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C O N T E N T S

Capital Inflows, Inflation, and the Exchange Rate Volatility: An Investigation for Linear and Nonlinear Causal Linkages

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This paper empirically examines the effect of foreign capital inflows on domestic price levels, monetary expansion, and the exchange rate volatility for Pakistan using linear and nonlinear causality tests. The key message emerging from the analysis is that there is a significant inflationary impact of capital inflows, in particular during the period of surges in capital inflows. Specifically, we find evidence of a significant nonlinear Granger causality running from capital inflows to the change in domestic prices. We also show that domestic prices are nonlinearly caused (in Granger sense) by the growth of domestic debt and money supply-to-GDP ratio. Our results, however, suggest that the market interest rate and the nominal exchange rate do not have significant relationships with domestic prices. The findings suggest that there is a need to manage the capital inflows in such a way that they should neither create an *inflationary pressure* in the economy nor fuel the *exchange rate volatility*.

1. INTRODUCTION

Examination of how macroeconomic indicators respond to foreign capital inflows is important to understand the role of foreign funds in host countries. Several studies have empirically examined the effects of ebbs and surges in capital inflows on macroeconomic performance of host countries. The findings of these studies are inconclusive at best, however. On the one hand, large number of studies have documented that surges in foreign capital inflows help promote investments, stimulate economic development, improve resource allocation, interact human capital, deepen domestic financial sector, and encourage positive growth externalities. Examples of these studies include, among others, De Mello (1996, 1997), Reisen and Soto (2001), Hermes and Lensink (2003), Alfaro, *et al*. (2004), Buch, *et al*. (2005), Adams (2009), Wang and Wong (2009), Choong, *et al*. (2010), and Azman-Saini, *et al.* (2010). Researchers have also shown that access to international funds help countries in attaining sustainable economic growth,

provide benefits associated with international financial integration, and ensure domestic macroeconomic stability [Kose, *et al.* (2009) and Obstfeld (2009)].

On the other hand, several studies have argued that the abrupt integration of emerging market countries with international capital markets has created some problems for the host economies. In particular, researchers have observed that foreign capital inflows create difficulties for the recipient countries [e.g., Rodrik and Velasco (1999), Aghion, *et al.* (2000), Ventura (2002), Eichengreen (2004), Caballero and Krishnamurthy (2006), Baharumshah and Thanoon (2006), Edwards (2007a, 2007b), Mendoza and Terrones (2008), Reinhart and Reinhart (2008), Caballero, *et al.* (2008), Hegerty (2009), Cardarelli, *et al.* (2010), Kim and Yang (2011), Furceri, *et al.* (2011), Cecen and Xiao (2012), Sethi and Sucharita (2012), Caballero (2012), and Furceri, *et al.* (2012)]. These difficulties generally include appreciation in currencies and in turn loss of foreign competitiveness, high inflation rates, and increased vulnerability to banking crises. Large capital inflows also help fuel headwinds in financial markets, surges in money supply, excessive private credit growth, spending booms, asset market bubbles, and the undermining of a strategy to achieve monetary stability by pegging the exchange rate. Further, some studies such as Bernanke (2005) argue that a glut of global savings leads to large international trade imbalances.[1]

There is a growing agreement in the literature that preserving stability of real and financial sectors during episodes of surges in international capital inflows requires effective *absorption* and *sterilisation* of foreign capital inflows.[2] For instance, the central bank should intervene in the foreign exchange market in order to absorb the foreign exchange brought in by the capital inflows. However, such policy measures are not costless. For example, buildup of foreign reserves as a result of the central bank's foreign exchange purchases not only helps increase the *monetary base* of the economy but also expands bank deposits and loans. Such surges in the money supply result in excessive private credit growth and in a sequence generate inflationary dynamics. Further, the expansion of bank balance sheets owing to international capital inflows may increase the fragility of the banking system if bank supervision is weak.

In theory, the effects of capital inflows on domestic financial and real indicators depend on the ways in which they flow into an economy. The effects also depend on whether the inflows are sustainable or temporary. Theoretically, the forces driving capital inflows differ from country to country and can be classified into three clusters: (1) an exogenous increase in the domestic productivity of capital, (2) an autonomous increase in the domestic money demand function, and (3) external factors, such as a reduction in international interest rates. The former two are known as "*pull*" factors and the latter one is called "*push*" factor.[3]

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[1]However, Laibson and Mollerstorm (2010) show that instead of an excessively abundant supply of global savings, mismatch of international balances is mainly the result of domestic consumption booms and national asset bubbles.

[2]See Obstfeld, *et al.* (2005), Reinhart and Reinhart (2008), Glick and Hutchison (2009), Aizenman and Glick (2009), Cardarelli, *et al.* (2010), and De Gregorio (2012) for effective policy measures in response to capital flow bonanzas.

[3]Other things remain constant, capital inflows owing to "pull" factors will cause an upward pressure on domestic interest rates, whereas, capital inflows caused by "push" factors, such as a fall in international interest rates, will have a tendency to put downward pressure on domestic interest rates on one hand. On the other hand, it will initially drive up nominal and real balances, but then, as domestic price level increases, real balances may decline. See, Rashid and Husain (2010) for the potential differential effects of capital inflows caused by "pull" and "push" factors on financial indicators.

This paper aims to examine how domestic prices respond to foreign capital inflows. Specifically, we propose a simple empirical model of the equilibrium price by incorporating foreign capital inflows into the standard classical quantity theory of demand for money. We also empirically study the inflationary effects of capital inflows for a relatively small open economy, namely Pakistan, using monthly data covering the period 1990–2012. In particular, the paper investigates the causal linkages between capital inflows, domestic price levels, the growth of domestic debt, money supply, the market interest rate, and the nominal exchange rate using the linear and nonlinear cointegration and Granger causality tests. The paper also examines the impact of capital inflows on the exchange rate volatility. The full sample period is divided into two sub-samples in order to examine the differential effects of capital inflows across episodes of low and high capital inflows. Three different measures of foreign capital inflows are used in empirical investigation.

The results of the paper suggest a significant inflationary impact of foreign capital inflows, in particular during the period of surges in capital inflows. Specifically, we show that there is a significant co-movement in capital inflows and the price level. Results concerning short-run dynamics indicate that there is significant linear as well as nonlinear Granger causality running from capital inflows to the rate of inflation. Our regression results also reveal that domestic prices are nonlinearly caused (in Granger sense) by the growth of domestic debt and the money supply-to-GDP ratio. However, our results suggest that the market interest rate and the nominal exchange rate do not have significant relationships with domestic prices. We also observe that capital inflows amplify the volatility of real effective exchange rate irrespective of whether the influx of foreign capital is low or high.

The rest of the paper proceeds as follows. Section 2 reviews the inflow of foreign funds and the rate of inflation in Pakistan. Section 3 describes the empirical model, the empirical methodology, and the data used to assess the relationship between capital inflow surges and the price level. Section 4 presents the empirical results. Section 5 concludes the paper.

2. FOREIGN FUNDS AND THE RATE OF INFLATION: PAKISTANI CONTEXT

We start our empirical investigation by estimating correlations between foreign capital inflows and the other variables included in the analysis. We divide the full-sample period into two sub-periods. The first sub-sample period ranges from January 1990 to December 2000, while the second sub-sample runs from January 2001 to June 2012. This division seems rational because there was a large capital surge during 2001 to 2012. The correlation matrices for first and second sub-sample periods are presented in Tables 1 and 2, respectively.[4,5]

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[4]See data Section 4 of the paper for definition of the variables.

[5]The breakdown of the whole sample is based on the flow of foreign capital inflows, as our main objective is to analyse the differential effect on domestic price levels and the exchange rate volatility of foreign capital inflows across low and large flows. However, one should note that the objective of our study is not to test apparently the presence of structure break in the capital inflows–domestic prices relationship. For testing the possibility of structure breaks, a separate comprehensive analysis is required. One may extend our analysis along these lines by applying sophisticated econometric techniques such as Carrion-i-Silvestre and Sanso (2006).

Table 1

Correlation Coefficients; Sample Period: January 1990 to December 2000

Variables	Ratio Series				First Difference of Series			
	CAR	FAR	FRR	MSR	LCPI	MMR	LNER	LDC
FAR	**–0.260**							
FRR	0.130	**0.648**						
MSR	**–0.322**	0.047	0.125					
LCPI	**0.316**	–0.023	0.130	–0.098				
MMR	–0.203	0.095	0.040	**0.246**	–0.089			
LNER	–0.037	–0.066	–0.129	0.022	–0.026	–0.040		
LDC	0.182	**–0.249**	–0.040	–0.003	0.011	0.229	**0.239**	
LMPI	**0.326**	–0.076	**0.166**	0.165	**0.395**	**0.314**	**0.403**	**0.415**

Note: Bold values indicate that the correlation is significantly different from zero at the 5 percent level. MMR = the market interest rate, LNER = the log of nominal exchange rate, LCPI = the log of consumer price index, FAR = net foreign assets-GDP ratio, CAR = capital account-GDP ratio, FRR = the ratio of foreign reserves to GDP ratio, LMPI = the log of manufacturing production index, MSR = the ratio of money supply to GDP, LDC = the log of domestic credit.

The correlation estimates suggest that the relationship among the variables has changed dramatically during the *massive* capital surge episode in 2001-2012. For instance, the ratio of money supply to GDP is significantly correlated (it is also interesting to note that the magnitude is negative) with the capital account to GDP ratio during the period 1990–2000 when the inflow of foreign funds was stumpy and inconsistent. The net foreign assets to GDP ratio and the foreign reserves to GDP ratio, however, are not significantly related to money supply during the period 1990–2000. During the period of relatively large capital inflows (2001 to 2012), not only the magnitude of correlation between the money supply-to-GDP ratio, the net foreign assets-to-GDP ratio and the foreign reserves-to-GDP ratio has considerably increased but also the correlation appears statistically significant. This implies that after the year 2001, the foreign capital inflows have played a significant role in expanding the monetary base of Pakistan's economy.

Table 2

Correlation Coefficients; Sample Period: January 2001 to June 2012

Variables	Ratio Series				First Difference of Series			
	CAR	FAR	FRR	MSR	LCPI	MMR	LNER	LDC
FAR	**0.436**							
FRR	0.121	**0.963**						
MSR	**0.763**	**0.834**	**0.827**					
LCPI	**0.439**	**0.509**	**0.483**	**0.354**				
MMR	**0.561**	**–0.361**	**–0.531**	–0.009	–0.023			
LNER	0.045	–0.128	–0.116	–0.071	–0.124	–0.036		
LDC	**0.283**	**0.365**	**0.358**	**0.523**	0.076	0.132	0.007	
LMPI	**0.639**	**0.708**	**0.583**	**0.472**	**0.677**	**0.537**	**0.556**	**0.693**

Note: Bold values indicate that the correlation is significantly different from zero at the 5 percent level. MMR = the market interest rate, LNER = the log of nominal exchange rate, LCPI = the log of consumer price index, FAR = net foreign assets-GDP ratio, CAR = capital account-GDP ratio, FRR = the ratio of foreign reserves to GDP ratio, LMPI = the log of manufacturing production index, MSR = the ratio of money supply to GDP, LDC = the log of domestic credit.

The estimates of the correlation between the rate of inflation and the net capital inflows-to-GDP ratio, the balance of capital account-to-GDP ratio, and the foreign reserves-to-GDP ratio provide fascinating insight about the association of foreign funds and inflationary pressures. The inflation rate is significantly correlated with the three ratios with a positive sign during the period of 2001-2012, whereas, it was only significantly related to the capital account-to-GDP ratio over the period 1990–2000. The growth in domestic debt is approximately 50 percent correlated with the monetary base of the economy during the latter sub-period, though both were independent of each other in earlier period.

In sum, the coefficients of correlation provide some preliminary evidence of the dynamic interactions between capital inflows and inflationary pressures: a theme that is explored in this paper. Moreover, the estimates of correlation clearly indicate that there is a *structure break* in 2001. Thus, it is very likely that *nonlinearities* exist in the salient economic relationships. This motivates us to apply the nonlinear cointegration and Granger causality test to examine the long- and short-run linkages among the variables.

 The correlation coefficients presented in Tables 1 and 2 provide insights about the ineffectiveness of the policy used by the State Bank of Pakistan (SBP) to manage the foreign capital inflows, particularly, during the second sub-period. Theoretically, the change in monetary base driven by capital inflows depends on the central bank's decision to maintain a fixed exchange rate or to allow it to float freely with no intervention. If there is an intervention, then an accumulation of international reserves results in an increase in the net foreign exchange assets of the central bank and directly affects the monetary base of the economy. The inefficient intervention by the central bank further aggravates the problem of expansion in the monetary base.

For effective *absorption* and *sterilisation* of foreign exchange reserves, it is necessary to know whether the relationships between foreign capital inflows, the monetary base of the economy, and the price level, are stable in the long run or just short-term in nature. This paper tries to address this question. If there is a significant causation running from capital inflows to the rate of inflation, then, definitely, the continuity of the existing foreign exchange management policy could spell trouble for the economy.

Our paper contributes to the existing literature in at least four major dimensions. First, we propose a simple model for equilibrium prices, which predicts a positive impact of capital inflows on domestic price levels. Second, we empirically examine the influence of foreign capital inflows, the growth of domestic debt, the market interest rate, the monetary base of the economy, and the real and nominal exchange rates on domestic price levels. We also examine the impact of capital inflows on the exchange rate volatility. Third, and more importantly, we consider the possibility of nonlinearities in the relationship between capital inflows and the other underlying variables with domestic prices. Fourth, and finally, we examine the differential effects of capital inflows and the other said variables on the price level during periods of low (1990–2000) and high (2001–2012) capital inflows.

3. EMPIRICAL MODEL, METHODOLOGY, AND DATA

3.1. The Empirical Model

The impact of foreign capital inflows on domestic prices can be explained through the following example. Suppose the private sector of an economy receives a gift of G dollars from abroad. Now government does not allow the private sector to use these dollars and buys the dollars from the private sector at the current exchange rate, e, and adds G dollars to its reserves. Consequently, the aggregate expenditures can be defined as follows:

$$E = \bar{M} + eG \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (1)$$

where E denotes the nominal expenditures on goods and services, $\bar{M}$ is the pre-gift nominal money stock, and e is the nominal exchange rate. As expression (1) also represents the demand for money, the money market equilibrium condition is:

$$M^d = M^s = \bar{M} + eG \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (2)$$

Considering the quantity theory of demand for money, the nominal price (P_N), in equilibrium is defined as[6]

$$P_N = \frac{V \times M^s}{Y} = \frac{V \times \bar{M} + eG}{Y} \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (3)$$

Where V is the income velocity of money and Y denotes the aggregate level of output. Equation (3) describes a positive relationship between foreign capital inflows and domestic price levels (i.e., $\frac{\partial P_N}{\partial G} > 0$) and negative relationship between the level of output and prices (i.e., $\frac{\partial P_N}{\partial Y} < 0$). Thus, as long as the government adds the gift G to its reserves, and does not allow it to be absorbed in the economy, it would produce only an inflationary effect.

Different explanatory variables are used in estimation of Equation (3) to ensure that empirical links between capital inflows and inflationary dynamics are not spurious. The choice of explanatory variables in our empirical work is based on availability of data, previous evidence found in the literature, and aforesaid theoretical rationale.

3.2. The Empirical Methodology: Nonlinear Cointegration and Granger Causality Tests

Regarding the linear long- and short-run relationship, we use the standard Johansen's cointegration test and the Granger causality test, respectively. As these two tests are very common in the literature. Below, however, the nonlinear cointegration and causality tests are explained in detail. We use the Lin and Granger (2004) tests to explore the nonlinear long-run relationships between foreign capital inflows and domestic price levels.

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[6]We can understand that prices in a country such as Pakistan are not fully determined by market forces. They are commonly twisted by providing subsidies and setting ceiling and floor price. However, we do not consider government distortion in price determination in order to keep our model simple.

As in Lin and Granger (2004), let x_t be a linear integrated process and y_t and x_t are nonlinearly cointegrated with function f provided $u_t = y_t - f(x_t)$ has asymptotic order smaller than those of y and $f(x)$. Lin and Granger (2004) define the following steps to test the null of nonlinear cointegration against alternative of no nonlinear cointegration.

(1) Identify the possible nonlinear function for using Alternative Conditional Expectation (ACE) criterion (i.e., logarithm, exponential, square root, Box-Cox transformation, etc.).

(2) Apply the Nonlinear Least Square (NLS) method to estimate the parameters of the specified function.

(3) Obtain the residuals from the estimated model and store.

(4) Apply KPSS test for estimated residual to test the null of nonlinear cointegration.[7]

To examine the nonlinear short-run causality, we use the Hristu-Varsakkeis and Kyrtsou (2010) nonlinear Granger causality test—known as the bivaraite noisy Mackey-Glass (hereafter M-G) model and is based on a special type of nonlinear structure developed by Kyrtsou and Labys (2006). The model is given below:

$$X_t = \alpha_{11} \frac{X_{t-\tau_1}}{1 + X_{t-\tau_1}^{c_1}} - \delta_{11} X_{t-1} + \alpha_{12} \frac{Y_{t-\tau_2}}{1 + Y_{t-\tau_2}^{c_2}} - \delta_{12} Y_{t-1} + \xi_{1t} \quad \xi_{1t} \approx N(0,1) \quad \ldots \quad (4)$$

$$Y_t = \alpha_{21} \frac{X_{t-\tau_1}}{1 + X_{t-\tau_1}^{c_1}} - \delta_{21} X_{t-1} + \alpha_{22} \frac{Y_{t-\tau_2}}{1 + Y_{t-\tau_2}^{c_2}} - \delta_{22} Y_{t-1} + \xi_{2t} \quad \xi_{2t} \approx N(0,1) \quad \ldots \quad (5)$$

where X and Y are a pair of related time series variables, the α_{ij} and δ_{ij} are parameters to be estimated, τ_I are delays, c_i are constants.

As mentioned in Kyrtsou and Labys (2006, 2007), Kyrtsou and Vorlow (2009), and Kyrtsou and Terraza (2010), the principle advantage of Model (4) over a simple VAR alternative is that the nonlinear M-G terms are able to capture more complex dependent dynamics in a time series. The test aims to capture whether past samples of a variable Y have a significant nonlinear effect (of the type $\frac{Y_{t-\tau_2}}{1 + Y_{t-\tau_2}^{c_2}}$) on the current value of variable X.

Testing procedure begins by estimating the parameters of a M-G model that best fits the given series, using ordinary least squares. To test reverse causality (i.e., from X to Y), a second M-G model is estimated, under the constraint $\alpha_{22} = 0$. Let $\hat{\xi}_{1t}$ and $\hat{\hat{\xi}}_{1t}$ be the residuals produced by the unconstrained and constrained best-fit M-G models, respectively. Next, we compute the sums of squared residuals $S_c = \sum_{t=1}^{N} \hat{\zeta}_{1t}$ and $S_u = \sum_{t=1}^{N} \hat{\xi}_{1t}$. Let m be the number of free parameters in the M-G model and k is the

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[7]Lin and Granger (2004) argue that if the null hypothesis is specified as cointegration, then the KPSS test would give the right distribution under the null hypothesis and power approaching one as sample size grows under the alternative.

number of parameters set to zero when estimating the constrained model, then the test statistic is defined as:

$$S_F = \frac{(S_c - S_u)/k}{S_u/(N-m-1)} \approx F_{k,N-m-1}$$

If the calculated statistics is greater than a specified critical value, then we reject the null hypothesis that *Y* does not nonlinearly cause *X* (in Granger sense).

3.3. The Data

We use monthly data from January 1990 to June 2012. The main source of data is the IMF's International Financial Statistics database. The variables are market interest rate (line 60b and denoted by MMR), the log of nominal exchange rate (linear and denoted by LNER), the log of real effective exchange rate (line 65um and denoted by LREER), the log of manufacturing (industrial) production index (line 66ey and denoted by LMPI), the log of consumer price index (line 64 and denoted by LCPI), the ratio of net foreign assets to GDP (line 31n divided by line 90b and denoted by FAR), the ratio of capital account to GDP (line 37a divided by 90b and denoted by CAR), the ratio of foreign reserves to GDP ratio (line 1Id times linear divided by line 90b and denoted by FRR), the ratio of money supply to GDP (lines 34 plus 35 divided by line 90b and denoted by MSR) and the log of domestic credit (line 32 and denoted by LDC).[8]

4. EMPIRICAL RESULTS

4.1. Identifying the Order of Integration

We start our investigation of the existence of long-run relationship between foreign capital inflows and domestic price levels by testing the order of integration. In particular, to examine whether variables are integrated of order zero or one, we employ the ADF and the KPSS [proposed by Kwiatkowski, *et al.* (1992)] unit root tests. The results for both sub-periods are presented in Table 3. To find an appropriate lag length for ADF tests, we use the criterion developed by Campbell and Perron (1991). Under this procedure, one should start with a maximum lag length (say *k*) and sequentially delete insignificant lags until the last lag appears statistically significant. The ADF results show that the null hypothesis of non-stationarity cannot be rejected at any common level of significance for all the series. This implies that the series at their levels are non-stationary. Said differently, they have unit roots at their levels. These findings hold for both sub-periods.

