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Capital controls and capital flow volatility during global shocks: Indian experience

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Abstract

This paper examines the issue of capital controls in India and their effectiveness in stabilizing the capital flow volatility in the economy. It documents the evolution of the capital controls regime in India since its economic liberalization in 1991 and focuses on India's experience with capital controls in the period leading up to the Global Financial Crisis (GFC) of 2008 until the taper tantrum aftermath in 2013. We construct a capital controls index based on data from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). The index shows careful ease of capital controls by Indian policymakers in the financial sectors, i.e., the capital market, money market and direct investment, over the 2001–2008 period. The index further shows that the process of decontrol in the capital market stagnated during 2009–2014 due to the GFC to insulate the Indian economy from global shocks. This paper further explores the impact of capital controls in managing capital flow volatility in the context of the GFC. Using the tobit estimation approach, we show that capital controls effectively reduce capital flow volatility in the pre-GFC period followed by a limited impact post-GFC. This complements the capital account liberalization process during pre-GFC period. Our findings support India's prudent approach to capital account management as financial markets evolve to manage risk efficiently in a large economy.

Keywords: Capital controls, Capital flow, Current account deficit, Exchange rate, FDI, FII, Global financial crisis, IMF AREAER.
JEL Classification: E4; E5; F3; F4.

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Contents

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Contribution of this paper to the literature
This paper makes two key contributions to the literature. First, it provides an analysis of the changes in the capital control regime in India pre- and post-GFC and its implication for capital flows. Second, it shows that the effectiveness of control regimes in managing capital flow volatility reduced during the post-GFC period.

1. Introduction

Capital flows to emerging economies have an extensive impact on their short-term financial needs and their long-term economic goals.[1] Foreign capital relaxes credit constraints, brings knowledge and discipline to the host country, augments investment resources, and increases capital allocation efficiency and productivity, thus enhancing economic growth (Ahmed & Zlate, 2014; Harrison, Love, & McMillan, 2004; Tong & Wei, 2011). However, capital inflows also hurt economic performance through several channels – transfer of resources from tradeable to non-tradable sectors, leading to slow productivity growth; financial market volatility due to episodes of sudden stops after large capital inflows; exchange rate volatility; and high foreign debt exposure (Benigno, Converse, & Fornaro, 2015; Calvo & Reinhart, 2000; Gourinchas & Obstfeld, 2012).

Several emerging economies have experienced multiple episodes of volatile capital flows during the 1980s and 1990s (Forbes & Warnock, 2012). Capital flows dried up in the late 1990s, but they surged again during the mid-2000s, followed by sharp contraction during the 2008 Global Financial Crisis (GFC) and remained highly volatile post-GFC and until after the taper tantrum[2] episode in 2013. These episodes posed serious risks to the macro-financial stability of economies with thin domestic financial markets, placed higher dependence on global finance, limited export capacity, and weakened the policy framework and buffers (Borio, James, & Shin, 2016; Bruno & Shin, 2015; Coeurdacier, Hélène, & Pablo, 2019; Kim, 2012). Such instances and structural economic vulnerabilities led these economies to adopt regulatory measures, such as capital controls, to manage macro-financial stability risks related to capital inflows.[3]

India, as one of the major emerging economies, maintained a calibrated approach to capital control measures since the 1990s, gradually liberalizing them in the following decades. During this period, India experienced strong economic growth and managed to recover more robustly from the GFC compared to other emerging economies (Gallagher, 2011). Given this background, this paper aims to analyze India's capital controls regime in the light of global financial crisis and the role of capital controls in restricting capital flow volatility during global shocks (the GFC of 2008 and the taper tantrum episode of 2013). We aim to answer two related research questions here. First, what is the effect of capital controls on capital flows? Second, does an increase in capital control measures reduce the capital flow volatility for the Indian economy.

For the first part of our analysis, we constructed a capital control index with 13 categories using qualitative data on restrictions on the capital account for the 2001–2014 period, comprising the pre- and post-GFC phases. Further, we aggregated the index for capital inflows and outflows and finally constructed an aggregate capital control index for net capital inflows. We first illustrate that the net capital control index eased before the GFC, and the net inflow increased during this period. After the GFC, net capital control increased in the face of volatile capital inflows. Using the disaggregated categories of the capital control index for foreign direct investment (FDI) and foreign institutional investment (FII), we also depict that FII-based capital control measures follow similar dynamics as the net capital inflows. However, FDI-based capital control measures eased until 2005 and remained stagnant afterwards. As expected, FDI inflows consistently rose, being the more stable category of capital inflows. We further show a gradual relaxation of capital control measures for inflows and outflows. Finally, we also illustrate that the capital control measures for the capital market, money market, and direct investment consistently declined during the 2004–2014 period.

