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Financial Development and Monetary Policy Efficiency: Unraveling the Empirical Contradiction and Discovering the True Relation

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Abstract

Considering the contradicting findings and inadequate theoretical framework, this paper re-investigates the relationship between financial development and monetary policy effectiveness utilizing panel data from 40 economies, covering the time-span 1992-2014.This research shows that the influence of monetary policy in conjunction with financial development on output growth and inflation tends to be positive and negative, respectively, although quite meager in magnitude, where the System GMM for the combined data set is thought to be the more appropriate estimation technique as it addresses the endogeneity problem. It implies that financial development enhances monetary policy effectiveness. As monetary expansion, combined with financial development can cause sustainable growth, so, financial development is instrumental in policy effectiveness and consequently, must be considered meticulously for appropriate monetary policy formulation. Expansionary monetary policy could be more effective in the developed economies for output expansion and influence inflation more in the developing world.

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1. Introduction

The significance of prudent macroeconomic management for fostering economic growth (Ames et al., 2001) is well conceived and has accordingly been extensively studied by researchers. An appropriate policy mix in conjunction with financial sector attributes is supposed to both accelerate and sustain economic progression. Monetary policy targets specific macroeconomic variables pertaining to the financial sector with the ultimate objective of affecting the real economy, principally, output growth rate and inflation through the transmission mechanism; consequently, financial development exerts influence on the transmission mechanism (Luis et al., 2010). This research provides new evidence whether financial development augments or deteriorates monetary policy effectiveness. More precisely, through the incorporation of more logical sampling methods and appropriate estimation techniques to address endogeneity, it has analyzed the effectiveness of monetary policy with ongoing financial development (focusing only on the depth dimension) with a view to efficient macro-management. The literature review also validates that this research topic is not only timely, but also anticipated to have significant theoretical and policy implications for the global economies experiencing speedy financial development.

Historically, the monetarist view has advocated the influence of monetary policy on both output and inflation. The research works of Krausa and Rioja (2006), Luis et al. (2010) and Ma and Lin (2016) have linked the notion of financial development with the effectiveness of monetary policy. Considering the contradicting findings of the previous research, this study has attempted to derive a set of generalized conclusions about the direction of relation, for unravelling this long-standing puzzle. This research has made significant contribution to the literature in terms of verifying the findings of previous studies, as well as explaining the contradiction of Ma and Lin (2016), through more heterogenous and comprehensive sampling, adopting econometrically correct estimation methods and incorporating possible theoretical rationale. This study shows that the influence of monetary policy in conjunction with financial development on economic growth and inflation tends to be positive and negative respectively, but quite meager in magnitude. It implies that financial development enhances effectiveness of monetary policy. As monetary expansion, along with financial development, can cause sustainable growth, financial development is instrumental in policy effectiveness. Consequently, the level of financial development must be considered meticulously for appropriate monetary policy formulation.

After the Introduction, Section 2 entails a brief overview of the theoretical developments and the literature. Discussions on the deployed empirical models, methodologies and the dataset are featured in Section 3. Section 4 captures the descriptive analysis regarding the empirical findings. Section 5 wraps up with the concluding remarks.

2. Monetarism, financial development (FD) and effectiveness of monetary policy (MPE)

Monetary theory proclaims that through variations in money supply, monetary policy can influence national output in the short run and price levels over the long run, where targeting money supply growth is predicted to perform better over discretionary monetary policy. Within the domain of mainstream economics, Milton Friedman's (1956/2005) restatement of the quantity theory of money uplifted the doctrine of monetarism challenging the Keynesian (1936) understanding. Friedman, expanding on Clark Warburton (1945), developed the notion of "money matters", which subsequently encouraged Cagan (1956), Meltzer and Brunner (1968), Tobin (1969), Fischer (1977), Blinder and Stiglitz (1983), Bernanke and Gertler (1995), Kimball (1995), Clarida et al. (1999), Woodford (2001), Svensson (2003), Bernanke et al. (2004) and others to conduct quality research in this field. This ever-expanding doctrine of monetarism has incorporated new dimensions to produce innovative and dynamic research, in which recently, the notion of financial development has been associated with the effectiveness of monetary policy.