The KPSS test statistics η_u and $\hat{\eta}_\tau$ are estimated to test the null hypothesis of stationarity against the alternative hypothesis that the series contains a unit root with and without a linear time trend, respectively. Since the estimated test statistics, η_u and $\hat{\eta}_\tau$, are greater than the critical values for all the said series, we reject the null hypothesis of stationarity in favour of the alternative hypothesis of unit root. That is, all the series at

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[8]Here, the domestic debt includes claims on general government (net), claims on non-financial public enterprises, claims on private sector, and claims on nonblank financial institutions.

their levels have unit roots. The KPSS unit root test results confirm the results of the ADF unit root test. Since the first differences of the series under study appear stationary, we conclude that all the series are integrated of order one (i.e. $I(1)$).[9]

Table 3

Unit Root Test Results for Level Series

| Series | January 1990 to December 2000 | | | | January 2001 to June 2012 | | | |
| | ADF | | KPSS | | ADF | | KPSS | |
	$t_{ADF(c)}$	$t_{ADF(c+t)}$	$LM_{KPSS(c)}$	$LM_{KPSS(c+t)}$	$t_{ADF(c)}$	$t_{ADF(c+t)}$	$LM_{KPSS(c)}$	$LM_{KPSS(c+t)}$
FAR	−2.456	−2.708	0.516	0.197	−2.570	−1.561	1.254	0.447
FRR	−2.156	−2.205	1.013	0.589	−2.037	−1.278	1.013	0.589
CAR	−1.074	−3.152	2.446	0.218	−0.071	−2.126	1.815	0.385
MSR	−2.193	−1.179	0.960	0.341	−1.399	−3.120	1.682	0.239
LCPI	−2.203	−0.574	2.732	0.542	2.430	−2.076	2.166	0.477
LMMR	−1.668	−1.552	0.517	0.235	−1.955	−2.244	0.610	0.404
LNER	0.205	−3.429	2.720	0.224	−2.142	−2.129	0.522	0.532
LREER	−1.137	−3.726	1.932	0.471	−1.982	−2.091	0.581	0.407
LDC	−2.251	−0.938	2.679	0.505	2.568	−2.381	2.135	0.451
LMPI	1.325	−0.796	1.295	0.640	−1.087	−1.963	1.982	0.521

Notes: $t_{ADF(c)}$ and $t_{ADF(c+t)}$ are the standard ADF test statistics for the null of non-stationarity of the variable in the study without and with a trend, respectively, in the model for testing. $LM_{KPSS(c)}$ and $LM_{KPSS(c+t)}$ are the KPSS test statistics for the null of stationarity of the variable in the study without and with a trend, respectively, in the model for testing. MMR = the market interest rate, LNER = the log of nominal exchange rate, LREER = the log of real effective exchange rate, LCPI = the log of consumer price index, FAR = net foreign assets-GDP ratio, CAR = capital account-GDP ratio, FRR = the ratio of foreign reserves to GDP ratio, LMPI = the log of manufacturing production index, MSR = the ratio of money supply to GDP, LDC = the log of domestic credit.

4.2. The Linear Relationship between Capital Inflows and Domestic Prices

To examine the short- and long-run relationship between capital inflows and the price level, we apply cointegration and Granger causality tests. The results from multivariate Johansen's cointegration procedure for the first sub-period (January 1990-December 2000) as well as for the second sub-period (January 2001-June 2012) are given in Tables 4 and 5, respectively.

We use three different measures, namely, the net foreign assets to GDP ratio, the foreign reserves to GDP ratio, and the capital account surplus to GDP ratio, as proxies for foreign capital inflows. Accordingly, the four models are estimated using a set of other control variables, which vary from model to model, to explore the impact of capital inflows on the price level. The estimates provide strong evidence of the existence of, at least one cointegrating vector. The existence of the long-run relationship holds for all models. This indicates that the cointegration results that we report here are robust to different proxies for foreign capital inflows and to different specifications. The results also suggest that evidence about the presence of long-run relationship between foreign capital inflows and domestic prices holds for both sub-periods. This implies that foreign capital inflows and domestic price levels are integrated (in cointegration sense) during periods of small as well as massive capital inflows.

[9]The unit root test results for first differences of the variables are not given here to economise the space. However, are available from authors.

Table 4

Results from Multivariate Johansen's Cointegration Tests
(January 1990 to December 2000)

Null Hypothesis	Model I		Model II		Model III		Model IV	
	λ_{max}	λ_{Trace}	λ_{max}	λ_{Trace}	λ_{max}	λ_{Trace}	λ_{max}	λ_{Trace}
$r = 0$	31.36*	66.95*	39.63*	104.50*	41.50*	84.93*	51.94*	126.12*
$r \leq 1$	21.11	35.59*	27.31	64.87*	18.80	43.43*	31.52*	74.17*
$r \leq 2$	9.00	14.48	23.86	17.57	17.38	24.62	21.83	42.65*
$r \leq 3$	5.48	5.48	9.53	13.71	7.25	7.25	11.77	20.82
$r \leq 4$	–	–	4.17	4.17	–	–	9.05	9.05

Note: *Denotes the rejection of the hypothesis at the 1 percent level of significance.

Model I: *LCPI = f (FAR, LMMR, LMPI)*.
Model II: *LCPI = f (FRR, LMMR, MSR, LMPI)*.
Model III: *LCPI = f (CAR, LDC, LNER)*.
Model IV: *LCPI = f (FAR, LMMR, LDC, LREER)*.

MMR = the market interest rate, LNER = the log of nominal exchange rate, LREER = the log of real effective exchange rate, LCPI = the log of consumer price index, FAR = net foreign assets-GDP ratio, CAR = capital account-GDP ratio, FRR = the ratio of foreign reserves to GDP ratio, LMPI = the log of manufacturing production index, MSR = the ratio of money supply to GDP, LDC = the log of domestic credit.

The results given in Tables 4 and 5 suggest that there is a long-run co-movement between domestic prices and capital inflows. These findings imply that capital inflows are significant in determining price levels in the host economy. A possible explanation for the existence of a significant relationship between foreign capital inflows and domestic price levels is that the surge in foreign capital inflows not only increases the monetary base of the economy but also increases the aggregate expenditures in the recipient economy. Consequently, the price level would increase in the economy. The capital inflows may also positively affect domestic prices if they are caused by an exogenous growth in productivity of domestic capital or/and by a drop in interest rate in foreign money markets. These findings are in accordance with several previous empirical studies including Kim and Yang (2009, 2011), Sayek (2009), Rashid (2010), Bernanke (2010), Nazir, *et al.* (2012), and Tillmann (2013) that document a significant association between foreign capital inflows and prices.

Table 5

Results from Multivariate Johansen's Cointegration Tests (January 2001 to June 2012)

Null Hypothesis	Model I		Model II		Model III		Model IV	
	λ_{max}	λ_{Trace}	λ_{max}	λ_{Trace}	λ_{max}	λ_{Trace}	λ_{max}	λ_{Trace}
$r = 0$	32.58*	45.62*	44.16*	76.43*	37.85*	65.72*	46.66*	95.85*
$r \leq 1$	13.21	15.01	38.48*	49.62*	17.94	36.14*	19.57	23.76
$r \leq 2$	11.54	13.76	15.14	26.12	13.63	14.98	13.38	17.49
$r \leq 3$	0.02	0.02	10.09	11.80	0.98	0.98	9.62	10.37
$r \leq 4$	–	–	0.06	0.06	–	–	0.83	0.83

Note: *Denotes the rejection of the hypothesis at the 1 percent level of significance.

Model I: *LCPI = f (FAR, LMMR, LMPI)*.
Model II: *LCPI = f (FRR, LMMR, MSR, LMPI)*.
Model III: *LCPI = f (CAR, LDC, LNER)*.
Model IV: *LCPI = f (FAR, LMMR, LDC, LREER)*.

MMR = the market interest rate, LNER = the log of nominal exchange rate, LREER = the log of real effective exchange rate, LCPI = the log of consumer price index, FAR = net foreign assets-GDP ratio, CAR = capital account-GDP ratio, FRR = the ratio of foreign reserves to GDP ratio, LMPI = the log of manufacturing production index, MSR = the ratio of money supply to GDP, LDC = the log of domestic credit.

4.3. The Response of Domestic Prices to Capital Inflow Shocks

We estimate impulse response functions (IRFs) as *an additional* check of the cointegration test's findings. Order and Fisher (1993), Cholesk-type of contemporaneous identifying restrictions are employed to draw a meaningful interpretation. The recursive structure assumes that variables appearing first contemporaneously influence the latter variables but not vice versa. It is important to list the exogenous variables earlier than the endogenous variables.

Impulse response functions for the first and second sub-periods are presented in Figures 1 and 2 given in the annexure, respectively. The response is considered significant if confidence intervals do not pass through zero line. For both the periods, the directions of changes observed in the impulse responses are according to economic theory. For the first sub-period, the immediate and permanent effect of a one standard deviation shock to net foreign reserves on domestic price levels is positive. The effect of a one standard deviation shock to the ratio of money supply to GDP on price levels is negative in the short-run; however, it is positive in the long run. The graphs also reveal that the money market rate, the nominal exchange rate, manufacturing output, and the capital account surplus to GDP ratio do not have any significant long run effect on domestic prices.

For the second sub-period, the net effect on domestic price levels of a one standard deviation shock to the ratio of foreign assets to GDP, the ratio of money supply to GDP, and the change in level of domestic debt is positive in the short run as well as in the long run. One the other hand, we observe that a one standard deviation shock to the ratio of capital account surplus to GDP has a positive effect initially but the permanent effect is negative. Impulse response functions confirm the findings of cointegration tests that there exists a long-run equilibrium relationship between foreign capital inflows and domestic price levels.

After confirming the existence of the long-run relationship (cointegration) between foreign capital inflows and domestic price levels, we explore the short-run dynamics. Since the variables are cointegrated, using the Vector Error Correction (VEC) model, we test whether the variables individually Granger cause domestic price levels in all the four models. For this, we test for the joint significance of lagged coefficient of each variable along with the error correction term. The estimated results for the first sub-period are reported in Table 6.

One can see from the Table that the null hypothesis of no short-run Granger causality cannot be rejected for the net foreign assets-to-GDP ratio as well as for the foreign reserves-to-GDP ratio. This implies that neither the net foreign assets nor the amount of foreign reserves significantly cause (in Granger sense) domestic prices during the period 1990–2000. These findings suggest that the foreign capital inflows do not have causal linkages with the price level during the periods of low capital inflows. That is, smooth flows of foreign capital do not create inflationary pressure in the recipient country. This finding is consistent with the literature that indicates that only large episodes of foreign capital inflows do matter for the host economy. The results regarding our third proxy of foreign capital inflows that is the ratio of capital account to GDP reveal that domestic prices are significantly Granger caused by foreign capital inflows via capital account surplus.[10]

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[10]This differential causal impact across different proxies of foreign capital inflows suggests that it would be worth exploring the impact of different components of foreign capital inflows such as foreign direct investment (FDI), foreign portfolio investment (FPI), foreign bank borrowing, remittances, etc. on domestic price levels. Further, it would also be useful to investigate the differential effects of private versus public foreign inflows on host economies. However, one should note that we do not extend our analysis along these lines in order to emphasise more on the objectives of our study.

Table 6

Linear Granger Causality Test Results for January 1990 to December 2000

Null Hypothesis	Number of Lags	χ^2 – Square	Decision (at the 5% level)
Model I: *LCPI = f (FAR, LMMR, LMPI)*			
LCPI is not Granger caused by FAR	3	3.089	Do not reject
LCPI is not Granger caused by MMR	3	2.356	Do not reject
LCPI is not Granger caused by LMPI	3	9.178	Reject
Model II: *LCPI = f (FRR, LMMR, MSR, LMPI)*			
LCPI is not Granger caused by FRR	3	0.129	Do not reject
LCPI is not Granger caused by MMR	3	3.188	Do not reject
LCPI is not Granger caused by MSR	3	10.769	Reject
LCPI is not Granger caused by LMPI	3	12.994	Reject
Model III: *LCPI = f (CAR, LDC, LNER)*			
LCPI is not Granger caused by CAR	3	7.908	Reject
LCPI is not Granger caused by LDC	3	10.232	Reject
LCPI is not Granger caused by LNER	3	1.150	Do not reject
Model IV: *LCPI = f (FAR, LMMR, LDC, LREER)*			
LCPI is not Granger caused by FAR	3	4.115	Do not reject
LCPI is not Granger caused by LDC	3	21.699	Reject
LCPI is not Granger caused by MMR	3	5.020	Do not reject
LCPI is not Granger caused by LREER	3	1.808	Do not reject

Note: MMR = the market interest rate, LNER = the log of nominal exchange rate, LREER = the log of real effective exchange rate, LCPI = the log of consumer price index, FAR = net foreign assets-GDP ratio, CAR = capital account-GDP ratio, FRR = the ratio of foreign reserves to GDP ratio, LMPI = the log of manufacturing production index, MSR = the ratio of money supply to GDP, LDC = the log of domestic credit.

The results do not provide any significant evidence of the rejection of the null hypothesis that domestic price level is not Granger caused by the money market rate and the exchange rate (neither the nominal nor the real one) in any estimated model during the period 1990–2000. These observations indicate that the interest rate and the exchange rate both do not have any significant short-run causal relationship with domestic price levels. These findings also suggest that during the period 1990–2000, both interest rate and exchange rate policies were not effective in controlling inflation in the economy.

The results given in Table 6 also show that the domestic price level is significantly influenced (in Granger sense) by domestic credit and money supply. This implies that increases in monetary base of the economy during the period 1990–2000 have inflated domestic prices. Likewise, more credit supply to domestic sector has also significantly and positively contributed to the price level. We find that there is a significant Granger causality sunning from manufacturing output to domestic prices. This implies that the level of industrial output has a significant short-run impact (in Granger sense) on the level of prices.

On the whole, we observe from the results presented in Table 6 that during January 1990 to December 2000, the capital account to GDP ratio, the money supply to GDP ratio, and the level of domestic debt significantly cause the domestic price level. However, we show that the net foreign assets to GDP ratio, the foreign reserves to GDP ratio, the money market rate and both nominal and real effective exchange rates do not

significantly influence the rate of inflation. Thus, we can say that during the period 1990–2000, domestic prices are significantly caused by domestic macroeconomic factors, namely money supply, domestic credit, and manufacturing output, instead of foreign capital inflows in the short run.

The results for the second sub-period spanning January 2001 to June 2012– a period of large capital surge—are given in Table 7. Contrary to the period of low capital inflows (1990–2000), yet consistent with our expectation, foreign capital inflows are significantly related to short-run dynamics of inflation during surges in capital inflows. In particular, we find strong evidence to reject the null hypothesis of no Granger causality for net foreign assets in Model I and Model IV. This implies that domestic prices are significantly Granger caused by the net foreign assets-to-GDP ratio. There is also significant evidence of the presence of the short-run causal relationship between the ratio of foreign reserves to GDP and the price level (see Model II). These findings suggest that the impacts of foreign capital inflows that we reported here are robust to different proxies of foreign exchange rate and different specifications, and thus, any specific proxy or any particular specification of the model does not drive them.

It is noteworthy that both the proxies for capital inflows, namely the net foreign assets to GDP ratio and the foreign reserves to GDP ratio, do not have any short-run causal relationship with domestic price levels during an episode of smooth capital inflows (January 1990 to December 2000). Nonetheless, during the period of large capital inflows ranging from 2001–2012, both of the proxies have a significant impact (in Granger sense) on domestic price levels, which is what we expect. This implies that the higher the level of the foreign capital inflows, the higher the level of the inflation. These findings suggest that the abrupt increase in foreign capital inflows would not only undermine central bank's ability to achieve monetary stability but also increase monetary base, fuel spending booms, and cause asset market bubbles without benefiting significantly the real sector of the host economy. Thus, capital inflow bonanzas generate inflationary pressures in the recipient country. These findings also suggest that policymakers can provide nominal anchor to the economy by stabilising the dynamics of foreign capital inflows. Our findings are consistent with those studies that document that large and sudden capital inflows significantly fuel domestic credit growth and price levels in host economies.

It is also important to note that although, during the period 1990–2000, capital account surplus to GDP ratio Granger causes domestic prices, we do not find any significant evidence of the presence of the short-run causal relationship between capital account surplus and the price level during 2001–2012. This finding is contrary to the preliminary evidence provided by correlation estimates that capital account surplus is significantly related to the price level during both the sub-periods. Similarly, there is no evidence of the short-run impact of market interest rate on the price level.

This finding holds for both sub-periods. Further, the results reveal that consistent with the first sub-period, neither the nominal nor the real exchange rate is significantly related to the short-run dynamic of inflation. Finally, we find that domestic debt, manufacturing output, and money supply significantly Ganger cause domestic price levels. These findings also hold for both sub-periods, indicating the persistent inflationary effect of these variables. These findings suggest that domestic credit growth and industrial output are significant for controlling inflationary dynamics in Pakistan. However, both the exchange rate and the money market rate cannot be effectively used as policy tools for stabilising short-run price dynamics.

Table 7

Linear Granger Causality Test Results for January 2001 to June 2012

Null Hypothesis	Number of Lags	χ^2 – Square	Decision (at the 5% level)
Model I: *LCPI = f (FAR, LMMR, LMPI)*			
LCPI is not Granger caused by FAR	2	6.726	Reject
LCPI is not Granger caused by LMMR	2	0.638	Do not reject
LCPI is not Granger caused by LMPI	2	8.076	Reject
Model II: *LCPI = f (FRR, LMMR, MSR, LMPI)*			
LCPI is not Granger caused by FRR	2	6.326	Reject
LCPI is not Granger caused by LMMR	2	1.175	Do not reject
LCPI is not Granger caused by MSR	2	8.254	Reject
LCPI is not Granger caused by LMPI	2	9.984	Reject
Model III: *LCPI = f (CAR, LDC, LNER)*			
LCPI is not Granger caused by CAR	2	2.637	Do not reject
LCPI is not Granger caused by LDC	2	16.609	Reject
LCPI is not Granger caused by LNER	2	1.487	Do not reject
Model IV: *LCPI = f (FAR, LMMR, LDC, LREER)*			
LCPI is not Granger caused by FAR	2	13.980	Reject
LCPI is not Granger caused by LDC	2	10.721	Reject
LCPI is not Granger caused by LMMR	2	1.843	Do not reject
LCPI is not Granger caused by LREER	2	1.654	Do not reject

Note: MMR = the market interest rate, LNER = the log of nominal exchange rate, LREER = the log of real effective exchange rate, LCPI = the log of consumer price index, FAR = net foreign assets-GDP ratio, CAR = capital account-GDP ratio, FRR = the ratio of foreign reserves to GDP ratio, LMPI = the log of manufacturing production index, MSR = the ratio of money supply to GDP, LDC = the log of domestic credit.

4.3. The Effect of Capital Inflows on the Exchange Rate Volatility

In this section, we examine the impact of capital inflows on the exchange rate volatility. In particular, we investigate the differential effect of capital inflows on the nominal and real exchange rate volatility during periods of low and large capital inflows. The volatility of nominal exchange rate (VNEX) and real effective exchange rate (VREER) has been calculated by using the three-period moving average standard deviation: $S.D_t = [(1/m \sum_{i=1}^{m} (EX_{t+i-1} - EX_{t+i-2})^2]^{1/2}$, where $m = 3$ and *EX* denotes the underlying exchange rate series. Before examining the influence of capital inflows on the exchange rate volatility, we test the order of integration of generated volatility series. For this, we apply the ADF and the KPSS unit root tests. The results for both sub-periods are given in Table 8. The results indicate that both volatility series are stationary at their levels.

Table 8

Unit Root Test Results: The Exchange Rate Volatility

Volatility Series	January 1990 to December 2000		January 2001 to June 2012	
	ADF	KPSS	ADF	KPSS
VNEX	−5.469*	0.484*	−3.654*	0.312*
VREER	−7.100*	0.119*	−5.783*	0.453*

* Indicates the series is stationary at the 1 percent level.

Since the exchange rate volatility series are stationary at their levels, we estimate the VAR model for testing the short-run Granger causality between the exchange rate volatility and the change in foreign capital inflows. The results summarised in Table 9 provide evidence that both the nominal and real effective exchange rate volatility is significantly influenced by the change in net foreign reserves during 1990–2000. This implies that during the first sub-period, capital inflows are significantly related to the short-run dynamic of both nominal and real exchange rates. Although during this period, the flows are relatively small and smooth, they play significant role in determining exchange rate fluctuations. It should be noted that during this period, foreign capital inflows not only affect the nominal exchange rate volatility but also the real effective exchange rate volatility. Thus, in turn, the inflows affecting foreign competitiveness increase international trade imbalances and escalate vulnerability to a financial crisis.

Table 9

Granger Causality Test Results: Capital Inflows and the Exchange Rate Volatility

Direction of Causality	January 1990 to December 2000		January 2001 to June 2012	
	χ^2–Square	Decision (at the 5% level)	χ^2–Square	Decision (at the 5% level)
Δ FAR $\rightarrow$ VNEX	7.579 (3)	Do not reject	0.930 (2)	Reject
Δ FAR $\rightarrow$ VREER	8.776 (3)	Do not reject	8.546 (2)	Do not reject

Note: Here the arrow points out the direction of causality. Values in parentheses are optimal lag-length selected by the AIC.