In the next part of our analysis, we estimate the impact of capital controls on the volatility of capital flows using the tobit model estimation. We include key macroeconomic control variables (inflation, current account to GDP, and the interest rate differential between India and the USA) in our estimation procedure. The full period (2001–2014) estimation shows that capital controls are highly effective in reducing capital flow volatility in India. We further split the data into pre- and post-GFC periods to analyze the relative effectiveness of capital control for managing capital flow volatility. We found that capital controls significantly reduced capital flow volatility in both periods. However, they were relatively more effective during the pre-GFC period compared to the post-GFC period.

Our results indicate that India cautiously relaxed its capital control measures for different categories of capital control during the pre-GFC period and experienced increased capital inflows. However, post-GFC they gradually imposed the capital control tools to manage capital flow volatility. Based on the estimation results, these measures remained effective in managing moderate capital flow volatility during the pre-GFC period, but they had limited success in reducing financial fragilities in the post-GFC phase.

Our results nicely dovetail with the existing literature that has mostly focused on the general impact of capital controls on the gross capital flows and exchange rate. Magud, Reinhart, and Rogoff (2011) summarized that capital controls allow some space for monetary policy independence and partly alter the composition of capital inflows. Several other studies used a cross-country framework and analyzed the countercyclicality of capital controls and the effectiveness of different types of capital control measures (Cerutti, Claessens, & Laeven, 2017; Fernández, Rebucci, & Uribe, 2015). Several related studies analyzed country-specific evidence (i.e., in Chile and Malaysia) on capital control and found it to have a limited impact on capital flows and was ineffective in preventing currency volatility (Edwards, 2004; Forbes., 2005). However, previous studies have not examined the

[1] Capital inflows help a country to access funds for high yield investments, inducing growth in the economy. Capital inflows in the form of foreign direct investment (FDI) also bring better technology and management techniques that help to raise economic productivity and growth. Capital outflows provide an opportunity for individuals and firms to access the global market to earn high returns on financial assets, diversify the risk, borrow low-cost funds that help to reduce volatility, and facilitate smooth consumption and income in the economy. It was believed that such global integration and opening up the economy would enhance a country's welfare more than a closed economic system.
[2] Taper tantrum refers to the period between May and August of 2013 when the US Federal Reserve signaled a reduction in the pace of monthly asset purchases that triggered the capital outflows from emerging markets.
[3] In the early 2000s, the International Monetary Fund (IMF) strongly criticized capital control measures as key obstacles to global financial integration that restrict the benefits of global capital flows. However, post-GFC, they reversed their stance on capital controls and supported their limited use in the face of volatile capital flows (Gallagher, 2011; Kohli & Belaisch, 2012).

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robustness of the capital control regime in India and the comparative effectiveness of capital controls during the pre- and post-GFC periods.

The remainder of the paper is organized as follows: Section 2 describes the types and purposes of capital controls; Section 3 documents the capital control regime in India since its economic liberalization in 1991; Section 4 provides details on the literature available on the measure of capital controls and the role of capital controls as a tool to limit the volatility of domestic financial markets and economic stabilization; Sections 5 and 6 provide details on the data and the methodology adopted to analyze the capital control regime in India; Section 7 presents the estimation results; and Section 8 concludes.

2. Capital Controls

Capital controls are tools used to limit or redirect capital account transactions in an economy. Capital controls refer to various measures such as taxes, price or quality controls, prohibitions on international trade in financial assets, etc. Stiglitz (2002) suggested that the relaxation of capital controls was a major cause of the East Asian Currency Crisis. It further argues that the rapid movement of funds into and out of the country is clearly destabilizing, which is a point brought home by the East Asian Crisis where capital flows, in some cases, exceeded almost 10% of GDP.

Capital market liberalization has not always led to rapid growth, rather it can lead to greater risks. Edwards (2004) argued that high capital mobility increases macroeconomic volatility and poses greater destabilizing effects from external shocks. This paper further posits that if capital flows decline suddenly, the country would be permanently left with a smaller export market. In addition, capital inflows cause bubbles and booms, especially in the real estate sector, that makes the economy more vulnerable. Hence, capital controls are also considered useful tools that limit currency volatility brought about by capital flows in developing countries.