A comprehensive literature review reveals that both pragmatic monetary policy and ever-evolving financial systems can affect output growth. As the monetary transmission mechanism initially works through the financial sector, notable and fast development of financial systems in most economies, coupled with the ever-changing business and policy practices have forced policymakers to envisage its tentative impact on the effectiveness of monetary policy. On one hand, a more developed financial sector enhances monetary policy performance; on the other, the empirical study of Ma and Lin (2016) has also proven the diminishing effectiveness of monetary policy along with financial sector advancement. From this perspective, re-analyzing the nexus between financial development (FD) and the effectiveness of monetary policy (MPE) has significant theoretical and policy implications. In spite of the growing significance of FD in explaining MPE, an in-depth study of the relationship between FD and MPE is quite infrequent due to the lack of recognized measures of both MPE and FD. However, the researchers are also obstructed by the absence of theoretical foundations underlying this relationship as well as the unavailability of the required information.

Krause and Rioja (2006) have traced out the links between FD and short run stabilization, deriving monetary policy efficiency measures (PEMs) through inflation and output gap volatility. Deploying GMM estimation techniques, they have discovered that more developed financial markets, controlling for central bank independence, inflation targeting and membership to the European Monetary Union could significantly contribute to explain efficient monetary policy implementation. But the study has focused on short term stabilization and has considered a relatively shorter time span as well as not including recent developments. Luis et al. (2010) have summarized the results of a broad exploratory empirical analysis relating the

level of FD with the MPE based on a panel data set, resorting to factor analysis and VAR methods. The study has made apparent that in countries with less developed financial systems, monetary policy could have longer lags but higher medium-term impact, and monetary contractions could exert more intense effects than monetary expansions. The paper has deployed simple regression analysis techniques, disregarding complexities - such as heterogeneity of data set and endogeneity - and has put too much emphasis in finding the proper indicators for both FD and MPE. In fact, the results have not even explicitly mentioned the impact of FD on MPE. Using a panel data set and primarily relying on static linear panel models, Ma and Lin (2016) have provided contrasting evidence of MPE to be negatively correlated with FD. This latest study, which has been one of the motivations for the existing research, seems to be limited by skewed sampling and selection of improper estimation methods disregarding possible endogeneity, which appear to be instrumental in influencing the findings. In spite of recognizing the contribution made by the previous papers, it is quite evident that while illustrating the influence of FD on monetary policy in affecting both economic growth and inflation, the issue of endogeneity has not been properly considered or addressed, implicitly assuming unidirectional causality from changes in money supply in a developed financial system to both output growth and inflation. Gurley and Shaw (1967) have advocated the demand-following hypothesis, implying that economic progress forms a more developed financial structure for better sustenance. Boyd et al. (2001) and others have found inflation to adversely affect FD. Again, in spite of the strong theoretical background of inflation being caused by money supply growth, in a lot of instances, the inflation rate itself could influence the money supply decision of central banks. However, as the previous papers have not considered endogeneity comprehensively, this research has addressed it through the incorporation of the System GMM estimation technique to both output growth and inflation specifications for the aggregated data set. Moreover, the deployed System GMM has also addressed the issue of dynamic panel model bias.

3. Empirical methodology and data

Considering all the limitations of the previous studies, this research has resorted to more prudent sampling and appropriate estimation techniques for both disaggregated and aggregated data sets. Moreover, a lengthy and more recent time frame has been chosen. The following two standard macroeconomic panel data specifications have been deployed to determine the impact of money growth rate on output growth and inflation econometrically for the disaggregated data sets:

$$EG_{i,t}=\beta_{0}+\sum_{j=1}^{0}\beta_{j}^{EG}EG_{i,t-j}+\sum_{j=0}^{2}\beta_{j}^{M}\Delta M_{i,t-j}+\beta^{C}Crisis_{i,t}+U_{i,t}^{EG} \quad (1)$$

$$\Delta P_{i,t}=\gamma_{0}+\sum_{j=1}^{0}\gamma_{j}^{P}\Delta P_{i,t-j}+\sum_{j=0}^{2}\gamma_{j}^{M}\Delta M_{i,t-j}+\gamma^{C}Crisis_{i,t}+U_{i,t}^{P} \quad (2)$$

