



Investigating The Integration Of Financial Markets In India: A Time Series Analysis

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Abstract

This paper attempt to analyse the integration of financial markets based on time series data of four markets, namely money market, government securities market, stock market and forex market. Time series tools like unit root test, Johnson Co-integration method, Error correction model (ECM) and Granger causality test are applied. Based on study, it was found that money market shows integration with all other markets but there still remains some rigidities in other pairs of markets in the form of capital control. Based on short-term granger causality, it was found that that each market is impacted by forex market but vice-versa is not true. This shows the insignificance of Indian financial sector to impact the vast forex market.

Keywords: Financial Integration, Co-Integration, Time Series Analysis, Financial Reforms

JEL Classification Code: C01, E44, F36

Introduction

Financial Markets plays an important role in the economic growth of any economy. They help in channeling all sources of economic growth, through both supply side (savings, productive capacity, etc.) and demand side (consumption, investment, import-export, etc.). Financial markets also play its social role in the form of channeling wages, insurance, subsidy, and pension. Thus, a robust financial system is essential for economic growth, and a repressive financial regime, characterized by under savings, price distortion and non-market determined return on saving and investment, leads to inefficient allocation of resources and impedes the growth.

Before 1991, the financial markets in India were marked by administered interest rates, captive market for government securities, quantitative ceilings, statutory pre-emption, central bank financing of government borrowings, pegged exchange rates, and current and capital account controls. Since 1991, various reforms measures were undertaken in different sectors of financial markets in the form of liberalization and deregulations. Focus of these reforms has been to develop the market mechanism for all the niche of financial market and develop the overall financial system as an integrated-one (Mohan, 2007). Over the period, there has been a complete transformation in the functioning of money market, government securities market and foreign exchange market. An integrated financial system is characterized by deep and liquid financial market leading to efficient price discovery in each segment of market. This also improves the functioning of central bank policy decision by enabling the quick transmission of policy changes through entire spectrum of market rates (Acharya, 2020).

Integrated financial markets enhance the liquidity and helps in risk diversification, thus achieving the markets allocative efficiency and reduction of capital barriers. Financial integration also has macroeconomic implication as it plays an important role in determining the effectiveness of domestic monetary and fiscal policy in influencing the aggregate demand as well as promotion of savings and investments. Integrated financial markets also helps a country to emerge as an international financial center (Bhunia, 2012).

This paper attempts to measure the degree of financial integration among financial markets of India since 2004. This is due to the adoption of benchmarking system in banking system. With this system the banking system is expected to become efficient. Since Indian financial system is dominated by banking system, this may have contributed in financial integration of overall financial sector. The remaining paper is arranged as follows- Section I provides the basic conceptual framework of working of markets in an interdependent manner. Section 2 have reviewed some past literature relevant to the present topic of the study. Section 3 provides details of data source and research methodology used in the paper. Section 4 summaries the results and section 5 conclude and provides policy implication.

Conceptual Framework

Financial markets are expected to be integrated through various channels, primary ones being (i) Interest rate channel, (ii) Credit channel, (iii) Exchange rate channel, and (iv) Asset price channel.

Money market and stock market are expected to move in a way that an easy or low interest rates increase the liquidity in the financial system. This induces the money to flow in stock markets leading to rise in price-to-earning (PE) ratios. Similarly low interest rates leads to increased flow of funds towards the government securities(G-Sec), leading to lowering of rates of T-bills and G-Sec. Also, domestic interest rates are integrated with foreign exchange market through forward premia. A rise in domestic interest rates raises the inflow of foreign capital in expectation of better returns. This rise in capital inflow leads to increase in demand of foreign currency in forward market, thus leading to rise in forward premia.

Stock markets are also integrated with money markets. A rising stock market raises the liquidity in the system, thereby a decrease in interest rates. Similarly, it lowers the rates of government securities. A rising stock market also attracts Foreign Portfolio Investors (FPIs) and Foreign Institutional Investors (FIIs). This also increases the demand of foreign currency in forward market, thus causing a rise in forward premium.

The impact of foreign exchange market on government securities market depends upon the degree on which foreign investors are allowed to freely participate in government securities market. Till recently, the government securities markets have not been opened for foreign investors.

Economists have regularly flagged the risk of contagion of integrated financial markets. This has been the case in East Asian Financial Crisis (1997) and Global Financial Crisis (2007-08). These financial crises had their origin in financial sectors and had impacted the real economy very hard. But the need of an integrated financial market for economic growth and vice-versa is unparalleled.

Literature Review

The study of financial integration has been done at many levels, both domestically and internationally. Bhoi and Dhal (1998) attempted to empirically evaluate the extent of integration of India's financial markets in post-liberalization period from 1993 to 1998. Using time series analysis, they concluded that several segments of domestic financial markets have achieved operational efficiency and are increasingly integrated. However, the integration of domestic and overseas financial markets was not found to be robust.