Such a deep and negative impact of capital mobility strengthens the need for capital controls to stabilize the economy, especially in the context of emerging market economies. Considering the experience of several economies over the years, the IMF (2022) revised its institutional view to accommodate capital flow management measures as being useful in certain circumstances but should not be used as a substitute for warranted macroeconomic adjustment.

2.1. Types of Capital Controls

The different types of capital control measures are as follows:

- Market-based controls: Unremunerated reserve requirements and taxation of financial flows discourage the targeted transactions by increasing their cost.
- Administrative controls: Administrative controls prohibit or impose explicit quantitative limits on capital transactions because they often subject these transactions to the approval of the authorities.

Administrative controls are usually less transparent than market-based controls.

2.2. Purposes of Capital Controls

Capital controls have a long history, starting from World War I. The purposes of capital controls are as follows:

- Generate revenue/finance (during the two world wars of 1914–1918 and 1939–1945): Imposed on outflows.
- Enforce financial repression/credit allocation (developing countries): Imposed on outflows.
- Correct the balance of payment (BOP) deficits (US interest equalization tax 1963): Imposed on outflows.
- Correct the BOP surplus (German Bardepot scheme 1972–1973): Imposed on inflows.
- Prevent potentially volatile inflows (Chilean encaje 1991–1998): Imposed on inflows.
- Prevent financial destabilization (Chilean encaje 1991–1998): Imposed on inflows.
- Prevent real appreciation (Chilean encaje 1991–1998): Imposed on inflows.
- Restrict foreign ownership of domestic assets: Imposed on inflows.
- Preserve saving for domestic use: Imposed on outflows.
- Protect domestic financial firms: Imposed on inflows and outflows.

3. Capital Controls Regime in India

The Indian economy had an almost closed capital account in the post-independence period. However, India began the process of liberalization in the 1980s to benefit from globalization. Thereafter, India faced a balance of payment crisis in 1991, which led its policymakers to speed up market reforms. Since the economic liberalization in 1991, Indian policymakers have taken several steps to gradually liberalize the capital account, but numerous restrictions and controls remain unchanged. We discuss below the key changes in the capital control regime in the pre- and post-GFC periods.

3.1. S.S. Tarapore Committee I (1997)

Government of India constituted the Tarapore committee on capital account convertibility under the chairmanship of S.S. Tarapore. Its purpose was to provide a road map for capital account liberalization. The committee suggested various recommendations, including reducing the fiscal deficit, targeting medium-term low inflation, and fully deregulating the interest rates. It also suggested having a 5% band around the neutral real effective exchange rate (REER), the Reserve Bank of India (RBI) should intervene whenever the REER is outside the band, foreign exchange reserves should not be less than six months of imports, the forward exchange rate should reflect the interest rate differential, etc. Liberalization of capital inflows should be in tandem with the liberalization of capital outflows. Foreign direct investment and portfolio inflows should be regulated by transparent guidelines set out by the RBI and should obtain prior approval if needed. However, the East Asian crisis (1997) and its contagion effect reduced the possibility of the implementation of the Tarapore committee's recommendations. Since then, significant liberalization with respect to inward foreign investment occurred as

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economic conditions improved in India. In 2006, another Tarapore committee was constituted to explore the possibility of full capital account convertibility (FCAC).

3.2. Tarapore Committee II (2006)

The committee opined that full convertibility of the capital account should be adopted successively in three phases, i.e., 2006–07 (Phase I), 2007–08 and 2008–09 (Phase II), and 2009–10 and 2010–11 (Phase III). The objective of FCAC was to minimize the cost of capital, both equity and debt, to boost investments and growth in the Indian economy. The Tarapore committee emphasized that capital controls should be separate from procedural issues in order to monitor the capital controls more closely. Further, the committee recommended that all commercial banks should be brought under single banking legislation. To enhance banking system resilience amid crises, the committee recommended implementing robust risk management systems with stress testing frameworks. It recommended the adoption of an economic capital framework, and risk-based resource allocation. The committee also suggested that FII through participatory notes should be banned, and yearly limits of external commercial borrowing should be increased.

3.3. Policy Changes during 2006–08

Several policy measures were brought in to liberalize the economy after the second Tarapore committee report. Foreign investment up to 49% was allowed in stock exchange with the approval of foreign investment promotion board. Up to 100% of FDI was allowed in industries such as coal and lignite mining, petroleum and natural gas, and industrial explosives. (Rajan, Rongala, & Ghosh, 2008). Indian venture funds registered with the Securities and Exchange Board of India (SEBI) were allowed to invest in the equity of offshore venture capital undertakings. Individual residents were allowed to remit up to $50,000 (from $25,000 previously) in a financial year for any capital and current account transactions. The limit of overseas investments by Indian companies was raised from 200% to 300% of its net worth. The annual limit for residents' real estate acquisitions was increased from $10,000 to $20,000. An aggregate limit for overseas investments through mutual fund schemes was increased from $4 billion to $5 billion.

