The co-movement of monetary policy and its time-varying nature: A DCCA approach

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HIGHLIGHTS

- Higher degree of monetary coordination for advanced economies as compared to emerging economies.
- Role of flexible exchange rates in enabling monetary autonomy is rather limited.
- Capital controls do enable monetary autonomy specifically in the emerging economies.
- Strong trade and financial linkages result in higher monetary coordination.

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ABSTRACT

Employing a novel methodology of DCCA cross-correlation coefficient ($\rho_{DCCA}$), this study attempts to provide fresh evidences for the co-movement of monetary policies of the advanced (AEs) as well as the emerging economies (EMEs) vis-à-vis the United States. A higher degree of monetary co-movement as measured by $\rho_{DCCA}$ values, is identified for the AEs as compared to the EMEs. Lower co-movement of monetary policy is especially noticeable in the short run for EMEs. We further investigate the time-varying nature of such co-movements for the AEs by splitting the period (1980–2014) into four sub periods and also by performing a rolling window estimation for the entire period to reveal smoother dynamics. Significant evidence of higher monetary coordination is revealed for sub-periods with stronger trade and financial linkages.

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1. Introduction and literature review

The ability to conduct an independent monetary policy (not being influenced by the monetary policy of large center economies) has been an area of extreme interest for theoretical as well as empirical researchers in the field of open economy macroeconomics. In general, the Mundellian trilemma, a hypothesis forwarded by [1], asserts that an open economy can select only two of the three macroeconomic policy options: free capital flows, fixed exchange rate regime, and monetary independence. Thus, an economy can choose to have an independent monetary policy, focusing solely on its domestic objectives either by opting for freely flexible exchange rate regime with capital openness or by opting for fixed exchange rate regime but with extensive restrictions on capital flows. With time, majority of economies worldwide have shifted to relatively flexible exchange rate regimes with the advanced economies (AEs) following a de-facto freely flexible exchange rate regimes. It is therefore expected that there should be no systematic evidence of correlation or co-movement of domestic policy rates with the monetary policy in a base economy such as US. However, it has been argued that the rapid globalization...
which has progressively increased the trade and financial linkages amongst economies have rendered the trilemma invalid.
In the last few decades, economies worldwide have witnessed strong trade and financial linkages that has been growing continuously over the years. Both trade and financial integration accelerated in the globalization era post-1990. It has been argued that such strong trade and financial linkages have made it difficult to embrace monetary autonomy even by adopting a freely flexible exchange rate regime. Recently, [2] has forwarded empirical evidences of significant monetary coordination between AEs and has also suggested the role of trade and financial integration in strengthening monetary coordination amongst economies. The previous studies which have forwarded empirical evidences for monetary coordination amongst economies or have attempted to test the validity of Mundell trilemma have employed econometric investigations which require transformation of the data series if they are found to be non-stationary. Such transformations may not allow the actual information to be used in empirical investigations. This study take a different approach for the objective of investigating monetary coordination amongst economies and attempt to provide fresh evidences for the co-movement of monetary policy by using a novel methodology of DCCA cross-correlation coefficient ($\rho_{\text{DCCA}}$) which can be applied on non-stationary data series, even with differing orders of integration [3].

The empirical literature investigating the Monetary co-movements have been primarily normative. In the recent years, there has been an attempt to provide fresh evidences for monetary co-movements using various econometric techniques and the findings are mixed. Obstfeld [4] forwarded empirical evidences that the economies with flexible exchange rates have lower connection with the base country interest rate as compared to those economies with fixed exchange rates. Similar evidences have been forwarded by [4–6] who have also found that the monetary policies in economies with flexible exchange rates are less correlated with the base economies and hence it assists in providing insulation to monetary autonomy. On the other hand, [7–9] have found evidence of policy spillovers and significant correlation of short term rates between economies even with flexible exchange rates.

To summarize, there is a vast empirical literature that aims to decipher the information hidden in economic data to throw light on the validity of Mundell trilemma and thereby assist the policymakers worldwide in dealing with a host of issues in open economy macroeconomics. However, there is a great deal of inconsistency in the findings till date. Since, economic systems are complex systems, statistical physics can be of immense help in solving the issues economists face by providing fresh dimensions to the economic puzzles and dilemmas. This approach comes under the purview of “econophysics”, a term which was first introduced in 1995 and deals with a plethora of mechanisms whereby physicists aim to decipher the highly interdependent signals in economic systems.

Stanley et al. [10,11] provide an adept exposition of how the tools of statistical physics can be used to explore economic phenomenon and solve empirical challenges based on real data which economists face. A discussion of the historical development of the association between physics and economics can be found in [12].

Stanley et al. [13] highlight that approaching an economic problem from the point of view of an economist as well as a physicist is important as it may present new insights about the economic phenomenon. The techniques of econophysics have been used effectively to shed light on various economic and financial issues [12,14–16]. The impact of US monetary policy on US Dollar index and Crude oil market has also been investigated in the field of econophysics [17]. However, there are very few studies which have extensively investigated the interdependence of interest rates amongst economies even though such economic phenomenon is very important from the perspectives of policy making as well as economic outcomes.

Lee et al. [18] investigated the interdependence of term structure of interest rates for US, UK and Japan using spectral analysis and factor methods. This study specifically aims at the co-movement of monetary policy to provide fresh insights into the ongoing debate on the validity of Mundell trilemma and the benefits of flexible exchange rate regimes. The impact of the transition of exchange rate regime in an economy from managed to independent float on its market efficiency has already been investigated using multifractal analysis by [19].

The choice of the center economy in our study draws from the previous studies aimed at investigating policy spillovers. Even though the impact of monetary shocks originating in other large AEs like Eurozone, Japan and China have received due attention, the empirical studies are primarily concerned with the monetary shocks originating in the US. This is primarily because of the large size and dominance of the US economy and the worldwide adoption of US Dollar as a reserve currency. This implies that the steps taken by Federal Reserve with an objective of maintaining a robust financial system domestically, do have inevitable international consequences. Hence, the focus here is on the monetary coordination amongst economies with US as the base economy.

Further, it is expected that any such interdependence of monetary policy between economies would not have stayed constant across time and hence it deserves time-varying analysis as well. The findings of time-varying co-movement have been somewhat mixed in the empirical literature so far, with [20] providing evidence for lesser degree of co-movement of business cycle in the globalization period as compared to the common shocks period. Chatterjee [2] on the other hand have found a stronger co-movement for the globalization period. A few studies have attempted to establish changes in the dynamics for the interdependence of economic variables by investigating pre-GFC and post-GFC phenomenon in the field of econophysics. Fernandes et al. [21] investigate the contagion effect by analyzing pre-crisis and post-crisis episodes on G-7 countries. Similarly, [22] analyze the evolution of market efficiency in the pre-crisis and post-crisis periods. This study splits the sample period into four episodes of changing economic dynamics and illustrates dynamic relationships. We also investigate the continuous time-varying dynamics by following a rolling windows approach for our estimation. This would highlight the transition in policy coordination which may have occurred smoothly over time.
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