When we observe the Granger causality results for the second sub-period from January 2001 to June 2012, we find that the change in capital inflows has a significant impact (in Granger sense) on the volatility of real effective exchange rate. This finding indicates the persistent effect of capital inflows on the real exchange rate volatility during both sub-periods. This implies that the real effective exchange rate volatility is significantly influenced by the inflows of foreign capital regardless of whether these flows are smooth or of bonanza nature. The effects of foreign capital inflows on the real effective exchange rate that we presented here are consistent with the findings previously reported in the literature [Calvo, *et al*. (1993), Bandara (1995), Edwards (1998), Agenor (1998), Chen and Rogoff (2003), Lartey (2007, 2008), Cashin, *et al*. (2004), Lee, *et al*. (2009), Saborowski (2009), Rashid (2010), and Combes, *et al*. (2012)].[11] These studies

[11]Our findings regarding the effects on the exchange rate volatility of capital inflows are, however, inconsistent with Li and Rowe (2007), Mongardini and Rayner (2009), and Hussain, *et al*. (2009), who show that official foreign capital inflows are not significantly associated with the real effective exchange rate.

also document significant impacts of foreign capital inflows on real exchange rates. Our findings are also consistent with the view that ebb and flow of foreign capital inflows deteriorate macroeconomic and financial management in the recipient countries and overheat the economy by causing real appreciation. This set of findings suggests that there is a critical need to adopt more flexible exchange rate policies that would be useful in dampening the real exchange rate volatility, which stem from surges in capital flows.

4.4. The Nonlinear Causation between Capital Inflows and Domestic Prices

In this sub-section, we comprehensively analyse the existence of nonlinearity in capital inflows-domestic prices nexus. To test a long-run nonlinear relationship, we run a bi-variate regression of LCPI on a constant and BOX-COX transform of the underlying explanatory variable. Specifically, the function is defined as follows:

$$LCPI_t = \frac{\left(\left(|X_t|\right)^\theta - 1\right)}{\theta} \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \quad (7)$$

where X_t denotes the underlying explanatory variable. We use the nonlinear least squares (NLS) method to estimate the underlying parameters ($\hat{\theta}$), and then apply the KPSS test to the residual to test the null hypothesis of nonlinear cointegration against an alternative hypothesis of no nonlinear cointegration. The estimates are given in Table 10.

Table 10

Pairwise Nonlinear Cointegration Test Results

Variables included in Cointegration Equation	Sample Period: January 1990 to December 2000		Sample Period: January 2001 to June 2012	
	$LM_{KPSS(c)}$	$LM_{KPSS(c+t)}$	$LM_{KPSS(c)}$	$LM_{KPSS(c+t)}$
LCPI and FAR	1.286	0.102*	1.329	0.132*
LCPI and LDC	0.107**	0.098*	0.113*	0.162*
LCPI and MSR	1.261	0.137**	0.457*	0.201*
LCPI and LMPI	0.187*	0.121*	0.235*	0.117*
LCPI and MMR	1.412	0.238	1.377	0.275
LCPI and LNER	1.167	0.546	1.876	0.921

Note: * and ** denote rejection of the null hypothesis at the 1 percent and 5 percent significant levels, respectively. FAR = the ration of net foreign reserves to GDP, LDC = the log of domestic debt, MSR = the ratio of money supply to GDP, LMPI = the log of manufacturing output index, MMR = money market rate, and LNER = the log of nominal exchange rate.

The results provide strong evidence of the presence of nonlinear cointegration between domestic price levels and the net foreign assets-to-GDP ratio, the money supply-to-GDP ratio, manufacturing output, and domestic debt in both the examined periods. On the other hand, the results reveal that there is no significant nonlinear association between the price level and both market interest and nominal exchange rates. In particular, we find that the null hypothesis of nonlinear cointegration between foreign capital inflows and domestic prices cannot be rejected when we include a linear time trend in the KPSS test specification. The existence of the long-run nonlinear relationship between capital

inflows and price levels holds for both sub-periods. This observation suggests that nonlinearity in the capital inflows—domestic prices nexus is not attributed to the size of the waves of capital inflows. Rather, this asymmetric association may be heritable and stem from economic wellsprings.

To examine the nonlinear short-run causality between domestic prices and the other underlying variables, we use the Hristu-Varsakkeis and Kyrtsou (2010) nonlinear Granger causality test—known as the bi-varaite noisy Mackey-Glass model. The first step is to estimate the nonlinear VEC model (i.e., Equation (4) is estimated using the first differences of the variables and error correction term by ordinary least squares, in a specification $\tau_1 = \tau_2 = 4$ and $c_1 = c_2 = 2$) selected by the Log Likelihood procedure without and with restriction on lagged parameters of explanatory variable. We then obtain the residuals to calculate the test statistics (says S_F) for testing nonlinear Granger causality between the variables. For each variable, we estimate separately the nonlinear VEC model to examine the nonlinear causal impact on domestic prices of the underlying variable. We examine the nonlinear short-run causality during both sub-periods. Specifically, we aim to analyse whether the nonlinear short-run influence of capital inflows on prices depends on the size of flow of foreign capital inflows. However, for nonlinear Granger causality analysis, we utilise only the net foreign assets-to-GDP ratio as foreign capital inflows proxy. Table 11 presents the estimated S_F for both sub-periods.

Table 11

Pairwise Nonlinear Granger Causality Test Results

Direction of Nonlinear Causality	Sample Period: January 1990 to December 2000		Sample Period: January 2001 to June 2012	
	S_F – statistic	Decision (at the 5% level)	S_F – statistic	Decision (at the 5% level)
FAR → LCPI	0.364	Reject	9.454	Do not reject
LDC → LCPI	3.283	Do not reject	3.987	Do not reject
MSR → LCPI	4.247	Do not reject	9.545	Do not reject
LMPI → LCPI	3.673	Do not reject	7.169	Do not reject
LNER → LCPI	1.446	Reject	0.004	Reject
MMR → LCPI	1.318	Reject	0.164	Reject

Note: The arrow points to the direction of nonlinear causality. FAR = the ration of net foreign reserves to GDP, LDC = the log of domestic debt, MSR = the ratio of money supply to GDP, LMPI = the log of manufacturing output index, MMR = money market rate, and LNER = the log of nominal exchange rate.

We do not find any significant evidence of the existence of the nonlinear short-run causality between foreign capital inflows (the net foreign assets-to-GDP ratio) and domestic prices during the first sub-period when capital inflows are relatively smooth and small in size. During the second sub-period when there are surges in capital inflows, however, domestic price levels are significantly nonlinearly Granger caused by foreign capital inflows. This implies that the nonlinear short-run association between the price level and foreign capital inflows is asymmetric, depending on the amount of capital inflows. These findings are similar to our earlier findings of linear Granger causality tests—Granger causality running from capital inflows to domestic prices only for the period of massive capital inflows.

Results regarding other variables indicate that there is a significant nonlinear Granger causality running from the level of domestic debt, manufacturing output, and the money supply to GDP ratio to the rate of inflation. These results hold for both sample periods, suggesting the persistence in nonlinear short-run inter-linkages across low and high capital inflow regimes. In other words, ebbs and flows of foreign capital do not affect the nonlinear association between domestic prices, domestic debt, manufacturing output, and money supply to GDP ratio. Finally, we do not find significant evidence of the nonlinear Granger causality running from the market interest rate as well as the nominal exchange rate to the level of price in either period.

Several striking findings emerge from the evidence presented here. First, although the long-run linear and nonlinear association between foreign capital inflows and domestic price levels is independent of the size of foreign capital inflows, the short-run linear and nonlinear Granger causality exists merely during surges in capital inflows. Second, the causal impact on the level of price of domestic factors, namely money supply, manufacturing output, and domestic credit growth is robust regardless of whether foreign capital inflows are in small amount or of bonanza nature. Third, both the market interest rate and the exchange rate do not have any causal influence (in Granger sense) on domestic prices. Fourth, pronounced waves of foreign capital inflows significantly fuel the real effective exchange rate volatility. The significant influences of foreign capital inflows on domestic prices and the exchange rate volatility provide indication of so called "transfer problem"—which generally refers to the effect of foreign capital movements on the recipient economy. Our findings suggest that exchange rate flexibility and effective absorption and sterilisation of foreign capital inflows are necessary to penalise destructive capital inflows and lessen inflationary effects of capital inflows in the host economy. These measures, in turn, would be significant in dampening financial system vulnerability originating from surges in capital inflows.

5. CONCLUSIONS AND POLICY IMPLICATIONS

This paper has empirically investigated the inflationary effects of foreign capital inflows for Pakistan using monthly data covering the period from January 1990 to June 2012. To provide economic intuition, the paper has also proposed an empirical model of the equilibrium prices based on the standard classical quantity theory of demand for money subject to capital inflows. Further, we have divided the full sample into two sub-samples to study the differential effects of capital inflows on the price level across the low and high episodes of capital inflows.

Our empirical results suggest that there is a positive and significant impact of foreign capital inflows (in Granger sense) on domestic price levels, particularly, during the periods of massive capital inflows from 2001 to 2012. Our results, however, suggest lack of causality between capital inflows and domestic price level for the period 1990–2000. Besides the existence of linear causation between capital inflows and price levels, we find significant evidence of nonlinear Granger causality running from capital inflows to the rate of inflation. This implies that hikes in domestic price levels are not only linearly but also nonlinearly caused by changes in foreign capital inflows. The presence of nonlinearity in capital inflows-domestic prices linkages that we have unfolded in this paper would definitely provide new insights about the existence of causal links between

the price level and capital inflows. We also show that both the market interest and the exchange rate do not have any cause-effect relationship with the rate of inflation in either period. Finally, we find that foreign capital inflows have significant causal linkages with the exchange rate volatility. Our analysis suggests that the influence of capital inflows on the real effective exchange rate volatility holds during both low and high flow of capital inflows.

From the policy perspective, the findings are of particular interest to the government authority and the SBP. Since the capital inflows have played a significant role to push up domestic prices, particularly during the period of capital inflows surges (2001–2012), the foreign exchange management policy of SBP is questionable. The findings suggest that there is a need to absorb the capital inflows in such a way that they should neither create an inflationary pressure in the economy nor fuel the exchange rate volatility. More precisely, the SBP should put the limit to arbitrate in the forex market and should allow the private sector to use the foreign capital for productive purposes to increase the production in the economy, rather than just to add it to government foreign reserves. This policy can prevent the economy from overheating and dampen financial fragility.

The most effective ways to deal with capital inflows would be to deepen the financial markets, strengthen financial system supervision and regulations, where needed, and improve the capacity to design and implement sound macroeconomic and financial sector policies. These actions would certainly help increase the absorption capacity and resilience of the economy and financial systems to the risk associated with the inflows. The analysis may establish a useful base for future empirical work in this field and suggest that researchers should also consider nonlinearity in modelling to test the influence of surges in capital inflows on inflationary dynamics. We have unambiguously linked foreign capital inflows to consumer prices and the exchange rate volatility in both linear and nonlinear causality terms. It would also be enlightening to know how capital inflows and outflows differently affect asset price dynamics, in particular, house price inflation.

ANNEXURE

Fig. 1. The Response of Domestic Price Levels to One S.D. Innovations
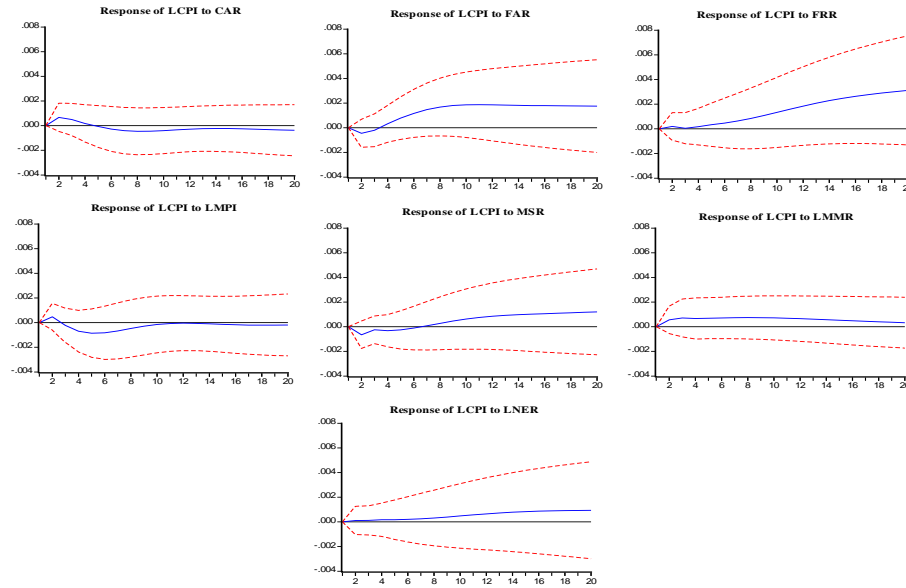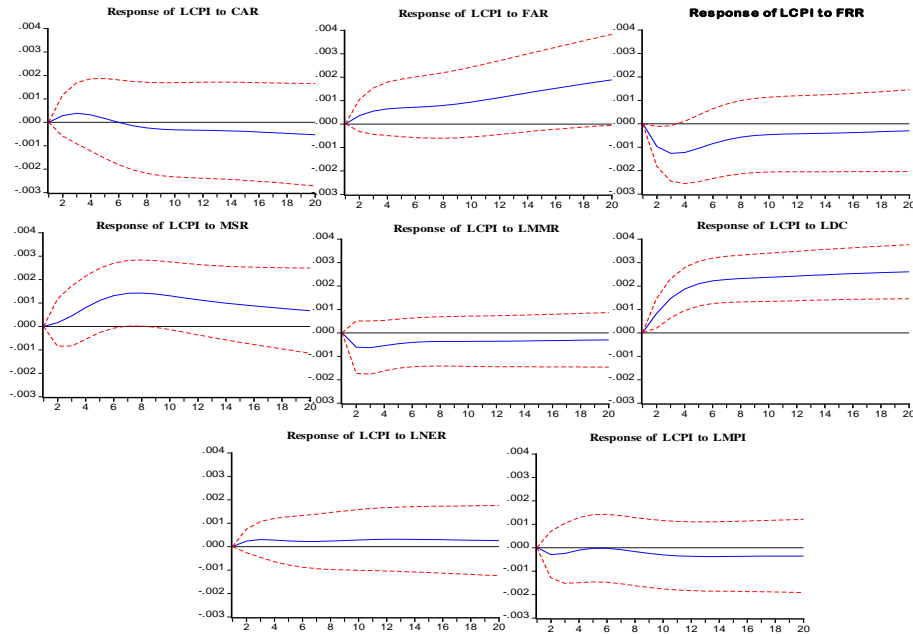**± 2 S.E., Sample Period: January 1990 to December 2000**

Fig. 2. The Response of Domestic Price Levels to One S.D. Innovations
± 2 S.E., Sample Period: January 2001 to June 2012

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Fiscal Decentralisation, Democratic Institutions and Inflation

NASIR IQBAL

This study examines the role of democratic institutions in an attempt to explain the relationship between fiscal decentralisation and inflation. The empirical analysis is based on time series data over 1972–2010 for Pakistan using the GMM estimation procedure. Three different measures of fiscal decentralisation are used in order to capture multidimensionality. The major findings of the study suggest that expenditure decentralisation has a negative impact on inflation if accompanied by democratic institutions. Revenue decentralisation, however, has a negative impact on inflation even in the absence of institutions, though institutions accentuate this effect. The role of institutions, therefore, is important in realising the benefits of fiscal decentralisation. Composite decentralisation has a negative and significant impact on inflation. This implies that expenditure decentralisation becomes effective when it is complemented with revenue decentralisation. Intuitively, provincial governments become more responsive when their expenditure needs are met with their own revenues.

JEL Classification: E31, H11, H72
Keywords: Fiscal Decentralisation, Inflation, Institutions, Pakistan

1. INTRODUCTION

Fiscal decentralisation (FD) is considered an effective strategy to promote economic growth through controlling inflation [Martinez-Vazquez and McNab (2003)]. The empirical literature, however, on the FD and inflation nexus is scant and inconclusive. For example, King and Ma (2001), using cross section data for 49 countries during the period 1973–1994, find a negative relationship between revenue decentralisation (RD) and inflation especially for developed countries. Neyapti (2004) extends this analysis by arguing that FD leads to lower inflation provided monetary discipline exists and not necessarily otherwise. The study, using a panel dataset for developed and developing countries, concludes that RD is effective in easing inflation only if it is accompanied by central bank's independence and local accountability. Martinez-Vazquez and McNab (2006) show that expenditure decentralisation (ED) decreases inflation only in developed economies but not in developing countries. Thornton (2007) finds that if the RD measure is restricted only to revenues over which local governments have full autonomy, the impact of RD on inflation is negligible. Jalal, *et al*. (2012) find that fiscal decentralisation appears to lead to a decrease in inflation rate.

It is quite evident that further research is needed to explore links between FD and inflation. The inconclusiveness of existing studies can be attributed to the missing role of institutions. We can deduce from existing literature that FD reduces inflation in developed

economies even in the absence of institutions, while in developing economies, FD reduces inflation when it is supported by local government accountability. The theorem of decentralisation[1] implicitly assumes that the positive contribution of FD is linked with the inclusive institutions that ensure accountability and transparency of governments and public officials [Oates (1993)]. Recent advancement in the field of FD makes this assumption explicit and incorporates the role of institutions in the theorem of FD. We argue that FD and democratic institutions reinforce and complement each other in determining inflation. Absence of local accountability, lack of institutional and administrative capacity and coordination problems are major factors that make FD less effective in controlling inflation especially in developing countries [Martinez-Vazquez and McNab (2006)]. Local autonomy in collecting local revenues may be limited due to political considerations [Neyapti (2004)]. Jalal, *et al*. (2012) find that the impact of decentralisation on inflation is determined by the level of perceived corruption and political institutions. We, therefore, hypothesise that FD leads to lower inflation provided an appropriate institutional framework exists, not necessarily otherwise. The objective of this study is two-fold; first, to examine the impact of fiscal decentralisation on inflation in Pakistan using time series data over the period 1972–2010; second, to test the hypothesis that fiscal decentralisation leads to lower inflation provided that a supportive institutional framework exists, not necessarily otherwise.

The GMM approach is used for estimation due to possibility of reverse causality and endogeneity among fiscal measures. This study contributes to literature in multiple ways: First, to the best of the author's knowledge, no study to date has investigated the relationship between fiscal decentralisation and inflation for Pakistan. Second, this study employs GMM approach to estimation to control reverse causality and endogeneity. Third, this study quantifies the role of democratic institutions in explaining the fiscal decentralisation-inflation nexus. Fourth, this study provides policy recommendations which would help the policy-makers in formulating better economic policies for long run macroeconomic stability. It also informs the policy-makers and practitioners about the strengths and weaknesses of the process of fiscal decentralisation in Pakistan. In addition to its relevance to policy-makers and practitioners, it also adds to the academic discussion on the impact of fiscal decentralisation.

The rest of this paper is structured as follows: the conceptual framework is explained in Section 2; the data, methodology and econometric issues are explained in Section 3; Section 4 presents the results of this study and Section 5 concludes the discussion and provides some key policy implications.

2. CONCEPTUAL FRAMEWORK

According to Martinez-Vazquez and McNab (2003), fiscal decentralisation promotes economic growth indirectly through maintaining macroeconomic stability.[2] The

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[1]Oates's "Theorem of Decentralisation" postulates that: "For a public good—the consumption of which is defined over geographical subsets of the total population, and for which the costs of providing each level of output of the good in each jurisdiction are the same for the central or the respective local government—it will always be more efficient (or at least as efficient) for local governments to provide the Pareto-efficient levels of output for their respective jurisdictions than for the central government to provide any specified and uniform level of output across all jurisdictions" [Oates (1993)].

[2]Martinez-Vazquez and McNab (2003) mention five different channels through which fiscal decentralisation may have influence on economic growth including (i) consumer efficiency, (ii) producer efficiency, (iii) the geographical distribution of resources, (iv) macroeconomic stability, (v) corruption and captures by elites. However, our focus in this dissertation is only to analyse macroeconomic stability channel.

literature on fiscal decentralisation mostly uses price stability as a proxy for macroeconomic stability.[3] There are controversies in literature as to whether fiscal decentralisation promotes or impedes macroeconomic stability.

A number of authors have suggested that devolution of some macroeconomic management policy measures to sub-national governments can promote macroeconomic stability, not hinder it [Shah (1999); Rodden and Wibbels (2002)]. Shah (2006) argues that fiscal decentralisation is linked with enhanced fiscal and economic performance because a decentralised fiscal setup provides a greater potential for the development of macroeconomic governance than a centralised fiscal setup. Public spending under a decentralised setup increases the economic efficiency because sub-national governments have more precise information about the preferences of the local communities that permits non-uniform provisions of public goods and services in accordance with the preferences of local citizens [Oates (1993)]. The process of decentralisation is also associated with more accountability and transparency in public service delivery [De Mello (2000)]. Existence of local accountability leads to more responsible behaviour of tax-payers that ultimately improves the effectiveness of local government [Wasylenko (1987)]. This implies that decentralisation may lead to macroeconomic stability via increased public sector efficiency [Neyapti (2010)].

The fiscal decentralisation can exert positive impact on price stability through the independence of the central bank. The existing studies show that the credibility of the commitment to price stability can be established if the monetary authority adheres to a set of formal rules or if there is a guarantee that it is independent from pressures from all levels of government [Shah (1994); Barro (1996)]. Shah (2005) argues that the central bank under a decentralised system performs better. Neyapti (2004) also argues that decentralisation and central bank independence reinforce each other in controlling inflation. Revenue decentralisation leads to lower inflation if it is accompanied by both central bank independence and local accountability.