Jain and Bhanumurthy (2005) examined the issue of integration of India's financial markets with overseas financial markets in the context of growing movement of capital flows. Using multiple co-integration approach, the study founded that domestic call money market has strong integration with London Interbank Offer Rate (LIBOR). Also, domestic foreign exchange market was founded to show long-term co-movement with LIBOR, but it is not robust. Finally, Government securities market was not founded to be integrated with international market. The study concluded that policy reforms are necessary to increase integration of financial markets.

Bhatt and Virmani (2005) studied the global integration of India's money market by checking for interest rate parity. They applied simple OLS regression on interest rate differential and forward premium. The study showed that the short-term money market in India (up to 3 Months) was getting increasingly integrated with USA, but far from perfect. Also covered interest parity was found to be hold but uncovered interest parity was not holding. RBI foreign intervention could have played its role in this.

Bhunja (2012) examined the relation of stock markets in India with some leading South Asian countries by using daily stock indices from August, 2002 to August, 2011. By applying bivariate and multivariate co-integration tests and the Granger causality tests, the study shows both short-term and long-term integration among the selected markets. This shows that investors can reap the benefits of investment diversification and risk reduction.

Wong, et.al (2005) empirically investigated the long-run equilibrium relationship and short-run dynamic linkage between the Indian stock market and the stock markets of major developed countries (United States, United Kingdom and Japan) after 1990 by examining the Granger causality relationship and the pairwise, multiple and fractional cointegrations between the Indian stock market and the stock markets from these three developed markets. The study concludes that Indian stock market is integrated with mature markets and sensitive to the dynamics in these markets in a long run. In a short run, both US and Japan Granger causes the Indian stock market but not vice versa.

Agenor (2001) provided a selective review of the analytical and empirical literature on the benefits and costs of international financial integration. It discussed the impact of financial openness and capital flows on consumption, investment and growth, as well as the impact of foreign bank entry on the domestic financial system. For small open developing countries, the benefits of financial integration are mostly long term in nature, whereas risks can be significant in the short run. Careful preparation and management are therefore essential to ensure that short-run costs do not lead to policy reversals. It also stressed that the empirical evidence on the impact of foreign direct investment on domestic capital formation and growth, as well as on the effects of foreign bank entry, should be viewed with caution. The possibility that foreign bank penetration may lead to adverse changes in the allocation of credit cannot be dismissed on the basis of the existing evidence.

Kaminsky and Schmukler (2001) studied whether the capital control affect the integration of domestic and foreign stock market prices and interest rates by applying band-pass filter techniques. The study found that markets seem to be more linked at longer horizons. Also, there was little evidence that capital controls effectively segment domestic market from foreign markets. When they do, the effect seems to be short lived. Also, the effect of control on outflows does not differ from the effect of control on inflows.

Kaur and Arora (2018) investigated the level of correlation and co-integration among the different financial markets of India for the period ranging from 2000 to 2015. It applied co-integration test for long-term association and granger causality test for short-run causality among the different variables. The study found that there is no long-run statistically significant association between equity, currency, commodity and bond markets. Also, there was strong empirical evidence of short-term causal linkages among the four markets.

Nath and Samanta (2003) examined the extent of integration between foreign exchange and stock market in India during the liberalization era from April 1993 to March 2003. The database covers daily observation of stock price index and exchange rate of Indian Rupee. Empirical analysis is carried out by employing Granger's causality test in vector auto-regression (VAR) framework and Geweke's feedback measures. While VAR framework shows very poor causal link between the two markets in most of financial years, Geweke's feedback measure detected strong causal link in each financial year. So, the study recommended further rigorous investigation to settle the debate.

Data and Methodology

To examine the level of financial integration, this paper uses four financial markets and one market rates for each market. The four markets and their respective rates are-

1. The Money Market- Weighted Average Call Money Rate (WACMR)
2. The Government Securities Market- G-364 Rate
3. The Stock Market- Average Price/Earnings Ratio of BSE Sensex (PE)
4. The Foreign Exchange Market- 3 Months Forward Premia (Inter-bank) (FWD3)

The data series for each market is monthly from January 2004 to July 2023, with 235 data entries for each series. The main source of data is Handbook of Statistics on Indian Economy, published by Reserve Bank of India (RBI).

The relationship between two markets can be determined by applying simple classical regression model. But before proceeding, it is necessary to check for stationarity of the time series data. If it is applied on non-stationary time series, the results can be spurious. Augmented Dickey Fuller (ADF) test is applied to check for stationarity of time series data. One of important pre-requisite for applying time series analysis is that all time series should be integrated of same order. ADF test is for checking unit root in the time series with a null hypothesis of presence of unit root. Unit root test is checked at both, level and first difference. (The unit root test can be studied at any basic book on time series econometrics).