3.4. Capital Controls: After the 2008 Global Financial Crisis

The collapse of Lehman Brothers in September 2008 severely affected the global financial system. Its effects also spilled over into emerging market economies since they are more vulnerable due to weak economic fundamentals. The Indian economy also slowed down and registered lower growth compared to the pre-GFC period. Capital inflows dropped from $30 billion to slightly negative values in October to December 2008. It was also a testing time for the capital controls regime in the Indian economy. It needed to insulate the economy and minimize the risk of the effects of a global crisis on India's financial market. Due to the GFC, less intervention in the Indian capital account was observed, and it was occasionally tightened if deemed necessary by policymakers. Post-GFC, the capital account was rationalized to clear ambiguities for international investors in an attempt to win back their confidence.

India took a gradual approach and remained cautious in opening capital account due to the GFC.[4] The limit on foreign investment was gradually raised, and borrowing and outbound investment by domestic investors was allowed once the crisis settled. The Indian economy witnessed two different environments of capital flows, those before and after the GFC and, accordingly, the capital controls regime. Therefore, it is important to empirically explore the shape of the capital control regime in India during the GFC and its ability to contain volatility in the financial market.

4. Literature Review

This paper reviews two key strands of literature, the measurement of capital control using different types of qualitative survey data, and the role of capital controls in managing capital flows.

The first strand of literature focuses on different methods to measure capital control through different types of indices. The measures of capital control use information on legal restrictions on capital inflows and outflows of the economy. There is a vast amount of literature on the construction of capital control measures through an index which also evolved over time. Quinn (1997) provides the first method to measure capital restriction using the disaggregated Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) data. Quinn's openness index combines international current account transactions and capital account transactions. However, its methodology is more suited to the earlier format of AREAER data. Johnston and Tamirisa (1998) provided one of the most disaggregated measures of capital controls, which combines all the classifications of the IMF's AREAER data.

The study by Rossi (1999) focuses on 15 developing countries, and it constructs a separate index for capital inflow and outflow by modifying the method of Johnston and Tamirisa (1998). Glick and Hutchison (2005) studied panel data of 67 countries from 1975 to 1997 using IMF AREAER data on capital control measures. Miniane (2004) created an index with 13 categories using disaggregated data reported in the AREAER. This index captures the changes from no control to full controls. However, the method is binary in nature and is therefore not able to distinguish the intensity of the effect of capital control on each category. Edwards (2004) developed an index on capital mobility based on data of 163 countries from 1970–2000. Chinn and Ito (2006) constructed an index on capital account openness using the principal component analysis. This index uses restrictions on four categories, i.e., multiple exchange rates, current account restrictions, a five-year restriction on the capital account, and export proceeds. Potchamanawong (2007) created a capital control index using IMF AREAER data. Thirteen different types of capital restrictions were used to build this index, and each type is given an equal weight while averaging. Each category of control has a range between zero and one with 0.25-point intervals. A higher value indicates a greater level of control.

Ghosh (2012) provides the most comprehensive index of capital controls using disaggregated data from the IMF. This index uses the information on disaggregated categories of capital account, information on capital account restrictions, and the surrender of export proceeds. It also presents a separate index for capital inflows

[4] We provide details of the policy changes in the Indian capital account post-GFC in the Appendix, section A.1

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and outflows. Several related studies further developed the index of capital controls (Fernández et al., 2015; Klein, 2012). Schindler (2009) and Uribe (2006) constructed a capital control index for 10 asset categories for the period from 1995–2017 for capital inflows and outflows. In this paper, we use the methods presented by Quinn (1997); Potchamanawong (2007); and Ghosh (2012) to construct a measure of capital controls in India.

The second strand of the literature focuses on the role of capital control in macroeconomic management and represents a different view on its effectiveness. Bhagwati (1998) identified liberalization of the capital account as the main cause behind several crises experienced by countries over the years. Klein (2012) conducted a panel data analysis of 44 countries that provide little evidence of efficacy of capital controls on the growth of financial variables, REER or GDP. Krugman (1999) argued that imposing capital controls may be effective in stabilizing the economy. Magud et al. (2011) further showed that capital controls make monetary policy more independent and reduce exchange rate pressure.