Another theory of decentralisation suggests that the process of fiscal decentralisation does not affect the inflation directly, but it keeps inflation rates constant, whether low or high, through making it difficult to change fiscal or monetary policies [Tsebelis (1995)]. The number of agents whose agreement is required for changing a policy is increased in a federal structure. The sub-national governments are sometimes provided with the right to veto the decisions made by the central government. This in turn reduces the probability of changing policy hence ensures continuity in the existing monetary and fiscal policies which ultimately makes inflation rates constant. The final macroeconomic outcomes, therefore, depend on policies which are initially in place.

In countries where inflation rates are high, a decentralisation process tends to perpetuate the underlying factors that cause high inflation and hence make it difficult to achieve durable stabilisation. On the other hand, in countries where inflation rates are low due to low fiscal pressure and depoliticised monetary policy, a decentralisation process further promotes stability via maintaining the inflation rate at a low level.[4]

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[3]See for example Treisman (2000), King and Ma (2001), Neyapti (2004), Martinez-Vazquez and McNab (2006), Shah (2006) and Thornton (2007).

[4]The empirical support for this continuity hypothesis is found by Treisman (2000).

Various studies argue that fiscal decentralisation per se increases macroeconomic instability or works as an obstacle to solving the persistent fiscal imbalance due to potential disregard of budget constraints by local governments under a decentralised framework [Rodden (2002)]. However, when macroeconomic instability predates decentralisation, it is much more difficult to achieve macroeconomic stability although not entirely impossible [Dillinger, *et al*. (2000)]. The possibility of soft budget constraint[5] at the sub-national levels of governments also makes it difficult to achieve macroeconomic stability through decentralisation [Stein (1999); Bahl (1999)].

Fiscal decentralisation may also have adverse consequences for macroeconomic stability because decentralisation may be associated with an increase in the degree of autonomy of the local governments. Ahmad, *et al*. (2005) argue that macroeconomic stability or price stability for an economy depends on the overall exposure to the risk. In this situation, the critical element is the borrowing of all jurisdictions in the country. Local governments have more authority to determine level of expenses as well as to collect revenues in their jurisdictions under decentralised set up. Hence, the central government has less control to manage the fiscal activities of local governments which ultimately leads to more macroeconomic instability.

Most of the criticism against decentralisation does not dismiss the idea of decentralisation per se, but is rather meant to highlight the need for augmenting the decentralisation process with sound institutions. According to the critics, only when these institutions are present does decentralisation bear the fruits that are promised by its proponents. The benefits of decentralisation largely depend on institutional arrangements that govern the design and implementation of decentralisation [Iqbal, *et al*. (2012)]. A well-defined institutional mechanism increases the accountability and transparency in the political system and hence helps to reduce corruption. Leading to efficient allocation of public resources [Iqbal, *et al*. (2012)]. Enikolopov and Zhuravskaya (2007) argue that the success of fiscal decentralisation depends on the quality of the political institutions in the country. This study shows that fiscal decentralisation is more successful in politically decentralised transition economies. They argue that the positive contribution of fiscal decentralisation will be attenuated if the country is plagued with a serious problem of corruption. On the other hand, a country which is free from corruption will be able to reap the benefits of fiscal decentralisation through macroeconomic stability. More stable political system may accentuate the impact of fiscal decentralisation on macroeconomic stability and vice versa [Enikolopov and Zhuravskaya (2007)].

3. DATA, METHODOLOGY, AND ECONOMETRIC ISSUES

The empirical analysis is based on time series data from 1972 to 2010 for Pakistan. FD, the subject matter of this study, refers to the devolution of policy responsibilities for

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[5]The idea of soft budget constraint (SBC) is introduced by Kornai (1979) to analyse the behaviour of state owned firms. The SBC is used in decentralisation system to refer to lower level governments that look to a higher level government to recover or bailout their excessive deficits. The term bailout implies to the additional funding that the higher level government provides to the lower level governments when it would otherwise be unable to service its obligations. On the other hand, hard budget constraint (HBC) implies that lower level governments have to face the full costs of their expenditure decisions. The soft-budget constraint problem refers to the fact that federal transfers to subnational governments are based on *ex post* financial needs and not, as it should be, on ex-ante characteristics of the recipient states [Rodden (2002)].

public spending and revenue collection from the central to the provincial governments. Data on fiscal decentralisation variables is sourced from the Fifty Year Economy of Pakistan and various annual reports published by the State Bank of Pakistan. Three different indicators are constructed to measure the level of FD.

- Revenue Decentralisation (RD): RD is measured as the ratio of the provincial government's revenues (PR) to the total government revenues (TR) (federal plus provincial) i.e. $RD = \frac{PR}{TR}$.
- Expenditure Decentralisation (ED): ED is defined as the ratio of provincial government expenditures (PE) to the total government expenditures (TE) (federal plus provincials) excluding the defence expenditures (DE) and interest payments on debt (IE) since these expenditures are mainly considered as part of the non-decentralised government expenditures. $ED = \frac{PE}{TR-(DE+IE)}$.
- Composite decentralisation (CD): Following Martinez-Vazquez and Timofeev (2010), CD is measured by using both RD and ED. CD captures the information in expenditure and revenue ratios. $CD = \frac{RD}{1-ED}$.

Figure 1 shows the trends in RD, ED and CD in Pakistan. Figure 1 shows that the share of provincial government revenue in total government revenue ranges from 7 to 25 percent. The share of provincial governments' revenue is 15 percent in total government revenue in 1980, thereafter showing an increasing trend to reach 23 percent in 1987. After this period, there is a decreasing trend in revenue decentralisation and provincial revenue share in total government revenue reaches 10 percent in 2010. Figure 1 shows that the share of provincial government expenditure in total government expenditure ranges from 34 to 69 percent during the last three decades. After reaching 50 percent in 1982, the share of provincial government expenditure shows a decreasing trend reaching 39 percent in 1989. For most part of the 1990s, expenditure decentralisation shows an increasing trend. However, after 1998 once again, provincial shares in total expenditures trend downwards, declining from 55 percent in 1998 to 35 percent in 2010. The trend shows that the 'Composite Decentralisation' measure ranges from 14 to 49 percent.

Fig. 1. Trend in RD, ED and CD Over Period 1972–2010 in Pakistan
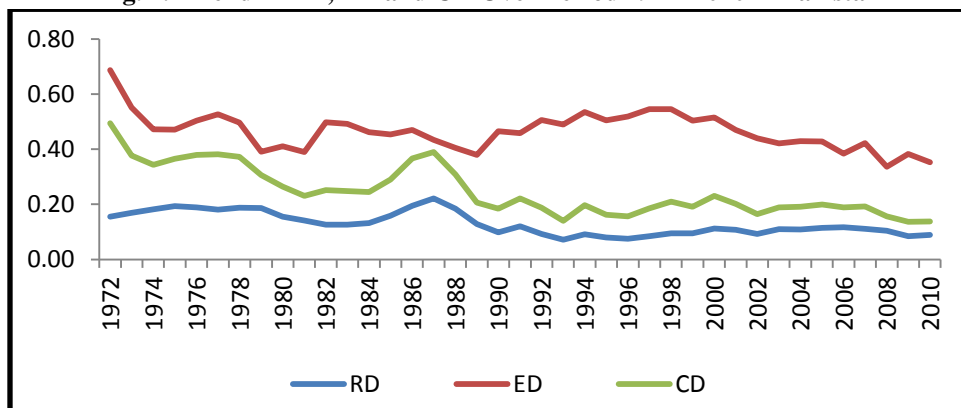
Source: Authors' own calculation.

Inflation is measured as the growth rate of consumer price index (CPI). The average inflation rate is 9.6 varying from 3.1 percent to 30 percent. Figure 2 shows the trend of inflation rate over the period 1992–2010. Figure shows that inflation rate touches the peak of 26.7 percent in 1974. After that inflation rate has declined from 26.7 in 1974 to 11.9 in 1980. During the decade of 1980s, the average inflation rate was around 7 percent. While during the decade of 1990s, the average inflation rate was around 10 percent. Inflation rate shows increasing trend after 2004 and once again touches the peak of 20 percent in 2008.

Fig. 2. Trend in Inflation Over Period 1972–2010 in Pakistan
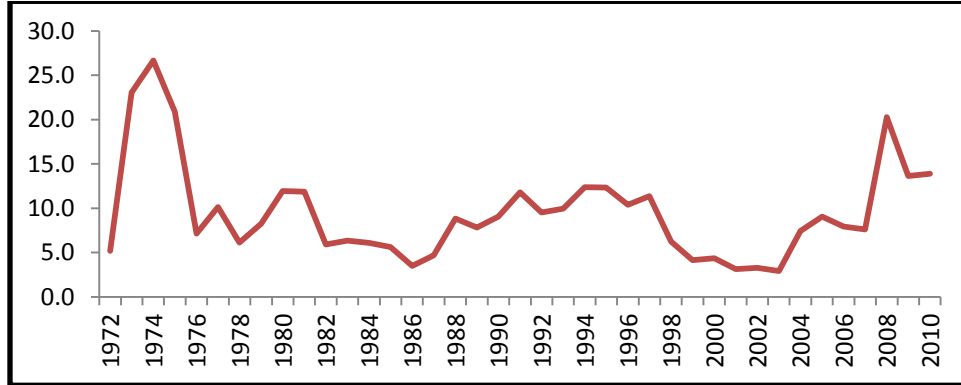
Source: WDI (2014).

The data on democracy is sourced from the Polity IV dataset. The democracy index ranges from +10 (full democracy) to –10 (full autocracy).   The democracy index in the below Table indicates that the average quality of the institutional framework is 0.85 ranging between –7 to +8 in Pakistan. The control variables consist of physical capital measured as capital stock per work, money supply measured as M2 to GDP ratio, openness measured as trade as percent of GDP and tax to GDP ratio. Data on these variables is taken from the *Economic Survey of Pakistan* (various editions). The descriptive statistics are presented in Table 1.

Table 1

Descriptive Statistics

Variables	Obs.	Mean	Std. Dev	Min	Max
Revenue Decentralisation (RD)	39	0.130	0.041	0.071	0.221
Expenditure Decentralisation (ED)	39	0.465	0.067	0.336	0.686
Composite Decentralisation (CD)	39	0.247	0.089	0.129	0.494
Inflation (INF)	39	9.587	5.748	03.10	30.00
Capital Stock per Worker (CS/W)	39	75273	16727	42950	95884
Openness (OPN)	39	0.338	0.037	0.273	0.432
Tax to GDP Ratio (T/GDP)	39	0.123	0.015	0.095	0.145
M2 to GDP Ratio (M2/GDP)	39	0.403	0.039	0.297	0.469
Democratic Institution (INS)	39	0.846	6.745	–7.000	8.000

Source: Authors' own calculation.

Following Neyapti (2004, 2010) the following model is proposed which captures the links among FD, democratic institutions and inflation:

$$INF_t = \delta_0 + \delta_1 FD_t + \delta_2 INS_t + + \delta_3 FD_t * INS_t + \delta X'_t + \varepsilon_t$$

Where INF is inflation rate, FD measures fiscal decentralisation, INS represents democratic institutions, X is the vector of control variables and ε is the disturbance term. In this model, the interaction term, $FD * INS$ allows us to test the hypothesis of complementarity between FD and democratic institutions. Based on this model, we aim to empirically examine the following hypotheses:

(i) Fiscal decentralisation influences the inflation rate.
(ii) Fiscal decentralisation and democratic institutions are complementary.

There are several studies that have used the Ordinary Least Squares (OLS) estimation technique to empirically investigate the impact of FD. However, a number of studies identify the possibility of reverse causality and endogeneity among FD and other variables [see e.g. Zhang and Zou (1998); Xie, *et al.* (1999); Lin and Liu (2000); Thiessen (2003); Jin, *et al.* (2005); Iqbal, *et al.* (2012)]. OLS estimates become biased and inconsistent in the presence of reverse causality and endogeneity. Weuse instrumental variables approach based on the generalised method of moments (GMM) to check endogeneity. The application of the generalised method of moments (GMM) can be considered as an extension of the instrumental variables (IV) estimation method. The main advantage of the GMM estimation method is that the model need not be serially independent and homoscedastic. Another benefit of the GMM estimation technique is that it generates parameters through maximising the objective function, which includes the moment restrictions in which correlation between the lagged regressor and the error term is zero.

The standard approach to determine the stationarity of the time series data is to check the existence of unit roots in the given series. The most commonly employed test for unit root analysis is called Augmented Dickey Fuller (ADF) test. We have used ADF tests to determine the stationarity of series. The results of the ADF test are reported in Table 2. The test statistics indicate that inflation, openness and M2 to GDP ratio

Table 2

Unit Root Test (ADF Test)

Variables	Level			First Difference		
	No Trend	With Trend	Result	No Trend	With Trend	Result
Revenue Decentralisation (RD)	−2.13	−3.24	NS	−4.63	−4.56	S
Expenditure Decentralisation (ED)	−1.72	−2.48	NS	−7.19	−7.02	S
Composite Decentralisation (CD)	−1.69	−3.41	NS	−5.49	−5.43	S
Inflation (INF)	−4.02	−3.62	S			
Capital Stock Per Worker (CS/W)	−2.81	−1.62	NS	−1.44	−3.83	S
Openness (OPN)	−2.93	−3.56	S			
Tax to GDP Ratio (T/GDP)	−1.32	−2.02	NS	−5.12	−5.71	S
M2 to GDP Ratio (M2/GDP)	−2.95	−4.58	S			
Democratic Institution (INS)	−1.97	−1.91	NS	−5.71	−5.76	S
INS*RD	−1.75	−1.73	NS	−5.47	−5.51	S
INS*ED	−1.91	−1.86	NS	−5.58	−5.62	S
INS*CD	−1.71	−1.69	NS	−5.40	−5.44	S

Note: 5 percent critical value is −2.87 for the case of no-trend, and −3.42 when a trend is included. AIC is used for lag selection. S stand for stationary series and NS stand for non-stationary series.

are stationary at level. While revenue decentralisation, expenditure decentralisation, composite decentralisation, capital stock per worker, tax to GDP ratio, democratic institutions and interaction terms are non-stationary at level and become stationary at first difference.

4. RESULTS AND DISCUSSION

This study has estimated the impact of various forms of FD on inflation. The Table 3 below shows the results. We observe a negative and significant impact of RD on inflation implying that an increase in RD leads to a lower level of inflation. RD helps to promote stability in many ways. First, the higher the level of provincially owned revenues, the less will be the dependence of provincial government on federal revenue. Subsequently, the federal government can enhance its own capacity by allocating more resources to public sector projects such as power and infrastructure. Secondly, it provides more policy space to central bank in controlling inflation. Shah (2005) argues that with fiscal decentralisation the central bank will be more independent since a decentralised system requires more clarified rules and regulations under which a central bank

Table 3

The GMM Estimates, Dependent Variable is INF

Variables	(1)	(2)	(3)
RD	−1.175***		
	(0.409)		
ED		−2.337	
		(4.467)	
ED			−1.227***
			(0.427)
Tax/GDP	−1.395**	−0.973	−1.514**
	(0.670)	(1.104)	(0.677)
Openness	−1.070***	−1.082**	−1.023***
	(0.212)	(0.540)	(0.222)
M2/GDP	−1.423	−1.403	−1.255
	(1.092)	(2.054)	(1.121)
Physical Capital	−1.202***	−0.803	−1.269***
	(0.356)	(0.512)	(0.367)
Constant	29.24***	17.76*	31.39***
	(9.699)	(10.22)	(10.10)
Observations	37	37	37
R-squared	0.628	0.382	0.616
Wald Chi2 Test	98.89	41.37	94.72
Normality Test	1.16 (0.56)	2.19 (0.33)	1.63 (0.44)
End. Test P.V.	0.0509	0.0303	0.0380
OI Test P.V.	0.6376	0.8147	0.5857
D. W. Test Value	1.96	2.06	1.95

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; The STATA v12 has been used for estimation by using 'ivregress-GMM' command.

operates. Also the central bank has more flexibility to interact with different levels of government. The combined effects of all these factors result in low inflation through RD. The results show that ED has a negative but insignificant impact on inflation. Martinez-Vazquez and McNab (2006) find similar results for developing countries. The insignificant association between ED and inflation may be due to weak institutional framework of the country. Lack of economies of scale, absence of local accountability, lack of institutional and administrative capacity and coordination problems are the major factors that make expenditure decentralisation less effective in controlling the inflation rate [Martinez-Vazquez and McNab (2006)]. Results also show that CD has a negative and significant impact on inflation. This implies that ED becomes effective when it is complemented with RD. Intuitively, provincial governments become more responsive when their expenditure needs are met with their own revenues.

Various control variables are used in the analysis. Physical capital has a negative and significant impact on inflation. This implies increased investment in capital stock is associated with a decrease in inflation rate. Investment in public infrastructure helps in many ways to promote macroeconomic stability. For example, investment in roads, electricity and other public amenities reduces the structural bottlenecks hence reduces the macroeconomic instability. It is evident that Pakistan has been facing supply-side constraints for the last few years. These constraints impede the growth process and reduce macroeconomic stability of the country. In this situation, public investment for capacity building especially in the power sector is required to maintain stability and growth. Private sector investment typically reduces production costs hence relieving inflationary pressure.

The money supply has a negative but insignificant relationship with the rate of inflation. This indicates inflation is not primarily because of money supply but it may be structural in nature and mainly attributed to supply-side factors. Nasir and Malik (2011) also argue that inflation in Pakistan is mainly supply side driven. Trade openness has a negative and statistically significant impact on inflation. This result is in line with Romer' view (1993), that inflation is lower in small open economies. A number of other studies also show that trade openness is negatively associated with inflation rate in Pakistan [Ashra (2002); Gruben and McLeod (2004); Kim and Beladi (2005); Hanif and Batool (2006); Mukhtar (2010)]. Openness enhances the efficiency and reduces costs through change in composition of inputs procured internationally and domestically, thus leading to lower inflation. Openness also affects inflation through better allocation of resources and increased capacity utilisation. Openness may also boost foreign investment which can stimulate output and reduce the price level [Ashra (2002)]. Tax to GDP ratio has a negative and statistically significant impact on inflation, implying that higher the tax to GDP ratio; lower the level of inflation in the country. Taxation generally reduces the level of income and with lower level of income; demand for goods and services will decline that will eventually lead to lower inflation.

To examine the role of democratic institutions, interactive terms of democratic institutions and FD are added as additional explanatory variables i.e. $RD * INS$, $ED * INS$ and $CD * INS$. The results show that FD becomes effective when interacted with democratic institutions (Table 4). All interactive terms have negative and significant impact on inflation. This implies that FD and democratic institutions reinforce each other.

Table 4

*The GMM Estimates, Dependent Variable is INF with INS Included in the Model*

Variables	(1)	(2)	(3)
RD	−0.551		
	(0.391)		
ED		−3.184	
		(4.383)	
ED			−0.655*
			(0.353)
RD*INS	−0.150*		
	(0.0894)		
ED*INS		−0.588**	
		(0.292)	
CD*INS			−0.200*
			(0.113)
INS	0.0155	0.0160	0.0170*
	(0.0101)	(0.0167)	(0.00973)
Tax/GDP	−1.789***	−1.894*	−1.932***
	(0.486)	(1.011)	(0.464)
Openness	−0.710***	−0.323	−0.647***
	(0.161)	(0.561)	(0.155)
M2/GDP	−0.206	1.417	0.00270
	(0.729)	(1.901)	(0.730)
Physical Capital	−1.058***	−1.112**	−1.160***
	(0.259)	(0.467)	(0.236)
Constant	26.91***	26.95***	29.82***
	(6.875)	(8.718)	(6.406)
Observations	37	37	37
R-squared	0.772	0.556	0.770
Wald Chi2 Test	201.7	151.6	211.1
Normality Test	2.10 (0.35)	2.51 (0.23)	1.65 (0.44)
End. Test P.V.	0.0808	0.0374	0.0496
OI Test P.V.	0.5620	0.4219	0.5443
D. W. Test Value	2.16	1.81	2.20

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; The STATA v12 has been used for estimation by using 'ivregress-GMM' command.

Brambor, *et al.* (2006) and Iqbal, *et al.* (2012) show that it is incorrect to include the interactive term simply due to the significance of the coefficient of the interactive variable. The marginal effect of FD on inflation should be observed by constructing confidence intervals for the estimates of coefficients of FD and interactive term of FD and INS. Figure 3 below is drawn on the basis of the coefficient estimates of FD and also its interactive term with democratic institutions and their variance-covariance terms. Figure 3 shows as the quality of institutions improves, RD and CD exert increasingly negative and significant impact on inflation. The impact of fiscal decentralisation on

inflation is very low when the quality of institutions is poor. However, as the quality of institutions improves, the fiscal decentralisation exerts a significant negative impact on inflation. The institutional school of thought argues that the quality of institutions increases the efficiency of the economic factors of production [North (1981)]. It reduces the level of corruption and enhances the accountability of the governments which lead to more stable macroeconomic environment, including lower inflation.