where i indexes over economies and t over time, the βs and γs are coefficients, EG is the output growth rate, ΔM is the money supply growth rate, ΔP is the inflation rate, *Crisis*, a dummy variable which is 1 if a country i at time t experiences a financial or banking crisis, and zero otherwise, and $U_{i,t}^{EG}$ and $U_{i,t}^{P}$ are the output and inflation shocks, respectively. Following the study of Jovanovski and Mehmed (2015), 2-year lag in the application of the measures of monetary policy has been considered. Both Karras (1999) and Ma and Lin (2016) have considered (1) and (2) as reduced-form expressions for output growth and inflation. The error terms are modeled as $U_{i,t}^{EG} = U_i^{EG} + W_{i,t}^{EG}$ and $U_{i,t}^{P} = U_i^{P} + W_{i,t}^{P}$, where U_i^{EG} and U_i^{P} represent the economy specific fixed effects. In spite of the relative convenience and prudence in manipulating the policy rates over the money supply growth by the central banks, easy availability of data has prompted the selection of money supply growth as a measure of monetary expansion. Additionally, interest rate targeting ultimately does end up affecting money supply growth. Following the previous literature (e.g., Demirgüç-Kunt and Levine, 1996; Levine, 2002; Beck et al., 2006; Demirgüç-Kunt et al., 2011; Ma-Lin, 2016), the following single but comprehensive measure for FD has been considered:

FD = Domestic credit provided by financial sector (% of GDP) + Market capitalization of listed domestic companies (% of GDP)

In constructing the FD indicator, both the credit and capital markets have been considered to depict the financial structure more comprehensively. It is plausible that a larger value of FD characterizes a higher level of financial development. The larger the values of coefficients in equations (1) and (2) are, the more profound the effects of monetary policy on growth and inflation are. Given the empirical setup in equations (1) and (2), firstly, the sample economies are classified as per the level of FD, and then regression analysis is performed for this disaggregated data set. In spite of the prevalence of dynamic panel model bias, for the disaggregated data set, the standard static panel linear estimation technique (fixed effect model - FEM) is applied as N<T. As the data set has displayed heteroskedasticity, auto-correlation and cross-sectional dependence, appropriate corrective measures have been undertaken. MPE can be verified by comparing the signs as well as the coefficient sizes of money supply growth rate across the subsamples, highlighting different levels of FD. To be precise, a higher coefficient in the subsample of highly financially developed economies and vice versa will suggest increasing MPE with FD.

Along with this empirical framework, an alternative empirical setup for the aggregated data set is also considered, where the FD variable is explicitly included in the regression equations and interacted with the money supply growth. This alternative framework is believed to be the more appropriate one from a technical context. This has also been derived from previous research (e.g., Karras, 1999; Berument-Dogan, 2003, Ma-Lin, 2016). The regression specifications for the aggregated data set follow as:

$$\Delta EG_{i,t} = \beta_0 + \sum_{j=1}^{0} \beta_j^{EG}\, EG_{i,t-j} + \sum_{j=0}^{T=2} (\theta_j^{M}\, \Delta M_{i,t-j} + \theta_j^{FD}\, FD_{i,t-j} + \theta_j^{FDM}\, FD_{i,t-j}\Delta M_{i,t-j}) + \beta^{C}\, Crisis_{i,t} + U_{i,t}^{EG} \quad (3)$$

$$\Delta P_{i,t} = \gamma_0 + \sum_{j=1}^{0} \gamma_j^{P}\, \Delta P_{i,t-j} + \sum_{j=0}^{T=2} (\varnothing_j^{M}\, \Delta M_{i,t-j} + \varnothing_j^{FD}\, FD_{i,t-j} + \varnothing_j^{FDM}\, FD_{i,t-j}\Delta M_{i,t-j}) + \gamma^{C}\, Crisis_{i,t} + U_{i,t}^{P} \quad (4)$$

Equation (3) is the output growth equation that measures the effect of FD on the relationship between money growth and economic growth and equation (4) is the inflation equation capturing the effect of FD on the relationship between money growth and inflation, where $FD_{i,t}$ is the measure of financial development of country i at time t, $FD_{i,t-j}\Delta M_{i,t-j}$ is the interaction term for FD and monetary expansion; θs and $\varnothing$s are the parameters. To address both simultaneous casual bias and dynamic panel model bias in the combined data set, a two-step GMM Systems estimator, developed by Blundell and Bond (1998) has been applied to provide robust estimates.