Ostry, Ghosh, Chamon, and Qureshi (2011) showed that there be no one-size-fits-all policy to deal with destabilizing short-term capital inflows. However, capital controls make a legitimate component of policy response to surges in capital inflows. Prasad, Rajan, and Subramanian (2006); Prasad, Rajan, and Subramanian (2007); and Prasad and Rajan (2008) showed that excessive capital flows lead to rapid exchange rate appreciation, reducing export competitiveness of emerging market economies. This volatility in capital flows have severe consequences for employment and output. Therefore, emerging market economies are required to limit capital flows. Ostry et al. (2010) and Korinek (2011) showed that capital controls are effective tools that can reduce credit growth, reduce the build-up of an asset bubble, and the lower risk of capital surge. Blundell-Wignall and Roulet (2014) showed that capital restrictions are useful in times of economic prosperity ; lowering restrictions on bonds and FDI flows gives better growth outcomes. Bruno, Shim, and Shin (2017) showed that banking sector-based capital controls are effective in mitigating excess bank inflows in Asia-Pacific economies. To substantiate the role of capital controls as an effective instrument, the IMF (2022) further revised its institutional view to accommodate capital flow management measures as they are "useful in certain circumstances". Given the existing empirical evidence in the literature, we next explore the research gap identified in the literature. The data used to conduct the analysis is discussed in the following section.

5. Data

For the analysis, data on both qualitative and quantitative metrics is used. The qualitative data of annual frequency is used to create the capital control index, while the data on quarterly frequency for the economic variables over a 14-year period (2001–2014) is taken for the quantitative analysis.

We refer to the Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) of the International Monetary Fund (IMF) to get information on the legal restrictions on member countries' capital accounts. This information is coded to create a de jure measure of capital controls. The qualitative data on capital account transactions from the AREAER is disaggregated into the following thirteen categories:

1. Controls on capital market securities.
2. Controls on money market instruments.
3. Controls on collective investment securities.
4. Controls on derivatives and other instruments.
5. Controls on commercial credit.
6. Controls on financial credit.
7. Controls on guarantees, sureties, and financial backup facilities.
8. Controls on direct investments.
9. Controls on repatriation of profits or liquidation of direct investments.
10. Controls on real estate transactions.
11. Controls on personal capital movements.
12. Provisions specific to commercial banks and other credit institutions.
13. Provisions specific to institutional investors.

Data on the other macroeconomic variables is taken from the RBI on a quarterly basis from 2001–2014. These variables include inflation, the current account deficit to GDP, the interest rate differential between the US and India, and the first difference of the exchange rate.

5.1. Summary Statistics

Table 1 presents a summary of the data used for the analysis. Net inflow to GDP ranges from 1% to 6% during the 2001–2014 period. The quarterly average of the exchange rate data was very volatile, ranging from 39 Rs./$ to 62 Rs./$ during the same period.

The rupee was strong before the GFC because of large inflows into the Indian economy, but it depreciated due to massive capital outflows in the post-GFC period. The average current account deficit (CAD) to GDP remained at -2% during the 2001–2014 period. It shows a sustainable level of CAD, which could be financed by a 2% level, on average, of net inflows to GDP during the same time period. Inflation was also quite volatile during the period of analysis and remained very high until recently when it reached its lowest level of 0.3% in December 2014. Average inflation was at 6.3%, posing a greater risk for the economy and reducing investors' confidence.

Net inflows were attracted into the Indian economy due to high returns on financial assets during 2004Q1–2008Q2. This process came to a halt due to the GFC, which suddenly led to a massive withdrawal from the Indian market by investors.

The Indian market witnessed a massive net outflow of Rs. 140 billion in December 2008 caused by the Lehman Brothers collapse, which panicked investors, leading to withdrawal. Later inflows subsequently improved and a net capital inflow of Rs. 1,232 billion was posted in June 2014.

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Table 1. Data summary (2001Q1–2014Q4).

Statistic	N	Mean	Std. dev.	Min.	Max.
Trade balance (Rs. in billion)	56	-1,535.438	756.521	-3,161.105	-311.550
Current account (Rs. in billion)	56	-466.020	422.096	-1,720.313	199.320
Net capital inflow (Rs. in billion)	56	429.831	326.513	-140.402	1,232.271
Net inflow to GDP	56	0.025	0.015	-0.013	0.062
Current account deficit to GDP	56	-0.023	0.019	-0.068	0.027
Trade deficit to GDP	56	-0.082	0.020	-0.125	-0.035
Inflation (%)	56	6.339	2.657	0.330	11.020
Average exchange rate (Rs/US $)	56	48.814	6.713	39.470	62.130

Note: Figures are in billions of Rs. and percent.