Fig. 3. 95 percent Confidence Intervals for the Marginal Effect of FD, by Institutional Quality
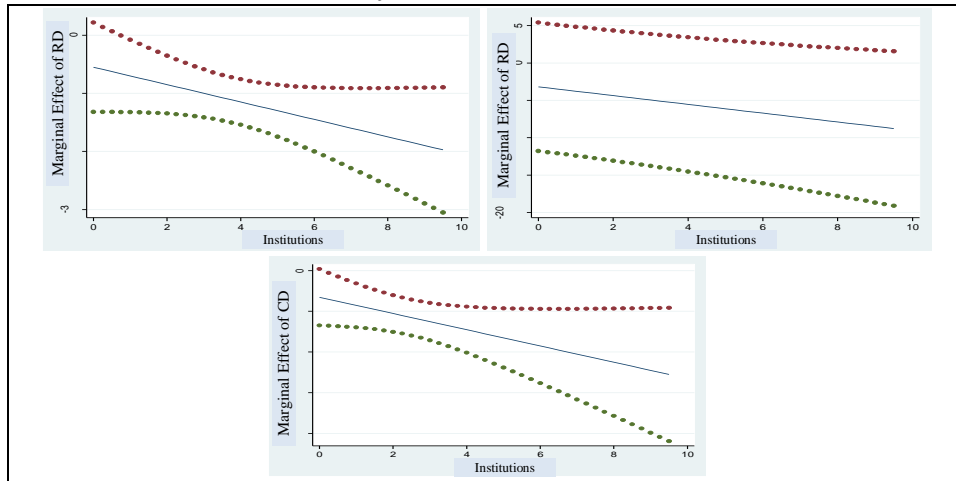
5. CONCLUSION

In this study, the role of democratic institutions in modulating the fiscal decentralisation-inflation nexus has been analysed using time series data over the period 1972–2010. We have used the GMM estimation procedure to estimate the model. The empirical analysis has shown that revenue decentralisation has a significant and negative impact on inflation rate while expenditure decentralisation has an insignificant association with inflation. The expenditure decentralisation fails to check inflation rate due to weak institutional framework of Pakistan that leads to more corruption and less accountability when resources through fiscal transfer are easily available to the provincial governments. Composite decentralisation also has a negative association with inflation. This implies that if Pakistan focuses simultaneously on both types of fiscal decentralisation, then it helps in promoting macroeconomic-stability in Pakistan. Further analysis has shown that fiscal decentralisation becomes effective in controlling inflation when complemented with democratic institutions. It is observed that improvement in the quality of democratic institutions enhances the ability of fiscal decentralisation to exert a moderating effect on inflation.

The crux of the analysis is that institutions are indeed important in realising the benefits of fiscal decentralisation. Strengthening democratic institutions is a pre-requisite for achieving the goals of fiscal decentralisation. Well defined and sound democratic institutions make provincial as well as central governments accountable and transparent in performance of their functions while remaining within their jurisdictions.

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Economics of Property Crime Rate in Punjab

SHAHZAD MAHMOOD JABBAR and HASAN M. MOHSIN

This study intends to ascertain the impact of socio-economic, demographic and deterrent variables and the effect of technical criminal know-how and past criminal experience on property crime rate. The property crime equation comprises of the following independent variables: population density, unemployment rate, literacy rate, police strength and number of police proclaimed offenders in a society. The property crime equation has been estimated by using a time-series data set for Punjab from 1978 to 2012. We have applied Johansen cointegration approach to test the long run relationship among the variables. Empirical findings suggest that police strength has a deterrent effect while past criminal experience enhances property crime rate in Punjab. The study finds population density has a significant positive relationship while education has a significant negative relationship with property crime rate. Further we also find a negative relationship between unemployment and property crime which is supported by the concept of 'consensus of doubt' in the discipline of crime and economics.

JEL Classification: D6

1. INTRODUCTION

"People respond to incentives" is a universal truth that allows us to claim that people participate in criminal sector for their own social, psychological or economic incentives. Current study has focused on property crime rate that comprises of those types of offences that intentionally and deliberately attempt to or actually cause loss of property. A higher property crime rate discourages commercial activity which in turn distorts the process of economic growth. The social scientists particularly economists seem keen to identify the potential determinants of property crime that can be helpful for policy-makers in order to restore peace and stability. Becker (1968) introduced the crime and economics discipline by designating criminals and law enforcement agencies as rational individuals. Following in his footsteps economists from all around the world are contributing to investigate those potential factors which can affect the magnitude of crime rate in different societies.

Unfortunately there is a growing concern about higher crime rate in Pakistan but economics of crime have received a little attention in the country. All available studies, which review this newly emerging discipline have a common characteristic of using a country level data of socio-economic variables in explaining their effect on crime rate.

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The crime rate, however, seems sensitive to the geographical boundaries of countries. The sizable literature uses states, provinces, and even the districts level data to   gain insights into this serious issue. Thus it seems better to observe the effect of various socio-economic and demographic factors on crime rate at sub-national level in Pakistan because there is lot of variation in most of the core socio-economic and demographic aggregates across regions.   We use the sub-national data to estimate the crime rate equation in order to avoid the overstatement or understatement of the effects of various socioeconomic, demographic and deterrent variables. The current study has selected Punjab as a case study due to higher property crime rate there and its major role in Pakistan's economy. Moreover, we have focused on the property crime rate only because it is more responsive to socio-economic, demographic and law enforcement conditions of a society [Becsi (1998)].

The higher incidence of property crimes in Punjab has ressulted in a state of insecurity, frustration and mental unrest that spells out a dire need to deal with the situation. Our empirical investigation focuses on those factors which can significantly affect the property crime rate but have been least focused in most of the empirical attempts available at country level literature of crime and economics. First, a deterrent variable labelled as police strength to check its deterrent effect on property crime rate has been included in the current study. Secondly, an explanatory variable population of police proclaimed absconders[1] has been incorporated in economic model of property crime to capture the effect of technical criminal know-how and past criminal experience on property crime rate. Finally population density; unemployment and education have been used as control variables to see their impact on property crime rate.

For this purpose we have applied Johenson Cointegration approach to a time series data set for Punjab from 1978–2012. The study finds a significant negative impact of increasing police strength and education on property crime rate. The increase in the number of police proclaimed offenders and population density have a significant positive impact on property crimes. In view of these findings, we believe current study will not only be helpful in proposing sound policy recommendations regarding property crime prevention but will also make useful contribution to the existing literature of crime and economics.

The study has been arranged as follows: we review the literature in Section 2. The theoretical framework is presented in Section 3. In Section 4 there is a debate on methodology used in empirical estimation along with the sources of data used. Empirical findings have been stated in Section 5 and finally concluding remarks along with   policy recommendations are presented in Section 6.

2. LITERATURE REVIEW

Study of crime remained a subject of interest in each society during different eras. When father of economics Smith (1776) talked about the accumulation of wealth by people he also discussed the motivation of people towards crime and demand of people for the protection from crime. Paley (1785) reported the role of deterrent variables in

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[1]Police proclaimed absconders are the persons that have committed crime but crime prevention authorities are still unable to arrest these persons. A lot of police reports consider it as a vital reason of high property crime rate.

changing the magnitude of crime rate in different societies. However, there was the father of utilitarianism Bentham (1879), who introduced calculus while determining the criminal behaviour and optimal level of law enforcement by crime prevention authorities. Fleisher (1966), Tullock (1967), Rottenberg (1968), Becker (1968), Stiggler (1974), Landes and Posner (1975) have contributed a lot to reconnect economists with Crime and Economics Discipline [Ehlrich (1996)].

If we talk about the recent theoretical foundations of crime and economics, then we will have to go back to the contributions of Becker (1968) who led the foundations of theoretical model of criminal behaviour. He was of the view that every criminal is an economic agent as he commits crime only, when there is an expectation of increase in his utility. He also discussed the optimal structure of institutions that are responsible for crime prevention in some state by arguing that these institutions should be designed so that they should suffer minimum cost during crime prevention. In this regard along with Stigler (1968) he preferred private enforcement of law rather than public enforcement of law.

Landes and Posner (1975) criticised the above mentioned idea of Becker of turning the most likely and an ideal public enforcement of law into private enforcement of law. They were of the view that private enforcement has severe drawbacks as there can be possibility of under enforcement or over enforcement. However they favour the private enforcement of law only in civil offenses as these can be detected with an ease and can be punished at zero cost.

Friedman (1984) defended the idea of private enforcement of law by Becker and Stigler (1968) with the help of an historical example of Ireland where private enforcement of law prevailed for three hundred years not only in civil offences but also in most severe criminal offences like murder etc. during the Anglo-Saxon period. Friedman concluded that private enforcement is not as effective in offences under criminal law as it is in offences under civil law but these inefficiencies can easily be eliminated by making some minor changes in some of the formal and informal institutions that play vital role in crime prevention.

Friedman (1995) presented a new idea of turning the criminal law into civil law in support of the above mentioned Becker's idea about optimal enforcement of law. He argued that punishment for the crime prevention either in terms of imprisonment or execution is not optimal and turning of criminal law into civil law can enable a country to punish offenders in terms of monetary fines. In this way net cost of crime prevention will be zero and there will be lesser burden on taxpayers.

The above mentioned debate about the rationality of criminals and efficient law enforcement by a state is the main theme of modern crime and economics discipline. Since a criminal activity involves multi-disciplines but the current study will concentrate only on those national and international studies which are related to identifying socio-economic, demographic and deterrent variables of crime rate.

Gillani, *et al.* (2009) have empirically investigated the effect of unemployment, inflation and poverty on crime rate of Pakistan by using a time series data from 1975–2007. They applied Johenson cointegration approach to conclude that unemployment rate, poverty and inflation are granger cause of crime in Pakistan. After that Jalil (2010) investigated the link between urbanisation and crime rate in Pakistan using a time series

data set   during 1964–2008. He also used Johenson cointegration approach in this empirical investigation and reported that a lack of planning regarding the expansion of urban areas increase crime rate while literacy rate and unemployment have a significant and negative impact on crime rate of the country.

All these studies had a little focus on deterrent variables in economic model of crime. Jabbar and Mohsin (2014) highlighted the measuring error problem and lack of deterrent variables in the economic modal of crime at country level literature. Using a time series data set for Punjab during 1978–2013, he applied Johenson cointegration approach and proved that police strength, high conviction rate and a higher literacy rate in a society have a significantly negative impact on murder crime rate while the impact of unemployment on violent crime is ambiguous.

In the large part of international literature the effect of various socioeconomic variables particularly the effect of unemployment on crime rate is ambiguous [Chiricos (1987)]. We will also discuss a few studies of crime and economics at sub-national level. Chiricos (1987) has also explored the unemployment crime relationship while other researchers like Coack and Wilson (1985) found insignificant and weak relationship between unemployment and crime rate. After a thorough research he concludes that we can get a weak and even an insignificant relationship between crime and unemployment if we use a time-series data or if we use the data of U.S economy for unemployment through the 1970s. He concluded that cross sectional studies better explain the relationship between unemployment and crime rate as compared to the time series analysis.

Imroho, *et al.* (2006) examined the effect of various economic, socio and demographic variables on the crime rate across different countries of the world with the help of a cross-sectional analysis. They selected at least one country from each of the continents of the world and they selected 1980 in USA as a benchmark year. They checked the effect of unemployment rate, fraction of low human capital individuals in an economy, income inequality, age categories, and the probability of apprehension along with duration of jail sentence on property crime. To check the effect of above said variables on property crime rate they used overlapping generation model to allow individuals to participate in either legitimate market activities or in illegal activities. In their final findings amazingly 79 percent people involved in property crime were not found unemployed but they were under employed. Moreover their model also predicted that 18 years of age or younger were 76 percent of the total criminals who participated in property crimes. Furthermore 46.1 percent people who were involved in property crimes did not have a high school diploma. Moreover they concluded that small differences in probabilities of apprehension and income inequality can generate a significantly large difference in the crime rates in similar environments.

Gumus (2004) investigated the effects of deterrent, socio-economic, and demographic variables on crime rate of 75 large US cities by using a cross sectional data. He concluded that per capita income and poverty are the root causes of crime in large US cities while the unemployment was statistically significant only in 1/8 of empirical equations used in this study.

Omotor (2009) used inflation, income, literacy rate, and unemployment rate to investigate their role in crime nexus of Nigeria. By using ECM and co-integration

approach, he tested the relationship between crime rate and above said socio-economic variables to conclude that unemployment has a positive relationship with crime rate while a low literacy rate and high population of Nigeria were not found the root causes of stimulating crime rate in Nigeria.

New developments are taking place in the crime and economics literature and providing new insights related to crime and its determinants. Current study also intends to bring forward some of the important causes of property crime rate in Punjab [Pakistan].

3. THEORETICAL FRAMEWORK AND EMPIRICAL PROCEDURE

In social sciences criminal behaviour can be discussed by different theories, however an economist has his own ideas to examine it. An economist always believes that people are rational and they respond to incentives so they treat criminals as economic agents as they participate in offences related to theft and snatching to enhance their utility. It can be argued that the choice between committing and not committing some criminal activity depends on the net-payoff (φ_i) of some criminal activity. Decision of participation in an illegitimate activity (P_i) by criminals is decreasing function of expected cost (C_i) and increasing function of gain (G_i) from criminal activity that can be described as under;

$$P_i = f(C_i, G_i) \qquad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

$$C_i = f(c_i, wl_i, p_i, f_i) \qquad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

$$G_i = f(L_i) \qquad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

Where, C_i is total cost faced while committing a crime and furthermore c_i can be described as direct cost i.e. time spend in planning and committing of a crime, efforts of self-defense,[2] wl_i denotes foregone market wages in case of arrest or conviction, p_i stands for probability of arrest or conviction and f_i represents the fines or other penalties in term of imprisonment. While in the above stated Equation (3), G_i is gross gain and L_i is something gained (loot) as a result of criminal activity. Thus net pay off[3] φ_i can be defined as the difference of gross gain and total cost i.e.

$$\varphi_i = G_i - C_i \qquad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (4)$$

Or

$$\varphi_i = L_i - c_i - wl_i - p_i f_i \qquad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (5)$$

It can be claimed that a criminal activity takes place if and only if;

$$\varphi_i > 0$$

It is important to note that we consider the expected gains as economic incentives because theft and snatching are more responsive to socio-economic and law enforcement variables. The above discussion is core of economic model of crime used in

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[2]Efforts made to avoid penalties, arrest, imprisonments or monetary fines etc.

[3]The net pay-off (φ_i) can also be stated as expected utility of committing some crime by a criminal.

the current study. After studing Buonnano, *et al*. (2008); Cherry, *et al*. (2002); Becsi (1999) and Jalil, *et al*. (2010) we have formulated the following economic model of crime;

Crime = f (Population, Unemployment, Education, Police Strength, Police Absconders)

The above stated function contains those types of socio-economic, demographic and deterrent variables, which correspond to the theoretical framework of the current study.

The current study will use a demographic variable in the form of population density that can be the representative of urbanisation because property crimes are often considered as an urban phenomenon [Gumus (2004)]. The next variable used in our modal is unemployment, which is one of the most controversial variables of crime analysis, however it is likely to be correlated with crime in one or another way. Third variable, education can affect the decision of committing some crime as it increases the expected legitimate earnings. The next variable included in our modal is a deterrent variable labelled as police strength, which is expected to be negatively correlated with property crime rate of a society. The last variable included in our modal is the number of police proclaimed absconders in a society about which it can be argued that in case of a low opportunity cost of committing some crime police proclaimed absconders prefer to commit property crimes for their material wellbeing.

The above discussion enables us to specify the following empirical equation to estimate,

$$PC_t = \alpha + \beta_1 POP_t + \beta_2 UR + +\beta_3 LR_t + \beta_4 PS_t + \beta_5 PPO's_t + e_t \qquad \ldots \quad (6)$$

Property crime (PC_t) is a dependent variable along with the independent variables, POP_t stands for population density, UR_t represents the unemployment rate, LR_t, stands for the literacy rate, PS_t exhibits the police strength and $PPO's_t$ stands for the police proclaimed absconders in Punjab during some *t* year. We will estimate Equation (6) by using suitable econometric technique to get empirical findings of the study.

Since we have a time series data set so we will use the standard practice of checking the data to see if it is stationary or non-stationary by using unit root test. If unit root test[4] discloses that all the variables are stationary at level then study will follow the simple OLS technique. If all the variables are non-stationary at level then study will follow the ARDL approach, finally if all the variables will be stationary at level 1 then the study will follow the Johenson maximum likelihood approach to find the long-run relationship among the dependent and independent variables.

4. DATA, VARIABLE CONSTRUCTION AND
ECONOMETRIC ISSUES

A data set related to Punjab during 1978–2012 has been used for empirical investigations. In this regard a few *missing values*[5] related to unemployment and literacy rate were obtained by calculating averages and using compound interest formula [Jalil (2010)].

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[4]Study follows the Augmented Dicky Fuller test [ADF] to check if the data is stationary or not.
[5]We found missing values for those years in which labour force survey had not been published.

Table 1

Nature of Explanatory Variables their Brief Definitions and their Data Sources

Variables	Nature of the Variable/ Definition	Source of Data
Property Crime	Depicts Criminal Behaviour/ It has been taken as sum of dacoity and burglary including motor vehicle snatching, motor vehicle theft, cattle theft, all other theft.	Various Issues of Punjab Development Statistics. Various Issues of Annual Crime Report, DIG Police (Crime), Punjab.
Population Density	Demographic/Population of Punjab in per square miles during some specific year.	Various Issues of Punjab Development Statistics.
Unemployment Rate	Economic/Number of persons who are unemployed out of the Total Labour force in Punjab.	Various Issues of Labour Force Survey.
Literacy Rate	Socio-economic/A person is said to be literate who can read and write his/her name.	Various Issues of Labour Force Survey.
Police Strength	Deterrent/ The number of police employees available to thousand members of Punjab in some particular year.	Various Issues of Annual Administration Report, AIG Police (Establishment), Punjab.
Number of Police Proclaimed Offender	Depicts Criminal Behaviour/ number of police proclaimed absconders present in society to 1000 member of Punjab.	Various Issues of Annual Crime Report, AIG Police (Crime), Punjab.

4.1. Descriptive Statistics

Table 2 given below narrates the descriptive statistics for the variables used in this study. It becomes clear that in last 34 years, average value of Property Crime (PC) per 1000 persons is 0.59. Magnitude of coefficient of variation depicts that unemployment rate has least variation ranging from 5.5 to 8.6 and population density and PC/1000 are more volatile variables. Except the average value of proclaimed offenders which lies above the middle of data, averages of the rest of the variables in data lie almost in the centre of the data which shows that data is almost equally spread around its mean values.

Table 2

Descriptive Statistics

Variables	Mean	S.D.	Min.	Max.	Coefficient of Variation
PC per 1000 Persons	0.590	0.201	0.300	1.098	34.08
Population Density	337.96	78.46	215.18	470.8	23.21
Unemployment Rate	6.971	1.024	5.464	8.606	14.69
Literacy Rate	45.424	9.59	31.25	60.6	21.11
Police Strength	1.326	0.302	0.838	1.911	22.83

| Proc. Offenders | 0.21 | 0.23 | 0.022 | 0.88 | 110 |

4.2. Estimation Procedure

Our purposed ADF test indicates that all the variables used in this study are stationary at (I=1), therefore, we apply Johenson Cointegration Approach to the following set of equations:

$$PC_t = \alpha + \beta_1 PD_t + \beta_2 UR_t + + \beta_3 LR_t + \beta_4 PS_t + \beta_5 PPO's + e_t$$

5. EMPIRICAL RESULTS

Our purposed ADF test indicates that all the variables used in this study are stationary (I=1), therefore, Johenson Cointegration Approach is used for estimation purposes.

Table 3
Results of the Unit Root Test

Variable	Only Intercept	Trend and Intercept	Conclusion
PC			
Level	–0.325323	–3.806383	
1st Difference	–6.227111	–6.218713	**I(1)**
Population Density			
Level	0.966131	–1.798407	
1st Difference	–8.325482	–8.626124	**I(1)**
Unemployment			
Level	–2.757306	–2.898596	
1st Difference	–5.029617	–4.974713	**I(1)**
Literacy Rate			
Level	0.062647	–3.277343	
1st Difference	–6.390288	–6.275866	**I(1)**
Police Strength			
Level	–0.002685	–2.030985	
1st Difference	–4.144891	–4.067436	**I(1)**
Proclaimed Offenders			
Level	–2.831661	–0.584165	
1st Difference	–3.867865	–4.872781	**I(1)**

5.1. Results of Johansen Cointegration Techniques

Table 4

Cointegration Rank Test (Trace) [Property Crime]

Hypothesised No. of CE(s)	Eigen Value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.97	239.69	103.84	0.00
At most 1 *	0.86	122.36	76.97	0.00
At most 2 *	0.53	60.19	54.08	0.01
At most 3 *	0.49	36.01	35.19	0.04
At most 4	0.25	14.33	20.26	0.27

| At most 5 | 0.15 | 5.05 | 9.16 | 0.28 |

Table 5

Cointegration Rank Test (Maximum Eigenvalue) [Property Crime]

Hypothesised No. of CE(s)	Eigen Value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
*None *	0.97	117.33	40.96	0.00
At most 1 *	0.86	62.16	34.81	0.00
At most 2	0.53	24.18	28.59	0.16
At most 3	0.49	21.68	22.29	0.06
At most 4	0.25	9.27	15.89	0.40
At most 5	0.15	5.06	9.16	0.28

Trace test indicates four cointegration equations while maximum eigen value test indicates 2 cointegration equations at 5 percent level of significance in property crime modal. Thus the variables of under discussion modal have long run relationship with each other. The null hypothesis stating that there are zero cointegration vectors is rejected.