For quantitative assessment, a panel data set has been constructed, prioritizing the notion of unbiased and logical sampling. The data set is comprised of 40 developed, developing and least-developed economies which covers the time span 1992-2014, depending upon data availability. Mostly, published sources like the World Development Indicators and Financial Development and Structure Database of World Bank, International Financial Statistics Database of International Monetary Fund and Laeven, L. and Valencia, F. (2012) have been exploited as the data sources.

Table I displays the average values of the quantitative variables of the 40 economies over the sample period while Table II presents the descriptive statistics. The 2nd, 3rd and 4th columns of Table I show that output growth, inflation and money growth, all vary substantially across the economies.

Table I - Sample averages of the variables over 1992-2014

Economies	AVG_{EG}	$AVG_{\Delta P}$	$AVG_{\Delta M}$	AVG_{FD}
Hong Kong	3.82068	2.873562	8.725755	749.7963
Japan	0.818636	0.229682	1.506009	380.6757
Switzerland	1.669188	0.942817	5.372987	357.0124
Singapore	6.142694	1.881753	9.246878	268.3601
USA	2.595997	2.436831	5.86987	320.6677
Australia	3.262468	2.567366	9.426149	210.0441
UK	2.284613	2.246157	7.616231	270.8664
Malaysia	2.75692	6.83531	12.59824	353.2704
S. Africa	5.682496	2.754393	13.72975	293.3047
Austria	1.839578	2.112832	9.114011	115.7351

Italy	0.6077	2.605363	5.394738	97.16711
Netherlands	1.960856	2.159474	5.394738	196.102
Norway	2.4421	2.013552	6.789522	87.79443
Portugal	1.135908	2.997041	5.394738	142.3517
Spain	1.913403	2.95184	5.394738	214.3381
Belgium	1.744304	1.999219	5.394738	124.1506
Canada	2.585101	1.818059	9.6664	213.8001
China	10.11891	4.580843	20.2476	137.7032
Denmark	1.471546	1.999254	4.484372	147.2514
France	1.535735	1.588705	5.394738	149.8293
Finland	2.033444	1.681078	5.394738	125.7728
Germany	1.30816	1.841344	5.394738	139.7729
Ireland	4.867476	2.269519	5.394738	140.0076
Sweden	2.184838	1.418155	6.2629	126.2574
Israel	3.799395	7.885212	20.77265	46.48513
Poland	3.351817	7.326969	19.55471	46.62081
Argentina	3.351817	7.326969	19.55471	46.62081
Bolivia	3.280616	7.236377	18.99914	46.80999
Turkey	3.229793	7.397102	19.28484	47.34372
Mexico	3.36898	8.408757	20.3679	48.46982
Indonesia	3.506233	8.226967	20.65356	48.01356
Philippines	3.36898	8.408757	20.3679	48.46982
Cote D Ivory	3.420248	8.702361	20.49551	49.53142
Nigeria	3.586002	8.846988	20.45834	50.37405
Thailand	3.729341	9.088039	20.4593	51.77368
Bangladesh	3.994239	9.20353	22.08564	53.07708
Pakistan	4.575981	8.119172	21.05224	53.09115
Brazil	4.309646	7.877189	20.66212	52.9131
India	4.098504	7.680743	19.1027	53.58105
Sri Lanka	4.420178	39.14889	50.77155	63.00495

Note: (i) EG = Real GDP growth rate (%), (ii) ΔP = Inflation (CPI) rate (%), (iii) ΔM = Money and quasi money growth rate (%) and (iv) FD = Domestic credit provided by financial sector (% of GDP) + Market capitalization of listed domestic companies (% of GDP)

The differences in magnitudes of the FD indicator in Table I advocates that the impact of FD on the MPE may be generating diverse growth and price effects across the economies as well

as signifying the substantial variability in relative importance of forms of financial instruments, financial intermediaries and financial markets across the economies.