Overall, the Indian financial market was quite volatile during the 2007–2013 period. Before the GFC, the economy posted consistently high growth rates of 7%–8%, which dropped to 5% on average in the post-GFC years. At the same time, capital flows, exchange rate and inflation worsened but later improved as the effect of the crisis lessened.

However, such changes in the Indian economy makes it very important to understand how these changes shaped the capital controls, which is an important tool to limit the volatility and risk in the market.

6. Methodology

This paper conducts two separate analyses to explore the intensity and shape of capital controls though an index and determine how capital control influences the capital flow volatility in India.

6.1. Construction of the Capital Control Index

The creation of the index on capital control was motivated by the works of Potchamanawong (2007) and Ghosh (2012).

The index is derived using information on the restrictions on capital transactions as per the rules listed below. The values for the transactions range from zero to one, with 0.25 intervals. Higher values indicate greater control on capital account transactions.

- 0: No restrictions (i.e., capital transactions are freely permitted); only a report or notification post transaction may be required by the government.
- 0.25: No prior approval is required, but registration or supporting evidence is required. Transactions are required to be made through exchange houses or authorized banks.
- 0.5: No prior approval is required; however, there are quantitative restrictions, such as limited ownership and limits on the amount that can be transferred per period; 'Yes' is allocated to the categories in which no other information is present.
- 0.75: Prior approval is needed before undertaking any transaction; approval is awarded on a case-by-case basis.
- 1: No transaction is permitted.

A separate index was created for capital inflows and outflows using restrictions on each of the 13 categories of capital account.

The index is further aggregated by the equally weighted averages of all categories to construct the consolidated capital control index. The above rule for the creation of the index incorporates the time taken by firms or individuals to conduct a capital account transaction having dealt with bureaucratic procedure. Such a procedure imposed on capital account transactions discourages capital mobility within the country. This criterion captures the cost of moving capital between countries, which increases when capital account restrictions are imposed.

The IMF AREAER data states the requirement of evidence, permission, and approval for capital account transactions.

6.2. Capital Flow Volatility and Capital Controls: Tobit Model Estimation

The capital control index analysis is supplemented by estimating the impact of capital controls on capital flow volatility. We capture capital flow volatility through four quarters of moving standard deviations of net inflow/GDP as a de facto measure of capital flow. We use the tobit model estimation procedure since our dependent variable (capital flow volatility) ranges between 0 and 1 and it is censored on the left. Our estimation model is as follows:

$$Capflow\_vol_t = \alpha_o + \alpha_1 cap\text{-}controls_t + \alpha_2(CAD/GDP)_t + \alpha_3 Inflation + \alpha_4(r_t - r_{t*}) + \alpha_5\pi_t + \alpha_5\Delta ex_t + \varepsilon_t$$

Where $Capflow\_vol_t$ is capital flow volatility (four quarters moving standard deviations of net capital inflows to GDP), $cap\text{-}controls_t$ is the quarterly interpolation of the capital control index, CAD/GDP is the current account deficit to GDP, π is inflation, $(r_t - r_{t*})$ is the interest rate differential between the 10-year government securities of India and the USA.

7. Empirical Evidence

7.1. Capital Control Index and Capital Flows

In Figure 1, the index of capital inflows is compared with net capital inflows in India from 1999–2014. It can be observed that the capital control index declines over the years, which shows decontrol of the capital account. Before 2008, the index shows that controls eased and net capital inflow increased.

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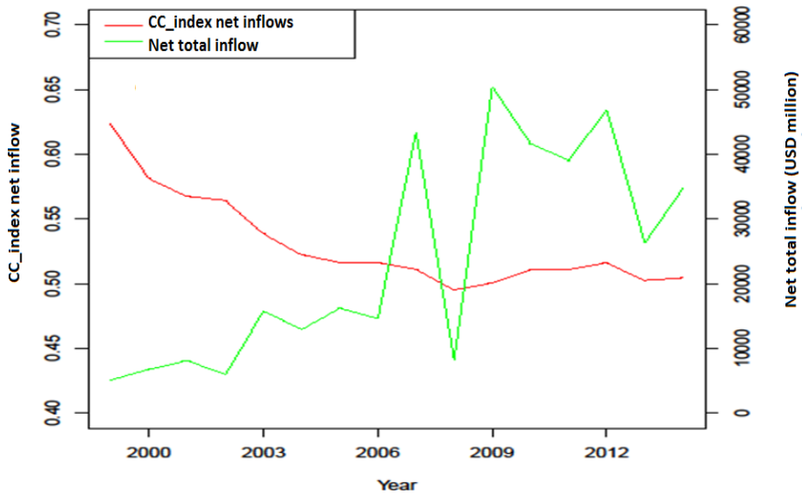

Figure 1. Capital control index and total net inflows.