The results of the estimated model are presented below.

$$PC_t = 1.3 + 0.008POP_t - 0.127UR_t - 0.059EDU_t - 0.065PPC_t + 0.393PPO's_t \quad (7)$$
$$(0.00036) \quad (0.00388) \quad (0.00310) \quad (0.02042) \quad (0.02307)$$

5.2. Interpretation and Discussion of the Results

Empirical findings indicate that there is a significantly positive relationship between population density and property crime which is consistent with the findings of Bechdolt Jr. (1975), O'Brien, *et al*. (1980) and Regoeczi (2003) who also found a positive relationship between property crimes and population density. Consistency of result with the literature of crime and economics allow us to claim that population density is one of the major determinants of property crime in Punjab.

The logic of this result is quite simple that an increase in population density decreases the probability of arrest, which leads to a lower cost for offenders, that motivates them towards property crime. It can also be argued that population density increases the number of criminals and crime targets and decreases protection of crime targets, which results in a positive relationship between property crime rate and increase in population density.

Secondly, we have found a negative and significant relationship between unemployment and property crime which is consistent with the empirical findings of Entorf and Spengler (2000) who have reported negative estimates for some of the theft crimes. Cantor and Land (1985) also argued that unemployment could have both a positive and negative impact on crime rates. Imrohoroglu (2001) concluded that about 79 percent of the people engaging in criminal activities are employed thus it can be argued that rise in property crimes is not only related to illiterate, unemployed and the poor class of a society but rich, educated, employed and underemployed people can also boost these types of crimes particularly in societies like Punjab.

Consensus of doubt in crime and economics discipline provides some technical reasons of such a negative relationship between unemployment and property crime. In this regard they state that most often unreliable figures of crime and unemployment data are available because official rates of unemployment considerably understate the true numbers of people who are without work. Similarly crime prevention authorities often understate or overstate the true number of registered crimes for their own incentives. The above mentioned discussion reveals that a general belief of positive relationship between unemployment and crime is not necessarily proved true in each study [Orsagh and Witte (1981)].

Thirdly, there is a negative and significant relationship between literacy and property crime rate, which is consistent with the empirical findings of Buonanno (2003), Lochner and Moretti (2001), Usher (1997), Lochner (2007) and Jalil, *et al.* (2010). The economic rationale behind this empirical finding is that a literate person is relatively more risk averse and forward-looking, which produces a negative association of education with illicit behaviour.

Moreover, current study yields a significantly negative relationship between property crime and per capita police men available to society, which is similar to the findings of Sjoquist (2012), Baltagi (2006), Vollaard (2005), Berkeley, *et al.* (2012), Kelaher and Sarafidis (2011). It can be argued that an increase in per capita police men available to society increases the probability of arrest that leads to a higher expected cost of crime. It is well known that police effectiveness regarding detection and prevention of crime in Punjab depends upon the geographically focused police practices along with the hot-spots policing. As property crimes are often considered as an urban phenomenon, the presence of free media and influential personalities in these areas compel crime prevention authorities to deter property crimes first. Crime prevention authorities try to depute their most efficient employees to deter the property crime for the sake of departmental reputation and for some of the other job related incentives. Thus this result is not only consistent with the international literature but also quite logical and corresponds to the current culture of most of the institutions of the province.

Finally, current study has reported a significantly positive relationship between property crime and increase in number of police proclaimed offenders in a society. It explicitly means that if number of police proclaimed absconders increase in some society then obviously there will be an increase in property crime rate of that society. This result is quite logical and dynamics of this result need some discussion. When police department declares a person as an absconder then termination of such a person from legitimate labour market is not amazing because a person of such repute is not accepted as a labourer by any person or organisation. Furthermore, fear of arrest, imprisonment and monetary penalties do not allow him to join legitimate labour market for legal earnings. Then it becomes inevitable for such a person to commit crime of theft and snatching for his survival. The above reasoning supports a positive and significant impact of population of proclaimed offenders on property crime rate as a police proclaimed offender has a lower opportunity cost of committing a crime.

It is also very important to note that these persons have not only a low opportunity cost of committing property crime but an adequate criminal know how from their past criminal experiences helps them a lot. All these factors support our positive and

significant relationship between number of police proclaimed absconders and property crime rate [Buonnano (2008); Fajnzylber, *et al*. (2002); Sah (1991)].

CONCLUDING REMARKS

The main objective of the study was to identify the impact of socioeconomic, demographic and deterrent variables on property crime rate of Punjab empirically. For this purpose a time series data set from 1978–2012 was used. Johenson cointegration approach has been applied to test the existence of long run relationships among the variables.

A positive and significant relationship of population density with property crime is first empirical finding of the study, which leads us to believe that population density is the main determinant of crime in Punjab. Although unemployment depicts a negative relationship with property crime. It may be due to the technicalities of data or empirical procedure that study has adopted.

Third major finding of our study is that education plays a vital role to control property crime rate in Punjab as literacy rate has a negative and significant relationship with property crime. The empirical results have proved that there is a deterrent effect of police strength on property crime rate and finally an increase in number of police proclaimed offenders in a society has a positive and significant effect on property crime rate.

Policy Implications

The study brings forth some important policy recommendations regarding crime prevention in Punjab. Authorities should concentrate on controlling population growth rate in Punjab to make the province less dense and there should be effective planning particularly in urban areas regarding infrastructure. Developing new housing colonies near populated areas can be an effective measure to minimise the effect of increasing population densities on property crime rate. Promoting education level can be a valid remedial measure to minimise the criminal behaviour. The state should create not only more job opportunities but also improve the real wages of prevailing jobs, otherwise education without jobs can be a curse as awareness and technicalities of educated individuals can promote white collar crimes. Finally, enhancing the police strength by new recruitments, providing them a better training, better transportation, better tools of communications and advance weapons can be an effective measure in detection and prevention of crime in Punjab.

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Money, the Stock Market and the Macroeconomy:
A Theoretical Analysis

RILINA BASU and RANJANENDRA NARAYAN NAG

The finance-growth nexus has become a significant issue in recent macroeconomic modelling and the centre of attention of policy makers. Over the past few decades equity markets have experienced phenomenal growth which has proved to be a major determinant of capital flow to emerging market economies. Naturally, one wants to know how development of equity markets influences the real sector and produces macroeconomic outcomes. In this paper we construct an open economy, structuralist model to examine the short-run and long- run effects of both policy-induced and exogenous shocks on output, the dynamics of stock market valuation and adjustment in monetary base. The model shows that devaluation or capital inflow will boost the economy, while fiscal expansion has deleterious consequences for stock market valuation and investment.

JEL Classifications: G01, G12, F32, F36
Keywords: Tobin's q, Effective Demand, Devaluation

1. INTRODUCTION

When one approaches the analysis of current economic conditions prevailing in "emerging market economies", one has to address at least two connected issues. The first issue relates to the nature of financial structure of emerging markets (EMEs), and the second addresses the possible connection between the real and financial sectors. This paper aims at studying the interdependence of the two sectors while focusing on an important constituent of the financial system, namely, the stock market.

Developing countries have been working towards reforming and deepening financial systems through the expansion of capital markets in order to improve their ability to mobilise resources and efficiently allocate them to the most productive sectors of the economy. The increasing penchant of the policy makers for stock market development in emerging market economies has led to the phenomenal expansion of such markets in terms of both size and liquidity.[1]

Theoretically, there have been two alternative approaches to the study of the impact of the financial sector on economic growth. One is the bank-based approach and

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[1]Market size is important because the level of savings mobilisation and risk diversification depend on this indicator for the development of the market. On the other hand, liquidity ensures low cost fund mobilisation and easy movement of funds from one investor to another.

the other is the market-based approach. In this paper, the market-based approach is chosen for the theoretical exposition of the interaction between the real and the financial sector. A large body of empirical studies clearly shows that the development of stock markets is strongly and positively correlated with the level of economic development and capital accumulation.[2] Empirical observations also validate the interconnectedness between the real sector and the capital market. In particular, one can mention works of King and Levine (1993a, 1993b), Atje and Jovanovic (1993), Levine and Zervos (1998), Mohtadi and Agarwal (2007), Caporale, *et al.* (2004) and Deb and Mukherjee (2008). Moreover, works by Levine (1991), Bencivenga, *et al.* (1996), Greenwood and Smith (1997), Grossman and Stiglitz (1980), Kyle (1984), Allen (1993) and Holmstrom and Tirole (1993) shed light on the role of stock markets in supporting resource allocation and initiating growth. By improving risk diversification through internationally integrated stock markets and increasing the array of possible investments, stock markets can augment the rate of saving and the rate of investment [Saint-Paul (1992); Devereux and Smith (1994); Obstfeld (1994)]. These works motivate us to carry out a theoretical analysis of complexities of the relationship between the real sector and the stock market in the presence of unemployment.

In its orientation this paper draws on Blanchard (1981). We have extended Blanchard's closed economy model to account for increasing openness of an emerging market economy in terms of both trade in goods and financial assets. Our model is closer to Buffie (1986) with some basic differences. Though Buffie incorporated Tobin's q, the dynamics of this asset price has not been addressed. Moreover, Buffie assumed perfect sterilisation of the balance of payment surplus. We drop this assumption and permit the specie flow mechanism to operate which changes the stock of nominal money supply. Another difference between Buffie and our work is that unemployment in Buffie's paper arises due to fixed real wage whereas, in our paper, unemployment is caused by demand deficiency. We consider different speeds of adjustment in macroeconomic variables. The asset price, particularly Tobin's q is a jump variable, which adjusts instantaneously while real money supply evolves continuously and given perfect foresight, the model has the standard properties of saddle path stability. The model shows that a devaluation or capital inflow will boost the economy while fiscal expansion depresses the stock market.

The paper is organised as follows. Section II elaborates the structure and working of the model. In Section III, we undertake certain comparative static exercises. Section IV concludes the paper.

2. THE MODEL

The following symbols will be used in the formal representation of the model:

Y : Domestic output
C : Consumption
I : Investment
X : Export

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[2]Atje and Jovanovich (1993); Demirgüç-Kunt and Levine (1996); Demirguc-Kunt and Maksimovic (1996); Korajczyk (1996); Levine and Zervos (1998) have confirmed that as economies develop, equity markets tend to expand both in terms of the number of listed companies and in terms of market capitalisation.

q : Tobin's q
e : Nominal exchange rate[3]
P : Domestic price which is fixed
$P*$: Foreign price level
m : Real money supply
M : Currency
Q : Consumer's Price Index
R : The rate of return on capital equity required by stock holders
F : Net capital inflows
γ : Proportion of investment expenditure on domestic capital
$1-\gamma$: Share of investment expenditure on imported capital
α : Share of consumption expenditure on domestically produced goods
$1-\alpha$: Share of consumption expenditure on imported goods
π : Profit earned by the firms
$\dot{a}$: $\dfrac{da}{dt}$, change in any variable, say, a over time

2.1. Structure of the Model

2.1.1. *The Capital Market*

There are three assets in the economy, viz. money, equity and government bond. Bond and equity are considered to be perfect substitutes.[4] However, equity is a very special asset. The reason is that its market fundamental depends on its future prices. Hence, expectation plays an important role in determining the dynamics of the stock price. We assume that all economic agents have perfect foresight concerning the relevant variables of an economic system other than unanticipated shocks.[5]

The demand for money depends on real income, and the interest rate. An important point to note is that the real money balance is deflated by consumer's price index, which is a weighted average of both domestic price level and import price: $Q = Q(\underset{+}{e P^*}, \underset{+}{P})$

$$\frac{M}{Q(eP^*, P)} = L(r, Y)$$
… … … … … … (1)

$$r = \left[\frac{\pi(Y)}{q}\right] + \frac{\dot{q}}{q}$$
… … … … … … … (2)

Equations (1) and (2) describe the mechanisms of asset valuation in the capital market. Equation (1) is the money market equilibrium. Equation (2) is the arbitrage condition on the assumption that bonds and stocks are perfect substitutes and hence, their returns are equalised. We also note that Equation (2) represents an inter-temporal

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[3]In this paper, commodity price level is assumed to be fixed, Since we ignore inflation, the nominal interest rate is same as the real interest rate.

[4]We assume perfect substitutability between equity and bonds. See Blanchard (1981), Gavin (1989).

[5]The perfect foresight assumption is a special case of rational expectation in a non-stochastic framework and hence, the expected rate of change of Tobin's q is same as the actual rate of change.

condition of capital market equilibrium, since it is entailed by the correct expectation of $\dot{q}$ and r at all future dates. The return on equity is obtained from both capital gains[6] as well as from dividends. We assume that the entire profit is distributed as dividend.

2.1.2. *The Goods Market*

The demand for domestic output is composed of domestic demand and foreign demand. Aggregate demand comprises consumption, investment, government expenditure and exports. While consumption is a stable and rising function of disposable income, investment is determined by Tobin's q. Equation (3) gives the commodity market equilibrium.

$$Y = \alpha C(Y - T) + \gamma I(q) + G + X(\frac{e}{P}) \quad \dots \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad (3)$$

2.2. Dynamic Adjustment and Steady State

The dynamics of the system and the overshooting of stock market valuation are analysed from the perspective of the different speeds of adjustment in the asset markets. The dynamics of the system can be described by the behaviour of the state variables q and h.

$$\dot{q} = rq - \beta\pi(Y) \quad \dots \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad (4)$$

$$\dot{H} = PX(\frac{e}{P}) + eF - e\left[(1-\alpha)C(Y-T) + (1-\gamma)I(q)\right] \quad \dots \qquad \dots \qquad \dots \qquad (5)$$

$$h = \frac{H}{P} \quad \dots \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad \dots \qquad (6)$$

Since the price level is assumed to be fixed, we have

$$\frac{\dot{h}}{h} = \frac{\dot{H}}{H}$$

Thus, we get

$$\dot{h} = \frac{\dot{H}}{H}\frac{H}{P} = \frac{\dot{H}}{P}$$

$$= X(\frac{e}{P}) + \frac{e}{P}F - \frac{e}{P}\left[(1-\alpha)C(Y-T) + (1-\gamma)I(q)\right] \quad \dots \qquad \dots \qquad \dots \qquad \dots \qquad (7)$$

Equation (5) represents an inter-temporal condition of the capital market equilibrium, since it is entailed by correct expectations of $\dot{q}$ and r at all future dates. Under the fixed exchange rate, the change in the supply of money is determined by a

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[6]i.e. $\dfrac{\dot{q}}{q}$. In a non-stochastic framework, rational expectation boils down to perfect foresight.

change in the net foreign asset holding by the central bank. Equations (5) to (7) explain the change in the real monetary base of the economy denoted by h.[7] The model includes import of both capital goods and consumer goods. In particular, import $= (1-\alpha) \, C \, (Y-T) + (1-\gamma) \, I(q)$. Exports vary directly with the real exchange rate. The flow of financial capital to the home country is assumed to be exogenous.

The dynamics of the system can be described by the behaviour of the state variables q and h which is represented by adjusting Equations (5) and (7).

In this model, h is a slow moving variable and it evolves continuously while q is a jump variable, which adjusts instantaneously.

Equations (5) and (7) can be represented in the matrix form:

$$\begin{bmatrix} \dot{q} \\ \dot{h} \end{bmatrix} = \begin{bmatrix} f_1 & f_2 \\ g_1 & g_2 \end{bmatrix} \begin{bmatrix} q - \bar{q}_2 \\ h - \bar{h}_2 \end{bmatrix}$$

where

$$f_1 = \frac{d\dot{q}}{dq} > 0$$

$$f_2 = \frac{d\dot{q}}{dh} < 0$$

$$g_1 = \frac{d\dot{h}}{dq} < 0$$

$$g_2 = \frac{d\dot{h}}{dh} = 0$$

In the steady state we have $\dot{h} = 0$ and $\dot{q} = 0$. Given perfect foresight, the model has the standard properties of saddle path stability where h is a slow moving variable and q is a jump variable, which adjusts instantaneously. In implicit forms, the dynamics of money supply and Tobin's q can be expressed as $\dot{h} = g(q, h) = 0$ and $\dot{q} = f(q, h) = 0$ respectively. This is shown in Figure 1.

Fig. 1. Saddle Path Equilibrium
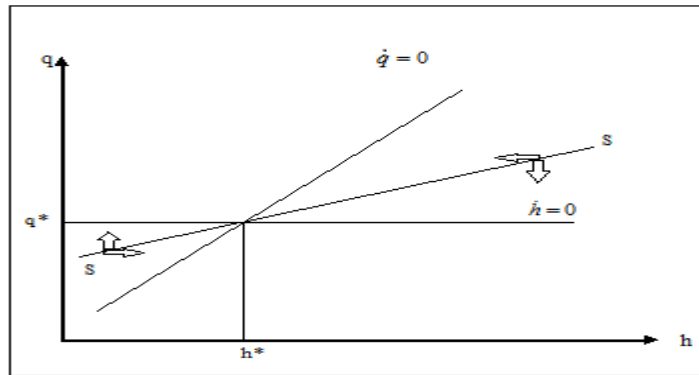
In order to depict equilibrium, we draw $\dot{h} = 0$ and $\dot{q} = 0$ on the (h, q) plane. The arrows indicate adjustment of the two variables, h and q in different quadrants. First, the locus $\dot{q} = 0$ gives the combination of Tobin's q and money supply that maintains $\dot{q} = 0$ in the (h, q) plane. From the system of equations, this has the slope $(\frac{dq}{dh})_{\dot{q}=0} = -\frac{f_2}{f_1} > 0$. The intuitive explanation for the slope of $\dot{q} = 0$ is this. An increase in the stock value has two effects. First, as q rises, to maintain money market equilibrium, given Y, r has to rise. So, we get $\dot{q} > 0$. Secondly, with a rise in q, investment increases, thus causing output to expand. However, with a rise in Y, profit level increases, thus, making $\dot{q} < 0$. For simplicity, we assume that $\dot{q} > 0$, following a rise in q.

Again as money supply increases, the rate of interest declines and hence, we get $\dot{q} < 0$. So with a rise in q, money supply has to increase to maintain the steady state. Hence, the $\dot{q} = 0$ locus is upward sloping.

Likewise, $\dot{h} = 0$ is the locus of combination of money supply and Tobin's q consistent with money market conditions. The slope of $\dot{m} = 0$ is given by $(\frac{dq}{dh})_{\dot{h}=0} = -\frac{g_2}{g_1}$. Intuitively, a rise in Tobin's q increases import of capital goods and thus makes < 0. However, a rise in h has no effect on $\dot{h}$. Hence, $\dot{h}= 0$ locus is horizontal.

The stable saddle path, SS is given by the equation

$$(q - \bar{q}_2) = (\frac{f_2}{\lambda_1 - f_1})(h - \bar{h}_2)$$

Or equivalently as

$$(q - \bar{q}_2) = (\frac{\lambda_1 - g_1}{g_2})(h - \bar{h}_2)$$

The slope of the saddle path (SS) is given by:

$$\frac{dq}{dh} = \frac{f_2}{\lambda_1 - f_1} = \frac{\lambda_1 - g_1}{g_2}$$

3. COMPARATIVE STATIC EXERCISES

3.1. Effects of Devaluation

Starting from an initial steady state *E*, devaluation will bring about rise in export and hence, output will rise leading to a rise in demand for real balance. Again, there will be a fall in real money supply since it is deflated by the consumer price index. On both counts there is a rise in interest rate. So $\dot{q} > 0$. Thus, the $\dot{q} > 0$ locus will shift downward. Again with BOP surplus, $\dot{h} > 0$. So money supply will increase and the $\dot{h} = 0$ locus will

shift upward. In the long run, output, q and money stock will rise. However, the effect on r is ambiguous. The rise in h tends to offset the initial increase in interest rate. This is shown in the following Figure 2.

Fig. 2. Effects of Devaluation
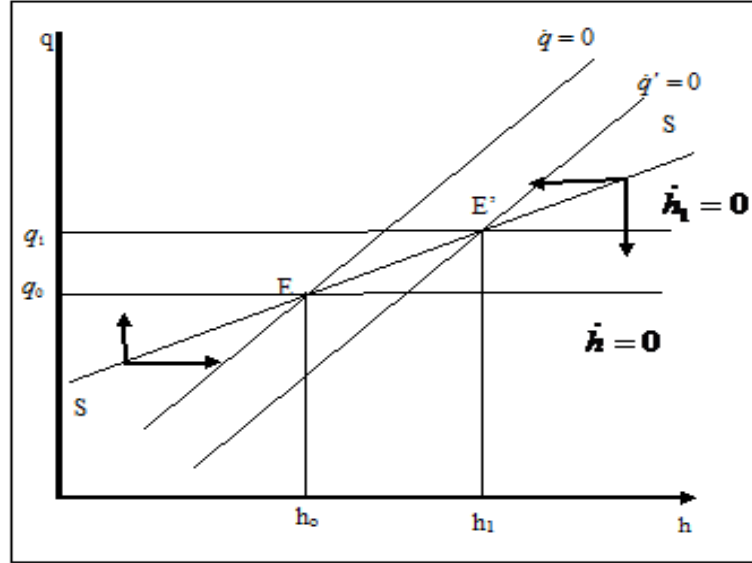
3.1.2. *Effects of Rise in Capital Inflow*

Following foreign capital inflow, there will be a favourable impact on the economy. The intuitive explanation is this. With rise in capital flow, there will be BOP surplus and hence, money supply will increase. This will cause the interest rate to fall and q to rise, thus, allowing investment to increase. The rest of the analysis of effects of capital flow is the same as that of the effects of devaluation.