Table II - Descriptive statistics

Variable	Observation	Average	Std. Deviation	Min	Max
EG	920	3.404629	3.415268	-13.1267	33.7358
ΔP	920	10.89919	98.65393	-4.47994	2075.89
ΔM	920	18.51448	127.882	-28.6298	3280.65
FD	920	164.2525	152.2413	9.05663	1381.22

Note: (i) EG= Real GDP growth rate (%), (ii) ΔP = Inflation (CPI) rate (%), (iii) ΔM = Money and quasi money growth rate (%) and (iv) FD = Domestic credit provided by financial sector (% of GDP) + Market capitalization of listed domestic companies (% of GDP)

4. Empirical results

The coefficients in the regression specifications (both equations 1 and 2) have been estimated by using static linear panel model estimation techniques (baseline results), along with corrections (FEM-corrected) for data structure for the disaggregated data set (Table III and Table IV). A high level of FD or HFD, mostly comprising of the developed economies, and includes the 24 most financially developed economies and a low level of FD, or LFD, contains the 16 comparatively less financially developed economies (even surprisingly 2 developed economies are in this group) in the sample based on a benchmark (considering the data structure, the chosen benchmark is the median value of FD). As anticipated, the coefficient of the crisis dummy tends to exert significant negative impact on output growth irrespective of the level of FD, where the magnitude of shock is considerably higher for the LFD. The developing economies have experienced significant gradual progress in the capacity to combat both internal and global financial crises through consistent macroeconomic consolidation, having more policy tools at disposal and learning from others, which assisted them immensely during the financial crisis of 2008, but they are still not as well equipped as the developed economies (Lin, 2011). For inflation, the crises do result in exorbitant or significant price shocks in the LFD. Although, the HFD do experience statistically significant price level distortions, but the magnitude of shock is not as high as that of the LFD. In spite of contradicting the standard economic theory of association between financial crisis and a low level of inflation, these findings are not at all puzzling but rather consistent and perfectly match the recent observations of Williams (2010), IMF (2013) and Friedrich (2014). Implementation of Quantitative Easing (QE) in the effected economies to counteract the negative effects of the global financial crisis (2008), long term implications of prolonged expansionary monetary policies, stable inflation

Table III - Financial development & monetary policy effectiveness: baseline results

Dependent variable – EG_t (FEM-corrected)		(1992-2014)
Independent Variables	HFD Subsample	LFD Subsample
Constant	1.0785***	3.6283***
EG_{t-1}	0.4666***	0.1551***
$\sum_{j=0}^{T} \beta_j^M$	0.0322***	0.0226***
$Crisis_t$	-1.4396***	-3.8258***
Number of Observations	480	320
Number of Economies	24	16

Note: (i) EG is real GDP growth rate (%), (ii) $\sum_{j=0}^{T} \beta_j^M$ *is the sum of the money growth coefficients; (iii) Crisis is the crisis dummy; (iv) the symbol *** indicates statistical significance at the 1% level*

expectations, long-term decline in the slope of the Phillips curve (IMF, 2013), the role of fiscal policy stance (Friedrich, 2014) could be put forward as tentative explanations. The reported results show that both output growth and inflation rate have a considerable degree of persistence, as indicated by the statistically significant positive AR (1) term in all equations.[1] As for the money coefficients, which are the focus of this paper, (Table III and Table IV) demonstrate that the sum of the money coefficients ($\sum_{j=0}^{T} \beta_j^M$) are estimated to be significantly positive in all equations, implying that an increase in money supply is associated with higher output growth and inflation across all the economies irrespective of level of FD. Meanwhile, the higher coefficients for the HFD in the output specification clearly indicates more effective monetary policy in terms of promoting economic growth. Again, the lower coefficient size for the inflation specification associated with the HFD in Table IV validates that the reliance of the developed world on monetary policy is not a whimsical one, as it is also capable enough in generating controlled inflation. Although for the LFD, the monetary policy is significantly contributing to growth, but it may generate a high level of inflation. Considering the combined results (from Tables III and IV) derived from the disaggregated data set, it is quite apparent that monetary policy is more effective for the HFD in generating both output

[1] The conducted model experiments allowing for more lags in the regressions confirm that the coefficients with higher lag order are statistically insignificant as well as not being the focus of the study which is why they are not reported

growth and controlled inflation as compared to the LFD. Surprisingly, these findings contradict the recent study of Ma and Lin (2016).

However, they are consistent with the notion that FD enhances both scope of action and subsequently performance of monetary policy as propagated by the studies of Luis et al. (2010), and Krause and Rioja (2006). Theoretically, the positive influence of FD on MPE is also quite plausible. The differences in the findings between the two studies, following almost similar methodologies for the disaggregated data set, could be attributable to modifications in estimation techniques and sampling methods. Firstly, this study has adopted more proper FEM-corrected estimates to handle heteroskedasticity, serial-correlation and cross-sectional dependence, which are prevalent in this sub-sampled macro panel (as N<T) data (Hsiao, 2007).

