of interest rate to control price instability. The empirical results indicated that inflation targeting can be pursued by considering interest rate as a nominal tool. It indicates that price hike is a monetary phenomenon. Hence, the other intermediate option available for monetary authorities is to use interest rate along with other policy variables as a policy tool to achieve the goals of price stability and stable economic growth.

This study had very interesting and helpful considerations for researchers and policy makers. As no country can live in isolation in today's globalized era hence monetary policy is of no exception. Globalization was considered to be a significant contributor of inflation of a country. It helps in increasing production efficiencies, proper use of capacities and enhancing foreign investment. So, while conducting monetary policy the external impact on inflation could not be ignored.

Domestic output gap had enhanced the level of price hike in all the specifications, which also turned out to be a major challenge for the policy makers. Hence, it is the primary task of the monetary authorities in an integrated environment to devise policies to reduce inflation and utilize better monetary tools

available at country level for this purpose. Globalization by opening new horizon for the developing countries through enhancing competition, creating novelty and reaping economies of scale can reduce the effect of surprise inflation and ensuring the price stability in an economy. Hence, the central banks should take into account these domestic and global changes while devising their policies.

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