3.1.3. *Effects of Fiscal Expansion*

With an increase in government expenditure, output will rise. This will cause imports to rise and hence, there will be BOP deficit. So the $\dot{h}=0$ locus will shift downward. Again, to maintain the money market equilibrium following the rise in Y, r has to increase. Assuming that the rise in r is more than the rise in profit per unit of capital, we get $\dot{q}>0$. So the $\dot{q}>0$ locus will shift downward. In the long run, q will decrease unambiguously but the effect on h will be ambiguous. Since Tobin's q falls, investment declines. However, the output level will increase. The intuition is this. At the steady state, $X(\frac{e}{P})+\frac{e}{P}F-\frac{e}{P}[(1-\alpha)C(Y-T)+(1-\gamma)I(q)]=0.$ Since investment declines, import of capital goods falls. To maintain the balance of payment equilibrium, there has to be an increase in imports of consumption goods which requires rise in output. The steady state effects of fiscal expansion are shown in Figure 3.

Fig. 3. Effects of Fiscal Expansion
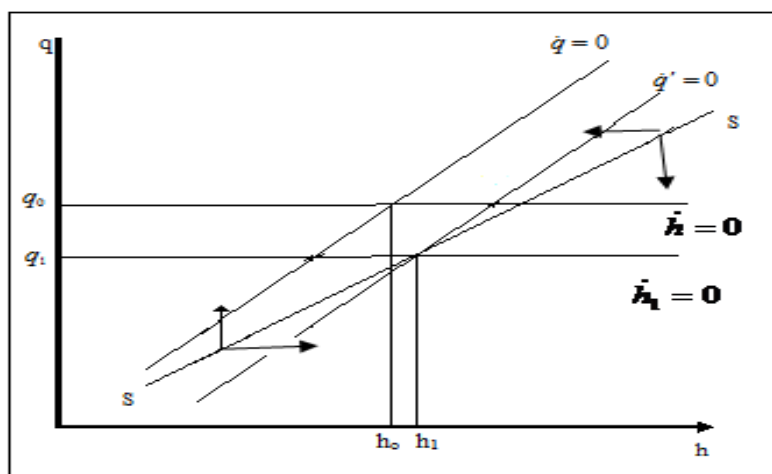
4. CONCLUSION

The issue of relationship between the financial sector and macroeconomic performance has long been debated. The channel of transmission has been identified as many and varied depending on the financial system in a particular economy. In this paper an attempt has been made to develop a demand side model of interconnectedness between the financial sector and the real sector with specific focus on macroeconomic implications of movement in stock market valuation under the fixed exchange rate regime. The paper shows that capital flow and devaluation contribute to the development of stock market as Tobin's q increases in both the cases. However, fiscal expansion has perverse effect on the stock market value. The model can be extended in several directions. The model is based on the assumption that the economy is in Keynesian unemployment. A detailed treatment of aggregate supply and the long run dimension of capital accumulation can be addressed. Moreover, the paper can be extended to include exchange rate dynamics with its attendant macroeconomic implications.

APPENDIX I

DERIVATION OF SADDLE PATH

First we derive the condition for existence of unique saddle path. The differential equations are:

$$\dot{q} = f(q,h), \dot{h} = g(q,h).$$

Using the Taylor series approximation of these two equations around the initial steady state values $(\overline{q}, \overline{h})$, we get,

$$\begin{bmatrix} \dot{q} \\ \dot{h} \end{bmatrix} = \begin{bmatrix} f_1 & f_2 \\ g_1 & g_2 \end{bmatrix} \begin{bmatrix} q - \overline{q}_1 \\ h - \overline{h}_1 \end{bmatrix} \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (1)$$

Now suppose that at time 0, it is announced that the parameters are to be increased at time $T \geq 0$. Therefore, the new steady state after the shifts have occurred is specified by

$$\begin{bmatrix} \dot{q} \\ \dot{h} \end{bmatrix} = \begin{bmatrix} f_1 & f_2 \\ g_1 & g_2 \end{bmatrix} \begin{bmatrix} q - \bar{q}_2 \\ h - \bar{h}_2 \end{bmatrix} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

As long as the shifts are additive, the co-efficient a_{ij} remains unchanged between the two regimes, the Eigen values λ_1, λ_2, say of Equations (1) and (2) are identical.

For simplicity and without loss of generality, we shall assume they are real. The fact that the dynamics are described by a saddle path, means that the product $\lambda_1 \lambda_2 = f_1 g_2 - f_2 g_1 < 0$. We assume that $\lambda_1 < 0, \lambda_2 > 0$, such that $f_1 g_2 - f_2 g_1 < 0$.

Over the period $0 \leq t \leq T$, before the shifts in the parameters occur, the solutions for $q(t)$ and $K(t)$ are:

$$q(t) = \bar{q}_1 + A_1 e^{\lambda_1 t} + A_2 e^{\lambda_2 t} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

$$h(t) = \bar{h}_1 + (\frac{\lambda_1 - f_1}{f_2}) A_1 e^{\lambda_1 t} + (\frac{\lambda_2 - f_1}{f_2}) A_2 e^{\lambda_2 t} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Since λ_i s are Eigen values, $\dfrac{\lambda_i - f_1}{f_2} = \dfrac{g_1}{\lambda_i - g_2}$

For i = 1,2. , in which case (4) can be rewritten as

$$h(t) = \bar{h}_1 + (\frac{g_1}{\lambda_1 - g_2}) A_1 e^{\lambda_1 t} + (\frac{g_1}{\lambda_2 - g_2}) A_2 e^{\lambda_2 t}$$

Likewise, for the period $t \geq T$, after the shifts have occurred, the solutions for $q(t)$ and $h(t)$ are

$$q(t) = \bar{q}_2 + A_1' e^{\lambda_1 t} + A_2' e^{\lambda_2 t} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

$$h(t) = \bar{h}_2 + (\frac{\lambda_1 - f_1}{f_2}) A_1' e^{\lambda_1 t} + (\frac{\lambda_2 - f_1}{f_2}) A_2' e^{\lambda_2 t} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

It is noted that $q(t)$ and h(t) do not diverge as $t \to \infty$. It is clear that $A_2' = 0$ and hence

$$q(t) = \bar{q}_2 + A_1' e^{\lambda_1 t} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

$$h(t) = \bar{h}_2 + (\frac{\lambda_1 - f_1}{f_2}) A_1' e^{\lambda_1 t} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

That is, after time *T*, *q(t)* and *h(t)* must follow the stable paths described by (7) and (8). The remaining constants A_1, A_2, A_1' are obtained by solving the equations

$$A_1 + A_2 = 0$$

$$(A_1 - A_1') e^{\lambda_1 t} + A_1 e^{\lambda_2 t} = d\bar{q}$$

$$(\frac{\lambda_1 - f_1}{f_2})(A_1 - A_1')e^{\lambda_1 t} + (\frac{\lambda_1 - f_1}{f_2})A_2 e^{\lambda_2 t} = d\overline{h}$$

$d\overline{h}$ and $d\overline{q}$ are shifts of steady state in h and q respectively.

Eliminating $A_1'e^{\lambda_1 t}$ from Equations (7) and (8), we get the equation of the stable saddle path equation as

$$(q - \overline{q}_2) = (\frac{f_2}{\lambda_1 - f_1})(h - \overline{h}_2)$$

Or equivalently as

$$(q - \overline{q}_2) = (\frac{\lambda_1 - g_1}{g_2})(h - \overline{h}_2)$$

The slope of the saddle path (SS) is given by:

$$\frac{dq}{dh} = \frac{f_2}{\lambda_1 - f_1} = \frac{\lambda_1 - g_1}{g_2}$$

This locus between q and h defines the stable arm of the saddle point passing through the steady state $(\overline{q}, \overline{h})$. Since $f_1 > 0$, $\lambda_1 < 0$ and $f_2 < 0$, hence, the locus is positively sloped.

APPENDIX II

EFFECTS OF DEVALUATION

$$\dot{q} = f(q, h, e), f_1 > 0, f_2 < 0, f_3 > 0$$
$$\dot{h} = g(q, h, e), g_1 < 0, g_2 = 0, g_3 > 0$$

Differentiating with respect to e, we get,

$$\begin{bmatrix} f_1 & f_2 \\ g_1 & g_2 \end{bmatrix} \begin{bmatrix} \dfrac{\partial q}{\partial e} \\ \dfrac{\partial h}{\partial e} \end{bmatrix} = \begin{bmatrix} -f_3 \\ -g_3 \end{bmatrix}$$

Using Cramer's Rule we get,

$$\frac{\partial q}{\partial e} = \frac{\begin{bmatrix} -f_3 & f_2 \\ -g_3 & g_2 \end{bmatrix}}{\Delta} = \frac{-f_3 g_2 + f_2 g_3}{\Delta} > 0$$

$$\frac{\partial h}{\partial e} = \frac{\begin{bmatrix} f_1 & -f_3 \\ g_1 & -g_3 \end{bmatrix}}{\Delta} = \frac{-f_1 g_3 + f_3 g_1}{\Delta} > 0$$

Where $\Delta = f_1 g_2 - f_2 g_1 < 0$

APPENDIX III

EFFECTS OF FISCAL EXPANSION

$$\dot{q} = f(q, h, G), f_1 > 0, f_2 < 0, f_4 > 0$$

$$\dot{h} = g(q, h, G), g_1 < 0, g_2 = 0, g_4 < 0$$

Differentiating with respect to G, we get,

$$\begin{bmatrix} f_1 & f_2 \\ g_1 & g_2 \end{bmatrix} \begin{bmatrix} \dfrac{\partial q}{\partial G} \\ \dfrac{\partial h}{\partial G} \end{bmatrix} = \begin{bmatrix} -f_4 \\ -g_4 \end{bmatrix}$$

Using Cramer's Rule we get,

$$\frac{\partial q}{\partial G} = \frac{\begin{bmatrix} -f_4 & f_2 \\ -g_4 & g_2 \end{bmatrix}}{\Delta} = \frac{-f_4 g_2 + f_2 g_4}{\Delta} < 0$$

$$\frac{\partial h}{\partial G} = \frac{\begin{bmatrix} f_1 & -f_4 \\ g_1 & -g_4 \end{bmatrix}}{\Delta} = \frac{-f_1 g_4 + f_4 g_1}{\Delta}$$

Where $\Delta = f_1 g_2 - f_2 g_1 < 0$. This result can be either positive or negative.

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Book Review

Atif Mian and Amir Sufi. *House of Debt: How They (and You) Caused the Great Recession, and How We Can Prevent It from Happening Again.* University of Chicago Press. USA. 2014. 192 pages.

This is a review and a summary of some of the key arguments presented by Mian and Sufi in their recent book "House of Debt." It highlights the contribution of Mian and Sufi by showing how they have solved the mystery of why there was a huge drop in aggregate demand during the Great Depression of 1929 and also following the recent Global Financial Crisis of 2007-08. The article shows how major economists like Keynes, Friedman, Lucas and others tried and failed to provide an adequate explanation of this mystery. The key to the mystery is the huge amount of levered debt present during both of these economic crises. The solution suggested by Mian and Sufi is to replace interest based debt by equity based contracts in financial markets. This solution resonates strongly with Islamic teachings on finance. These links are also highlighted in this article.

1. INTRODUCTION

Ben Bernanke has called explaining the Great Depression (GD) the "Holy Grail" of Macroeconomics. In the course of providing a convincing and surprising explanation of both GD and Great Recession (GR) which followed the Global Financial Crisis (GFC) of 2007-08, Mian and Sufi (2014) remark nonchalantly that Keynes did not have access to the wealth of data that is now available. "House of Debt" is a tour-de-force which succeeds in solving a problem which eminent economists like Keynes, Friedman, and many others failed to do. Not only does the book explain the root causes of the GFC and GR, but it also shows how the continuing economic problems created by it can be resolved. In addition, Mian and Sufi suggest radical changes that need to be made to avoid such crises in the future. Even though the authors do not mention the Islamic angle, the main message of the book resonates strongly with Islamic ideas about finance. In particular, replacing debt and interest with equity based contracts is the key to avoiding recurrent financial crises in a capitalist system. In this review, we make some of these connections explicit.

Mian and Sufi have written a thriller; a detective story in which we pursue many false leads, rejected by empirical evidence, before identifying the culprit (interest based debt) by putting together a variety of clues. This review offers a spoiler: a summary of the main arguments. The most exciting part, which is the strong empirical evidence offered in support of all of the assertions, is omitted from this brief summary. Although Mian and Sufi modestly attribute their success to the data, this data was available to all. Their tremendous contribution lies in focussing on the relevant portions and extracting extremely valuable information from delicate and subtle clues. We review some basic elements of the explanation to be provided, before plunging into the details.

1.1. Boom-and-Bust Cycles

Both GD and GR occurred in the aftermath of an asset price bubble. What are these bubbles, and how do they occur? Well known examples are stock market and real estate, where investors optimism leads to purchases and continuously rising prices. Rising prices lead to quick profits and high returns, which attract even more investors. Eventually, prices become unsustainably high and some event which shakes investor confidence leads to sell-offs. As panic spreads, sell offs multiply, leading to rapid declines in prices. If the bubble is sufficiently large, this collapse can have disastrous consequences for the economy as a whole, as we discuss in greater detail later.

A crucial underlying element in the process is the instrument of levered debt. Bubbles can become much larger if investors and speculators can borrow money to buy the speculative asset (land or stocks). The lenders who provide this debt have apparent safety valves in terms of collateral and insurance. Thus they do not have a stake in real outcomes of investment. If equity based investment was the rule, lenders would be forced to examine more closely the nature of the investment they are making, and would usually be able to differentiate between sound and unsound investments. The debt contract creates a certain indifference to outcomes, which leads to disastrous overloading of investments in basically unsound projects. One of the core concepts presented by Mian and Sufi is that use of equity based contracts would either completely avoid, or vastly mitigate, the otherwise harsh consequences of these asset bubbles.

2. A HISTORY OF THE GFC

The book by Mian and Sufi unravels the mystery of the GFC and the subsequent GR, peeling off layers step by step, and getting to the root cause near the end. We summarise their explanation in a direct historical and causal sequence.

2.1. The East Asian Crisis

Financial de-regulation in the Reagan-Thatcher era led to a vast expansion of capital available for investment in the USA and UK. Rates of return to investments in the western world were low, and capitalists sought to open up foreign markets, where higher rates were available. In particular, a combination of carrot and stick were used by USA and IMF to force the highest growing East Asian economies to open up to foreign investments in the 1990's. As a result, millions of dollars flowed into these economies, creating asset price bubbles in lands, buildings, and stock markets. Eventually the bubble burst, leading to massive capital flight out of the East Asian countries. This sudden withdrawal of foreign capital created an economic crisis. In a strange twist of fate, this crisis eventually led to the GFC via a causal chain described by Mian and Sufi that is discussed in the next section.

Islam stresses that earnings must relate to provision of products or services. Ownership of capital is not considered a service to society; thus, earnings on capital are permissible only if the lender shares in the risk of business. Had the principle of equity based loans been followed by investors in East Asia, the resulting crisis could have been averted. However, investment was done on the basis of standard debt contracts, which guarantee returns to the investor, regardless of whether the investment succeeds or fails.

This is inherently unjust since the wealthy parties providing the loans get returns without risk, while the debtors suffer extremely adverse consequences in case of failure. This leads to dramatic increases in poverty and inequality following financial crises, as has been repeatedly observed empirically in the past few decades.

2.2. Consequences of the East Asian Crisis

Sudden withdrawal of money leads to a collapse in asset prices which depresses aggregate demand in an economy. It also threatens viability of financial institutions, like banks, which operate on trust. Central Banks respond to these crises by providing liquidity—they create high powered money and provide it to financial institutions by various means, so as to avert financial crisis. In the East Asian crisis, financial institutions had liabilities in dollars, and Central Banks did not have sufficient foreign reserves to rescue them. They were forced to appeal to the IMF, which did provide the required liquidity, but at the cost of extremely stringent conditions. All over the world, governments respond to crises by providing relief, and liquidity. To protect interests of the foreign creditors, East Asian governments were forced to do the opposite—IMF required them to raise the interest rates and taxes, and balance budgets by cutting social welfare programmes precisely when they were most needed.

The misery inflicted by painful austerity measures forced on East Asia by IMF was noted all over the world. To avoid being caught in a similar trap, Central Banks all over the world sought to increase their holdings of dollars. From 1990 to 2001, central banks bought around $100 billion annually. From 2002 to 2006, the rate of reserve accumulation just about *septupled*. Central Banks prefer to hold dollars in highly liquid, but also extremely safe interest bearing assets, rather than cash which has zero interest. Thus, there was a massive increase in demand for super-safe assets denominated in dollars.

It is worth noting that in retrospect, this was the wrong response to the East Asian crisis. Many of the proposals made in the aftermath of the crisis suggest that various types of capital controls were necessary to prevent the crisis, and also to resolve the post-crisis economic problems. At the moment, Central Banks all over the world are over-loaded with dollars, which has allowed the USA virtually unlimited leverage in using seigniorage and the inflation tax to finance wars and bailouts for the wealthy. However theories of liberalisation, the Washington Consensus, and the might of the multinational institutions prevented even the contemplation of solutions based on restrictions on capital flows, which were the root of the problem.

2.3. Reverse Say's Law Combined with Gresham

A new asset—a near money—was created to satisfy this massive increase demand for dollars by Central Banks. A new type of security which was backed by mortgages (MBS) was created. The theory was that this was a super-safe security. The MBS utilised diverse pools of mortgages, thereby lowering risks. They also utilised complex prioritised payoff structures, which supposedly provided further safeguards against failure. All mortgages required insurance, which was another guarantee against failure. The ratings agencies also gave these "private label" securities the highest AAA ratings, certifying them as super safe. These financial gimmicks deceived investors, and created a huge

demand for these mortgage backed securities, which paid much higher returns compared to the safer government issued treasury bills. As money poured into these MBS, over the five years from 2002 to 2007, mortgage debt doubled from $7 trillion to $14 trillion.

Say's law also operates in the reverse: demand generates supply. The multi-trillion dollar demand for MBS led to the creation of the supply of mortgages. Prior to 2002, default rates in the mortgage industry in USA never went over 6.5 percent historically. However, in the five year period preceding the crisis, the rules were re-written. Mortgage initiators found that mortgages could be resold to these security agencies with no questions asked. The mortgage packaging agencies in turn sold these mortgages bundled into securities, to investors seeking dollar backed securities. In this supply chain of mortgages, no one had primary responsibility to ensure that the underlying mortgage was sound. The presence of mortgage insurance added to the apparent safety of these investments. In fact, in presence of insurance, it was rational for investors to ignore the probability of default—the insurance would pay in event of default.

Over the period of 2002 to 2007, these enormous inflows of money to purchase "private label" MBS created a huge amount of "toxic" debt. These were mortgages that all informed parties knew would never be repaid. The easy availability of loans for mortgages led to a dramatic rise in values of property – an asset price bubble which may be termed the "revenge of East Asia". Eventually, defaults started piling up. In 2007, a new phenomenon was observed: defaults on mortgages occurred within months of origination of the mortgage. Default rates reached historic highs of over 10 percent. As jittery investors moved out of these mortgage-backed securities, the entire market for them collapsed. The sudden withdrawal of credit led to a collapse in values of housing to the tune of $4 trillion. With this collapse in housing values, about a quarter of the mortgagers went "under-water" ! That is, the amount of debt they owed on their houses was greater than the value of the house which had been pledged as collateral for the debt. On a narrow cost-benefit basis, it would be rational from them to stop payments on their mortgage loans and allow the bank to foreclose on their property.

The collapse of market for MBS led to the global financial crisis. It also had huge negative impacts on the US Economy, leading to a massive increase in unemployment. Today, seven years after the crisis, unemployment, homelessness, hunger and poverty are at the highest levels seen in the USA since the great depression. In addition to piecing together the story outlined above, the key contribution of Mian and Sufi is to explain exactly how the collapse of asset price bubble in housing led to an economy wide crisis.

3. PARTIAL EXPLANATIONS

In explaining the Great Depression, Keynes noted that there was a shortfall in aggregate demand. Because goods were not demanded, they were not produced, even though the economy had the capacity to produce them. This contraction in supply led to unemployment of all resources, including labour. This was by itself a major theoretical problem for contemporary economists, who did not believe that such a phenomena could occur. Low aggregate demand would lead to lower prices which would increase the aggregate demand to match available supply. Similarly, persistent unemployment was a mystery, since this should lead to reduced wages, causing an increased demand for

labour, wiping out unemployment. Keynes argued that there were price rigidities which prevent these adjustments from taking place.

3.1. Keynesian Monetary Policy

Keynes proposed two solutions to the problem. One was through monetary policy. Increasing the supply of money in hands of the public would lead to increased demand. Supply would respond by increasing production, leading to more income for the factors of production, including labour. This would reduce unemployment and lead to further increase in demand, eventually overcoming the shortfall in demand and leading to full employment. Keynes noted that monetary policy might fail to work due to the famous "liquidity trap." Monetary policy supplies banks with liquidity, which could be borrowed at low interest rates by people to purchase commodities. If they were to do so, the aggregate demand would increase, leading to increased production, employment and incomes. However, people might not be willing to borrow at zero interest rate either to consume or to invest, in which case monetary policy could prove ineffective.

3.2. Keynesian Fiscal Policy

If monetary policy is ineffective, then fiscal policy must be used. This involves the government directly employing people in productive activities or else undertaking investment projects. Direct employment of people would put the money in their pockets that they need to spend to generate aggregate demand. Once they start spending, production would pick up in response to the increased demand. This would lead to a virtuous cycle, eventually restoring full employment. Keynes compared this to "priming the pump"—an initial intervention by the government was needed to start up the process.