As the financial crisis deepened in the global market, it led to massive outflows from the Indian economy. It can be observed from the figure that the capital control index (net capital inflows) remained stagnant during 2009–2014, suggesting stagnancy in the decontrol of the capital account to tackle risk spillover posed by the crisis. The index is further disaggregated to closely observe the changes in the main categories of capital inflows, such as net portfolio inflows and FDI. Figure 2 shows a similar trend to that in Figure 1. Net portfolio inflows were quite volatile after the October to December 2008 quarter and the capital control index on portfolios remained almost stagnant from 2008–2014. Net inflows in the portfolio category saw a huge dip in December 2008, showing massive outflows from the Indian market.

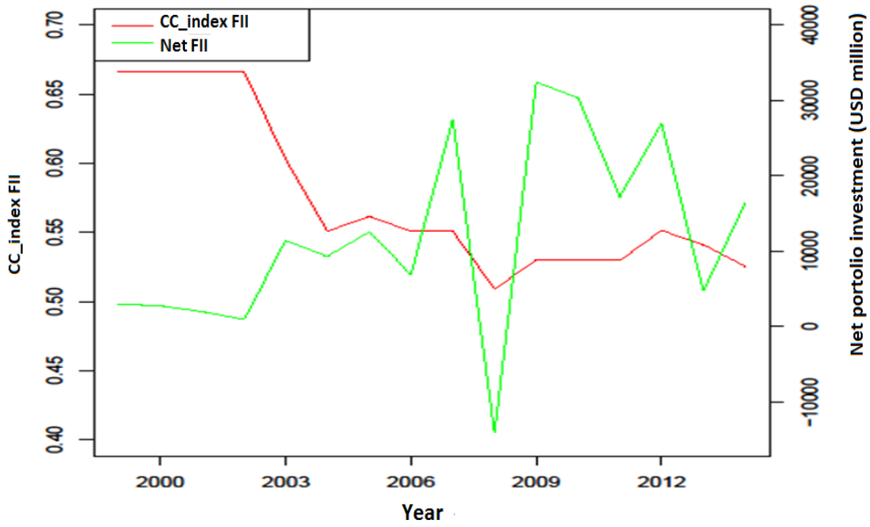

Figure 2. Portfolio inflows and portfolio category index.

In contrast with portfolio inflow, FDI is long-term investment in an economy. The index on the FDI category shows that capital controls on the index remained stagnant from 2006 to 2014 (see Figure 3). However, inflows in the FDI category continued to rise until the first quarter of 2009. Unlike the portfolio category, outflows in FDI occurred with a lag, and massive outflows in FDI continued from January–March 2009 to October–December 2010. Thereafter, net FDI inflows improved. Capital controls in the FDI category remained unchanged but inflows were affected mainly due to the 2008 financial crisis.

Figure 3. FDI inflow and FDI category index.

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The index on capital inflow and outflow is shown in Figure 4, which shows that both moved close together from 1999 to 2014. The correlation between capital inflow and outflow is 0.95, as shown in Appendix Table 3. This suggest that capital controls on inflows and outflows are combined, discarding any asymmetric distortion in either category. Historically, countries such as Chile, the US and Malaysia have imposed controls in either category of capital flow as deemed necessary. Such practices are not encouraged in India, as shown in Figure 4.

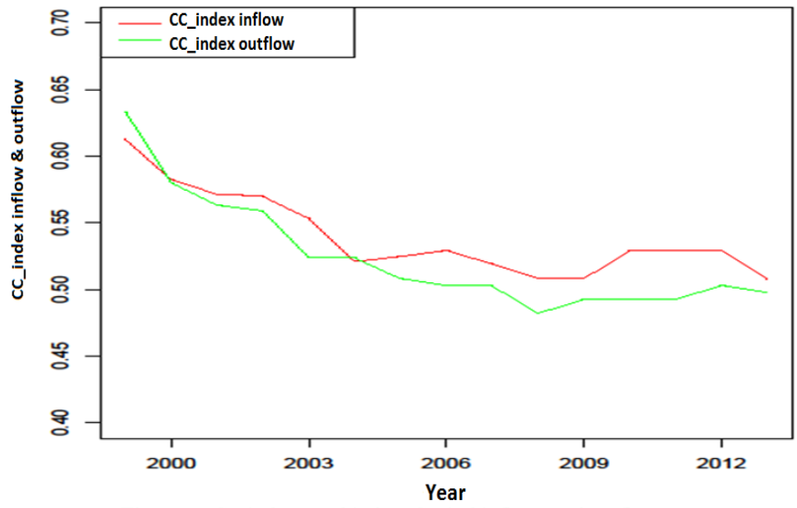

Figure 4. Capital control index: Capital inflows and outflows.