After checking for unit roots, Johnson's co-integration test is applied on the time series. One of the pre-requisites for applying Johnson co-integration test is that all the time series should be non-stationary at the level and stationary at first difference. For applying co-integration test, both Akaike's Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) are followed. Long-run co-integration is further confirmed by applying error correction model on the pairs of markets showing co-integration.

The co-integration test simply shows about the presence of any long-run relationship between the markets. It does not talk about the direction of relationship. This can be found by applying Granger Causality test.

Empirical Results

All time series data were found to be non-stationary at the level and stationary at first difference (Table 1). Co-integration test revealed that money market shows long-run relationship with all other markets (Table 2). Of all these, special mention of integration between forex market and money market is required. Because of presence of foreign banks and free capital movement in money market, Indian money market seems to have integrated with forex market.

Forex market did not show any significant level of integration with both government securities market and stock market. This is due to presence of significant level of barriers to free movement of foreign capital in these markets. Till recently, foreign capital was not allowed in government securities market. Over time, this may change with recent decisions by JP Morgan & Chase and Bloomberg's decision of inclusion of Indian bonds in their global indices. For stock market, though there are reduction in barriers for foreign investors, but there are still some barriers for free movement of capital flows in domestic stock market.

One of interesting result from co-integration test is that domestic stock market and government securities market does not show any long run relationship. This can be due to the presence of irrational exuberance and high volatility in stock market that cannot be explained by G-Sec market.

Result of error correction model (ECM) also showed that money market shows the tendency to correct any deviation in its rates with all three markets. This has confirmed long run relationship of money market with stock market, government securities market and forex market (Table 3).

The granger causality test between stock market and money market implied that the causality runs from stock market to money market and not vice-versa (Table 4). Similarly, there were evidence of bi-directional causality between government securities market and money market. Between forex market and money market, the causality runs from forex market to money market only. In fact, in all cases with forex market, the causality runs from forex market to the other market and not vice-versa. This indicates that the forex market impacts all other markets in short-run, but other markets are unable to impact the vast liquid forex market alone. Forex

markets are impacted by global forces beyond the control of single economy like India. Lastly, in case of stock market and government securities market, the short-run granger causality runs from stock market to government securities market. Hence, in case of causality between stock market and Government securities market & Money market, it runs from stock market to other two markets and not vice-versa.

Conclusion

Based on the study, it can be said that there is long-run relationship between money market and all other markets. In other pairs of markets, there are no long-run relationship based on Johnson co-integration test. One of interesting result is the absence of relationship between domestic stock market and government securities market. Short-term causality also runs from forex market to all other markets. The reverse of this is not true for all markets. This shows the insignificant impact of Indian financial markets on vast global forex markets. In short-run, the government securities markets are impacted by all markets. Also, stock market impacts both money market and G-Sec market. Thus, it follows that, though there has been significant progress in functioning of financial markets in an integrated manner, there still remains some barriers to capital flows.

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Appendix

Table 1 Unit Root Test results

	At Level	At Ist Difference
WACMR	-2.6031	-10.9554
PE	-2.6149	-7.2309
G_364	-2.2846	-16.6016
FWD3	-1.8900	-13.3487

The critical values are -3.4588 at 1% level and -3.8739 at 5% level.

Table 2 Co-integration Test results

	Trace Statistics	0.05 Critical Value	Prob.
WACMR, PE	25.0567	20.2618	0.0101
WACMR, G_364	75.0387	12.3209	0.0000
WACMR, FWD3	31.4874	20.2618	0.0000
FWD3, G_364	14.7628	20.2618	0.2403
FWD3, PE	10.3210	20.2618	0.6083
G_364, PE	16.7407	20.2618	0.1425

Source: RBI Handbook of Statistics on Indian Economy

Table 3 Error Correction Model

	Coefficient of ECT	Prob.
WACMR & PE	-0.1457	0.0000
WACMR & G_364	-0.5104	0.0000
WACMR & FWD3	-0.1802	0.0000

Table 4 Granger Causality Test results

<u>Causality</u>	<u>Prob.</u>
PE→WACMR	0.0114
WACMR→PE	0.2413
G_364→WACMR	2.E-09
WACMR→G_364	0.0177
FWD3→WACMR	2.E-06
WACMR→FWD3	0.7114
G-364→PE	0.6102
PE→G_364	0.0120
FWD3→PE	0.0145
PE→FWD3	0.3783
FWD3→G_364	0.0257
G_364→FWD3	0.2155

Note: The Null hypothesis of $X \rightarrow Y$ is that “X does not granger causes Y”.