3.3. Fisher's Debt-Deflation

Although Keynes was entirely correct in his perception that the problem was due to a shortfall in aggregate demand, he did not have any clarity regarding how this shortfall came about. In fact there was a huge deflation caused by the Great Depression. Price and wages fell by about 30 percent, refuting the idea that prices are sticky downwards. Keynes also missed the crucial role of debt in causing the Great Depression. Irving Fisher did note the relevance of debt, and also provided a solution which was ignored and forgotten. However, the recent GFC has revived interest in this proposal, which seems very relevant and important to the current situation. Fisher's proposal involves moving to 100 percent reserves to eliminate leveraged debt generated by the fractional reserve banking. This will be discussed later.

The Great Depression was also preceded by a spectacular boom in asset prices, including the price of stocks and land. Just as in the GFC and in other boom-bust episodes, ingenious financial innovations allowed people to borrow on the basis of these inflated asset prices. Mian and Sufi write that "From 1920 to 1929, there was an explosion in both mortgage debt and instalment debt for purchasing automobiles and furniture." Instalment financing revolutionised the sales of durable goods. It became socially acceptable to buy durable goods on instalments—that is, debt against future income. According to Fisher's analysis, it was the huge overhang of debt following the

collapse of stock market bubble, that led to the Great Depression. This debt prevented the usual adjustment mechanisms from working, as we now discuss.

A shortfall in aggregate demand would lead to a reduction in prices, which would normally restore demand. In the Great Depression, businesses cut down on production and reduced prices, as required by the adjustment mechanism. However, maintaining profitability required reducing wages at the same time. These cutbacks led to decreased employment and decreased incomes for the employed, reducing the ability of workers to pay back their debts. The debt burden, fixed in nominal terms, increased as a result of this process of deflation of prices and wages. Instead of stimulating aggregate demand, deflation led to a reduction in aggregate demand, which led to further decreases in production, prices and wages. This vicious cycle was termed the debt-deflation cycle by Irving Fisher; as he put it in 1933, "I have . . . a strong conviction that these two economic maladies, the debt disease and the price-level disease, are, in the great booms and depressions, more important causes than all others put together."

3.4. Friedman's Monetary Causes

Milton Friedman also studied the Great Depression and came up with rather different causes. His ideological bias towards unregulated free markets forced him to look to some type of government failure as the cause of the depression. There was a severe contraction of the money supply in the great depression, documented in Friedman and Schwartz (2008). According to the free market ideologues, the unregulated economy works perfectly well left to its own devices. However the government failed to fulfil its function of providing an adequate supply of money to prevent the contraction. The solution was for the government to restore money supply to the levels required for economy to function properly.

Friedman's theories were put to the test by his disciple Ben Bernanke who was in charge of the Federal Reserve Bank during the GFC. He followed the advice of Milton Friedman to the letter. As the crisis deepened, the spigots were turned on and money flowed freely. Unfortunately, this was not enough to stem the tide. To Bernanke's surprise, heavy unemployment, deep recession and other adverse economic consequences occurred anyway, proving that Friedman's analysis is not on the mark. There is no doubt that the depth of the recession would have been even more severe had the monetary policy been contractionary as at the time of the Great Depression. At the same time, it is equally clear that it is not solely bad monetary policy that causes deep downfalls in aggregate demand and prolonged recessions with heavy unemployment. Nor has an extremely expansionary policy sufficed to cure the problems created by the GFC.

4. THE MIAN-SUFI SOLUTION

As we have seen, explanations and remedies from eminent economists as well as worldly and experienced men of affairs were shown to be inadequate in the GFC. In fact, we have chosen only a very small subset of the explanations proffered for the Great Depression. Large numbers of alternatives, as well as confident claims that economists have solved the fundamental problem of preventing recessions, were swept away by the Global Financial Crisis. Knowledge of the history of all the renowned heroes who failed in the quest for the Holy Grail is essential to the appreciation of the accomplishment of

Mian and Sufi. There are many pieces of the complex puzzle stitched together by these authors. Some of the key elements were grasped by the predecessors, but the big picture was not. The core element of their analysis is "levered debt" which drives financial crises. We begin by providing a deeper analysis of asset price bubbles.

4.1. Failure of the Quantity Theory

We noted that it was flows of hot money into East Asia which led to the East Asian crisis. Similarly it was an excess supply of money for mortgages that led to the GFC. Many other similar episodes are documented in history. Conventional economic theorists, including Keynes and monetarists, hold that money is neutral in the long run. That is, an excess supply will eventually translate into a proportionate increase in prices without having any real effects. However, history bears clear testimony to the contrary. The puzzle is why have economists ignored this strong and clear empirical evidence?

The reason may be a shared consensus on the views of Lucas (2004) that: "Of the tendencies that are harmful to sound economics, the most poisonous is to focus on questions of distribution." As shown by Mian and Sufi, understanding effects of distribution is one of the keys to understanding the GFC. Lack of understanding of distributional effects led Lucas to make the embarrassing claim that "the central problem of depression-prevention has been solved" just before the GFC. The reason for the failure of the quantity theory is distributional. If the money is distributed proportionately to all, then the quantity theory might work as stated. However, if it all goes to some specific subpopulation which differs in characteristics from the general population, than the effects can be very different. In particular if it all goes into hands of wealthy investors who wish to further increase their wealth, it may end up creating an asset bubble, leading to economic collapse. On the other hand, if it goes to the hands of those who are deeply in debt, and those who have high marginal propensity to consume, it may cause an increase in aggregate demand which could lift an economy out of recession. To be effective, monetary policy needs to be targeted at the right group of people.

4.2. Bubble Creation Due to Levered Debt

Both bubbles and post-bubble crashes vary in depth and severity. If a group of wealthy investors has optimistic beliefs about the future of an asset, their investments can create a bubble in the asset price. As long as they don't borrow to invest, the post-bubble crash will not have large effects on the economy. The wealthy have diversified portfolios, and losing even a significant chunk of some subset will not cause any harm to the economy.

The situation changes when the wealthy borrow to invest. A key insight of Mian and Sufi is that big bubbles result when pessimists and optimists both buy into the bubble. This is possible due to the combination of interest-based debt and insurance, both of which insulate the pessimists from the effects of a crash. Pessimists provide money as loan to both speculators and optimists, who hope to make gains from appreciation of asset prices. Interest based debt with collateral and insurance insulate the pessimists from the effects of a crash. In practice, during the GFC, the asset prices collapsed in the bubble, driving down the value of the collateral. Also, AIG, the largest insurance company in the world, became insolvent, and was rescued by the USA to prevent a

collapse of the financial system. So in effect, the debtors were protected from the harm caused by the collapse of the bubble.

The situation becomes much worse when the debt is levered. During the GFC, buyers of houses could acquire mortgage debts with only 5 percent or less as equity, leading to leverage factor of 20 to 1 or higher. Leverage makes available to optimists and speculators a hugely larger pool of money, which can finance a hugely larger bubble. In this case, the collapse and crisis cause substantially more damage and are prolonged over a larger period of time.

The Islamic equity contracts would forestall these problems. Those who wish to finance investors MUST participate in the risk of investments. Also, conventional insurance contracts are not permissible under Islamic law. The Islamic alternative is a cooperative insurance, which protects from individual risk, but not from systemic risk. This means that investors must take systemic risk into account under an Islamic system, which would prevent pessimists from buying into the bubble.

4.3. Shortfall in Aggregate Demand

While other authors have picked up the pieces of the puzzle described so far, the singular contribution of Mian and Sufi lies in explaining why aggregate demand falls after a collapse of the asset bubble. Their crucial insight requires looking at dis-aggregated demand. They break up the economy into borrowers and lenders. The lenders are wealthy, while the borrowers are less wealthy. Mian and Sufi provide strong empirical evidence that it is the distributional aspects of debt-based borrowing which lead to the collapse of aggregate demand. As already documented, economists tend to neglect distributional effects. Failure to dis-aggregate demand between borrowers and lenders has created a mystery which eluded Keynes, Friedman, Lucas, Fama and other eminent economists.

It turns out that the classes which borrowed money to finance home purchases have a much higher marginal propensity to consume than the wealthy lenders. Collapse in asset prices wipes out the savings of this borrower class. This is aggravated by the harsh nature of levered debt, which is structured so that the poorer class is wiped out first, before any damage is done to the protected lenders. An equity-based contract would share the losses more equally. This collapse in the wealth of borrowers leads to a drastic shortfall in aggregate demand for two reasons. First, loss of income for this class with high marginal propensity to consume leads to a high drop in aggregate demand. Second, the borrowers have not only to repay debts, but also to build up their savings back to desired levels. If the loss was shared proportionately, or borne primarily, by the wealthy lenders, the shock to aggregate demand would be much less. This would substantially reduce the magnitude of the recession.

4.4. Wrong Theories and Wrong Solutions

Failure to understand the reasons for the shortfall in aggregate demand has led to a large number of wrong solutions. For example, Keynesian monetary policy would be effective only if money was targeted to the right class, the debtors who have lost their savings in the asset bubble crash. Similarly fiscal policy is also a crude instrument, which would not easily reach the debtors. Mian and Sufi remark that fiscal and monetary

policies work but with very low efficiency, because the remedy is not focused on the source of the problem.

Similarly, Friedman's idea that expansionary monetary policy would resolve the problem fails to work. As Mian and Sufi show, the Federal Reserve pursued a hugely expansionary monetary policy, but this did not have any effect on the money supply. The reserves of the banking system increased, but the money supply did not, contrary to the theory taught in monetary textbooks in universities.

The reasons for the failure of Friedman's monetary prescriptions (which were followed by Bernanke during the GFC), are closely related to the ideas of Irving Fisher, who noticed the same phenomenon during the Great Depression. The creation of money by the banking system depends on the existence of people willing to borrow money from banks. In a situation where there is a huge amount of toxic debt, people are unwilling to borrow. Also, banks need extra care in order to lend under these same circumstances. Fisher proposed an alternative system of 100 percent reserve banking, where money creation would be fully in control of the Central Banks, instead of being controlled by the willingness to lend and borrow in the private sector. This system would permit much greater control of the money supply by the Central Bank. Nonetheless, while alleviating the symptoms this would still not target the remedy effectively.

The most important wrong solution and remedy is the one that actually drove policy decisions, and continues to be the dominant view, even though it is fundamentally wrong. This is treated separately in the next subsection.

4.4.1. *The Banking View*

The view which currently dominates decision making is different from the ones outlined above. According to the banking view, the central cause of economic system malfunctions is a weakened or impaired financial system. The crash of the asset price bubble led to a severe reduction in the assets of the financial system, which impaired its ability to lend money. Providing liquidity to the financial system would revive this ability, and thereby the economy. Mian and Sufi argue that the problem is excessive debt, and the banking view proposes even more debt as a solution, which is obviously wrong headed.

One piece of evidence offered in favour of the banking view by Bernanke is the dot-com crisis which happened a few years before the GFC. As in the GFC, there was a stock price bubble in the dot-com stocks, which was roughly of the same magnitude as the bubble in real estate prices. The collapses of that bubble only created a minor disturbance, unlike the crash of the real estate bubble. The explanation offered by Bernanke is that the financial system was more vulnerable to decline in real estate prices, and therefore more severely affected by the GFC. Sufi and Mian provide a great deal of empirical evidence in refutation of the banking view. The explanation they offer is simpler. The dot-com bubble affected only the wealthy who had invested in these stocks, and not the general public. The loss of wealth did not affect aggregate demand because this class has a very low marginal propensity to consume.

It is a strong belief in the banking view which led to a trillion dollar bailout of banks, when a much smaller bailout of the mortgagors would have effectively solved the crisis created by the collapse of the MBS (mortgage backed securities) and prevented the

recession. The bailout of the banks did nothing to address the problem, which was a dramatic reduction in the wealth of homeowners—even those who did not borrow were affected by the general collapse in housing prices. This class was the one which spends the most, and had to switch to savings to re-build their wealth for retirement purposes. This led to a dramatic shortfall in the aggregate demand and the subsequent recession. The banker bailouts led to profits and bonuses for managers of banks whose irresponsible investments caused the recession, and encouraged more irresponsible behaviour by these same financial institutions. At the same time, since the money did not reach the distressed class with the high MPC, the aggregate demand continues to be low, and the unemployment and recession continues to linger.

5. FRAUD AND DECEPTION

Asset price bubbles are often (but not always) created using fraud and deception. This occurs on many levels. On the micro level, securities are portrayed as safe, and gains are made to appear attractive relative to others. Mian and Sufi report results of a study about fraud in market of the MBS: "Another striking finding from the study was the *depth* of fraud across the industry. The authors found that just about every single arranger of securitisation pools was engaged in this type of fraud. It was endemic to private-label securitisation." The fraud here refers to mis-representations of the safety of the mortgage. Documentation was systematically missing or misleading, and mortgages were falsely classified into low risk categories. But fraud also took place in many other ways. There was information available that could have shown that these mortgages were high risk. But insurance agencies and rating agencies all looked the other way, thereby aiding and abetting the fraud.

We are often told by free market ideologues that governments are corrupt and inefficient; therefore we should go for privatisation. However, widespread and systemic corruption of a multi trillion dollar magnitude is evident in the private sector. Enron and many other corruption scandals in the private sector show that this proposition is not self-evident as often asserted. In fact, given that the same people participate in the public and private sector, it is hard to see how one sector could differ from the other in terms of corruption.

Marketing of fraudulent assets is perhaps not as serious a problem as the marketing of fraudulent theories which is essential to maintaining a system drastically tilted in favour of the top 0.1 percent. It is these false theories, such as the banking view expounded above, which sustain the system in the long run. These theories prevented economists from seeing the crisis coming, and also prevented formulation of suitable responses to the crises.

5.1. Macro-Fraud or Failure of Economists

Prior to the East Asian Crisis, economists were largely in favour of financial liberalisations. Vast movements of capital into East Asian economies were viewed with approval as means of further speeding up the growth of these economies. Even after the collapse, economists did not generally point their fingers at the culprit: surplus hot money in hands of the wealthy seeking easy risk free returns. Chang (2000) has analysed a lot of misleading causes given for the crisis such as crony capitalism, industrial policy,

government guarantees, excessive corruption and others, and has shown that these cannot be held responsible the crisis. It appears as if false theories are fabricated in order to prevent recognition of the real causes of the crisis.

A similar problem occurred both before and after the GFC. Before the GFC, none of the leading schools of macro-economic thought were prepared to entertain the possibility of a serious and systematic overpricing of the stock market and real estate due to a bubble. This is because it is one of the fundamental principles of conventional economics that competitive prices effectively de-centralise production and consumption decisions, leading to efficient outcomes in free markets. Nobel prize winner Eugene Fama was also nominated for the "dynamite prize" by heterodox economists, seeking to recognise those who contributed the most to the economic blowup of 2007. Theories of rational expectations in stock market do not recognise the possibility of bubbles. Many who were not handicapped by such theories did recognise serious problems well before the crisis. Even the US Congress, ordinarily remote from academic pursuits, created a committee to investigate the failure of economic theory to predict the crisis, and its failure to provide suitable solutions after the crisis. The charter of the committee states that:

> The chief steward of the U.S. economy from 1987 to 2006 said he was in a state of "shocked disbelief" because he had "found a flaw in the model that [he] perceived [to be] the critical functioning structure that defines how the world works." Adherence to this model had prevented him from envisioning a critical eventuality: that the "modern risk management paradigm," seen by Greenspan as "a critical pillar to market competition and free markets," could "break down."

We have already discussed the banking view, which dominated post-crisis analysis and response. Whereas it seemed obvious to nearly everyone that the way to resolve the mortgage crisis would be to provide support to people who were losing their homes, a trillion dollar bailout was given to those who collaborated in the fraud which generated the crisis. The basis of this misplaced generosity was wrong theories about how the market and the economy function. Recent research by Gilens and Page (2014) show that decisions in Congress are closely aligned with the interests of the rich and powerful elites, rather than the majority voters; USA democracy is in fact a plutocracy—rule of the rich. Mian and Sufi argued that an important contributing factor in the failure to anticipate the crisis and the failure to propose suitable remedies lies in faulty economic theories. They aim to rectify the problem with their book.

5.2. Disaster Capitalism

A very surprising aspect of this story is how democratic governments can take action extremely damaging to the interests of the vast majority of the public? For instance, in the wake of the GFC, the homeowners with underwater mortgages were hurting. It seems intuitively obvious that medicine should be applied to the wound. There was public sentiment for relief of homeowners, and some bills were passed in this direction. Yet the legislation was rendered in-effective, and public sentiment was manipulated and changed. Mian and Sufi document how leading public figures argued that we should not pay for loser's mortgages, and how irresponsible borrowers should be

made to suffer—at the same time, analogous arguments about how fraudulent bankers should bear financial responsibility for the collapse they caused were side-stepped and ignored. Sufi and Mian spend some time on exonerating the mortgagors, and explaining why punishing the bankers would not lead to economic collapse, and would be fair and just.

Klein (2007) offers a deeper perspective on this issue, suggesting that economic or political crises provide an opportunity for the wealthy, and are sometimes manufactured or exaggerated for this purpose. Regulations constrain the wealthy and powerful, while laissez-faire allows them to create wealth without constraints. Arguments of Sufi and Mian show clearly that financial crises wipe out the borrowers without affecting the fortunes of the rich. Just like war profiteering creates billions for a small minority while causing immense damage to large numbers, financial crises also strengthen the stronghold of a tiny elite at the expense of the populace. Economic data from diverse sources show how the holdings of wealth in the hands of the top 0.1 percent has been steadily increasing, while the bottom 90 percent has seen a steady erosion of wealth beginning from the Reagan-Thatcher era of liberalisation. After the GFC, which only increased the wealth of wealthy, legislation to prevent future crises has been blocked or rendered ineffective, or even reversed. Alkire and Ritchie (2007) have documented how the battle of ideas has been carried out to provide the theoretical framework to support this victory of rich.

6. CONCLUSIONS

Mian and Sufi suggest a number of remedies more precisely and efficiently targeting the debtors. Simple ones are forgiveness of debts, as well as re-writing of mortgage debts so as to bring them in line with property values (called debt cram-down). Using empirical evidence, they show that these remedies which provide relief to the mortgagors would have solved the economic problems at substantially lower cost than the trillion dollar bailout to bankers which did not prevent the recession. Their solutions retain current relevance since more than 20 percent of mortgages are still "under-water", aggregate demand is still low, and unemployment, homelessness and hunger are still at record highs in post GFC USA. However, Mian and Sufi are pessimistic about the possibility that their remedies will be adopted. The lobby in favour of the banking view very strong, and the political system is unlikely to create the consensus required for a radical change of course. Instead they suggest that the crisis which occurred is endemic to the system, and an overhaul of the system is required to prevent such crises in the future. The main reform they suggest is a shift from interest based debt to equity based financing of investments.

In the Islamic world, financial sectors are not well-developed, and so asset bubbles and similar crises have not been experienced, except on a small scale. This is why Muslims have been much more enthusiastic in embracing Western financial institutions. The analysis of Mian and Sufi shows that debt based systems are prone to crises which create oppression and misery for the masses while providing massive profits for a few. Current efforts at creating Islamic financial systems are based on attempts to imitate Western institutions within the confines of the Shariah. We would be much better of creating a genuine alternative, founded on Islamic principles. Some of the key principles as they relate to finance are the following.

Experimenters in behavioural economics have firmly established that actual human behaviour is very different in the social sphere as opposed to the economic sphere. The social norms governing transactions in one realm are very different from those of the market realm. We would not dream of putting a price on a mother's love for her children. In the Islamic system, debt is only for charitable purposes; it is not meant to be a financial instrument. The transition from providing loans as a social act of kindness and charity, to the provision of loans for profit was part of Polanyi's (2001) Great Transformation from a paternalistic and regulatory society to a commercial and market based society. Giving debt to a person in need is an expression of universal brotherhood which is much admired and encouraged in Islam. The Islamic rules relating to debt make this amply clear. One should provide relaxation in time to debtors, and penalties cannot be charged for late payments. Interest cannot be charged on debts. Debts cannot be traded or transferred. Elimination of debt as a financial instrument would go a long way towards eliminating asset price bubbles and consequent financial crises, as established by Mian and Sufi.

A second essential component of Islamic rules relating to finance is that the earning of money must be related to provision of some service. Ownership of capital is not a service to society. However participating in the risk of a business venture is a service. Thus equity based participation is a permissible way to earn a return on capital while interest based debt is not. The full implications of this position are traced in Zaman (2014). This paper also points out that current attempts to create Islamic banks similar to western banks actually violate the spirit of Islamic financial regulations, and cannot achieve the gains possible within a genuinely Islamic system.

A third essential component of Islamic teachings is that contemporary forms of insurance constitute gambling and are not permissible. Insurance is a zero-sum transaction which creates an adversarial relationship between the insurer and the insured, leading to many types of moral hazard. The GFC was caused by the use of insurance to provide the appearance of safety to fraudulent mortgages, to enable marketing them to unsuspecting investors. Islamic insurance is termed "Takaful" to distinguish it from contemporary western formats of insurance. The Takaful contract is similar to mutual insurance, where a group of people insure each other against individual failures. This is a cooperative contract which does not insure the group as a whole against systemic risk. This means that if the group as a whole buys into an asset bubble, they would not be protected. Transactions based on equity and takaful, and the prohibition of levered debt would be sufficient to provide adequate protection against the worst types of bubbles, which cause the failure of the system as a whole. Thus, as many have noted, Islamic rules of finance are of value even to those who are not Muslims.

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