Table IV - Financial development & monetary policy effectiveness: baseline results

Dependent variable $-\Delta P_t$ (FEM-corrected)		(1992-2014)
Independent Variables	HFD Subsample	LFD Subsample
Constant	0.6715***	0.5619***
ΔP_{t-1}	0.5236***	0.0227***
$\sum_{j=0}^{T} \beta_j^M$	0.0315***	0.4025***
$Crisis_t$	0.3221***	9.2123***
Number of Observations	480	320
Number of Economies	24	16

*Note: (i) ΔP is inflation (CPI) rate (%),(ii) $\sum_{j=0}^{T} \beta_j^M$ is the sum of the money growth coefficients;(iii) Crisis is the crisis dummy ; (iv) the symbol *** indicates statistical significance at the 1% level*

But it is noteworthy to mention that static linear panel methods may not be perfectly appropriate for the dynamic panel specifications used in this study, justifying the backdrop of the alternative empirical setup. Secondly, as compared to the latest study, a more prudent sampling technique has been applied for this study which contains a balanced mix of developed, developing and even least developed economies. It is found that Ma and Lin (2016) covered economies possessing relatively developed financial structure (31 out of their 41 economies are developed economies; and the rest of the economies, which are classified as developing economies, have quite developed financial systems). Their sample has not considered a wide variety of economies to provide a comprehensive coverage of FD. So, their findings could imply that beyond a threshold level, FD reduces MPE, in the economies with relatively

developed financial structures, possessing deep and larger markets, a wide range of financial instruments and diversified financial intermediaries. In very highly developed financial systems, complexities in the financial structure impede growth like what has been experienced during the global financial crisis of 2008, particularly by many developed economies. But, this study has pointed out that those contrasting findings can be explained through having a well-balanced sample (including more heterogenous economies), satisfying the notion of prudent sampling to give a comprehensive coverage of FD (in this sample, half of the economies are developed and the remaining half represents both the developing economies and LDCs). It helps to capture the divergence in FD, to meaningfully explain that a real gradual shift from a

Table V - Financial development & monetary policy effectiveness: alternative empirical setups

Dependent variable – EG_t (System GMM) correcting for Bias (considering 2 lags)	(1992-2014)		(40 economies)
Independent Variables	System GMM	System GMM	System GMM
EG_{t-1}	0.3073***	0.2368***	0.3103***
$\sum_{j=0}^{T} \theta_j^{FDM}$	0.0007*	0.0007*	0.0008*
$Crisis_t$	-2.0812***	-2.3085***	-2.2161***
Hansen Test (p-value)	0.72	0.23	0.28
Arellano-Bond AR(2) Test (p-value)	0.51	0.80	0.48
Number of Observations	800	800	800
Number of IVs	27	39	33

Note:(i) EG is real GDP growth rate (%),(ii) $\sum_{j=0}^{T} \theta_j^{FDM}$ *is the sum of the coefficients of the interaction terms* $FD_{i,t}\Delta M_{i,t}$ *;(iii) Crisis is the crisis dummy; (iv) the symbol *** indicates statistical significance at the 1% level*

low to high level of FD can improve MPE. The regression equations (3) and (4), for the aggregated panel dataset are estimated installing the System GMM estimators (as N>T), which are supposed to be the best option for these types of dynamic panel models. As the concentration of this alternative empirical setup is to cross-check the findings derived from the baseline framework, it has solely focused on the sum of the coefficients of the interaction terms, skipping a detailed discussion on the other coefficients which have altered neither in direction nor in significance of relation, as portrayed in the baseline results. Tables V and VI illustrate the results considering the more appropriate techniques to tackle both simultaneous and

dynamic panel model bias. As this study prioritizes whether monetary policy promotes economic growth or not, different sets of assumptions have been incorporated within the System GMM estimation process (Table V) to capture the influence of monetary expansion on economic growth (not for inflation in Table VI). In all the 3 cases (Table V), the sum of the coefficients of the interaction terms $\left(\sum_{j=0}^{T} \theta_j^{FDM}\right)$ are strictly positive and significant, implying that FD improves MPE in terms of economic growth, which contradicts the findings of Ma and

Table VI - Financial development & monetary policy effectiveness: alternative empirical setup

Dependent variable – ΔP_t (System GMM) correcting for Bias with Robustness check (considering 2 lags) (1992-2014) (40 economies)	
Independent Variables	System GMM
ΔP_{t-1}	0.8023***
$\sum_{j=0}^{T} \theta_j^{FDM}$	-0.0010***
$Crisis_t$	1.9324***
	-
Hansen Test (p-value)	0.14
Arellano-Bond AR(2) Test (p-value)	0.35
Number of Observations	800
Number of IVs	27

*Note: (i) ΔP is inflation (CPI) rate (%),(ii) $\sum_{j=0}^{T} \theta_j^{FDM}$ is the sum of the coefficients of the interaction terms $FD_{i,t}\Delta M_{i,t}$;(iii) Crisis is the crisis dummy;(iv) the symbol *** indicates statistical significance at the 1% level*

Lin (2016), but perfectly matches with other previous studies as well as the baseline results (Tables III and IV). For inflation, as well (Table VI), the solitary scenario has exhibited a statistically significant negative impact of the sum of the coefficients on inflation, perfectly complying with the baseline results implying that FD weakens the inflationary pressure created by monetary expansion and raises MPE. The literature (e.g. M. Gillman et al. 2007) covering numerous studies has exhibited uni-directional causation from inflation to financial development where excessive inflation, is proved to be detrimental for overall development of the financial sector. Considering the literature, the findings of this segment bears prominence and expands the avenue for further research regarding both the transmission mechanism and

uni or bi-directional causal relation between financial development and inflation. So, the similarity in findings between the baseline and alternative empirical frameworks signifies the robustness of the findings regarding the positive impact of FD on MPE and consequently has addressed the historical contradiction. The data structure and types of specifications used in this study strongly recommend relying on the findings derived from the alternative empirical set. This positive nexus between FD and MPE has also been well projected in the literature, which makes the findings of this study extremely robust. In a comprehensive endeavor to portray the probable positive influence of financial development on monetary policy transmission, Singh et al. (2008) have summarized the key findings based on the literature review. The summary has revealed that although capital account liberalization, as a part of financial liberalization could make domestic monetary policy less effective, but other means of liberalization - such as promotion of greater competition through relaxing entry barriers, interest rate deregulation and gradual shift from the bank-based financial system with a view to financial disintermediation speeds up MP transmission. Correspondingly, they have also argued that various forms of financial innovation, like securitization and derivatives, boosts and accentuates MP transmission. All these findings imply enhancement of MPE with FD, validating this study.

5. Concluding remarks

In spite of the rising inquisitiveness among researchers about the influence of FD on MPE, the number of empirical studies exploring the answer is quite limited. This could be due to lack of comprehensive data sets, unanimously agreed upon measures and strong theoretical groundwork underpinning the associations between FD and monetary policy performance. Moreover, there are significant differences in approaches, methodologies and most importantly in findings. Considering the contradicting findings of the previous research, this study has attempted to derive a set of generalized conclusions about the direction of relation between FD and MPE. This study (for both aggregated and disaggregated data sets as well as for different estimation techniques) has reconfirmed that the influence of monetary policy in conjunction with financial development on output growth and inflation tends to be positive and negative, respectively, although quite meager in magnitude, where the System GMM for the combined data set is thought to be the more appropriate estimation technique as it addresses the endogeneity problem. It implies that FD enhances MPE. As monetary expansion, along with financial advancement can cause sustainable growth, financial development is instrumental in policy effectiveness. Consequently, the level of financial development must be considered meticulously for appropriate monetary policy formulation. Expansionary monetary policy could be more effective in developed economies for output expansion and influence inflation more in the developing world.

To conclude, it is noteworthy to point out that this study has not considered the economy specific socio-political-economic backdrops containing a variety of other factors which could also impact monetary policy performance along with FD, such as – size, autonomy and efficiency of central bank, membership to monetary union, explicit inflation targeting regime, divergence in inflation persistence, depth and performance of the stock market, structural breaks, extent of dollarization. The greatest limitation of the analyses stems from the non-existant theoretical framework for monetary transmission incorporating FD. Based on data availability, further development will not only stimulate more empirical research following the appropriate methodologies but also could encourage development of unexplored research-fields.

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