Finally, the control regimes in each category and the degree of intervention in each kind of market are compared. Figure 5 shows the capital control index for the money market, the capital market, and FDI. The money market instrument shows short-term investment, while the capital market and FDI represent long-term investment in the economy. Figure 5 also shows that the money market and FDI have had less intervention compared to the capital market during the 2009–2013 period.

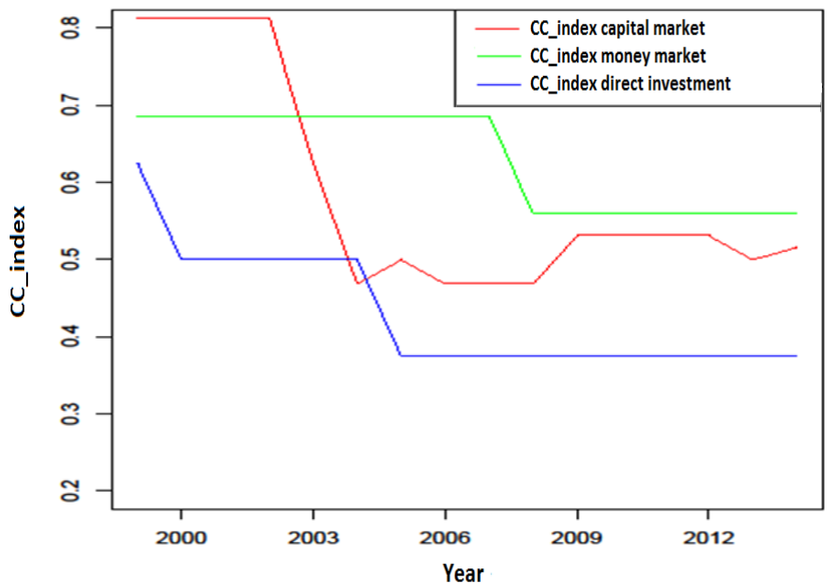

Figure 5. Capital control index: Capital control, money market and foreign direct investment.

7.2. Estimation Results: Capital Account Openness and Capital Control

Table 2 shows the empirical results for capital account volatility using the tobit estimation in the context of the GFC. We find that capital controls are highly significant and strongly contract capital flow volatility over the study period. A unit increase in capital control measure reduces the volatility of capital flows by 0.46 standard deviation.

Further, we split the sample into pre- and post-GFC periods to closely investigate the role of capital controls in reducing capital flow volatility during the shock of the GFC. We found that capital controls are highly effective in reducing capital flow volatility (0.54 standard deviation) compared to the post-GFC period (0.08 standard deviation).

This shows the muted impact of capital controls on capital flow volatility in the post GFC phase when the Indian economy was hit by two major shocks – the post-GFC hangover and the taper tantrum episode in 2013 – and the market was highly uncertain due to global financial stability conditions. The Indian economy also endured an exchange rate depreciation period and a high inflation phase post GFC. The Reserve Bank of India used the interest rate as a defense to manage exchange rate volatility and capital flow volatility, which proved to be largely ineffective (Goyal, 2014).

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Table 2. Capital flow volatility and capital controls (tobit estimation).

Variable	Dependent variable: Volatility in net inflow to GDP		
	Full period (2001Q1–2014Q4)	Pre-GFC period (2001Q1–2008Q4)	Post-GFC period (2009Q1–2014Q4)
Capital controls	-0.460***	-0.532*	-0.008*
	-0.096	-0.237	-0.004
Interest rate differential	0.0001	-0.0003	0.00001
	-0.0003	-0.0004	-0.0003
Inflation	-0.0004	0.001	-0.003***
	-0.001	-0.003	-0.001
Exchange rate	-0.001	-0.001	-0.001
	-0.0004	-0.0004	-0.0004
CAD to GDP	-0.141***	-0.065*	-0.075
	-0.045	-0.028	-0.059
Constant	0.246***	0.281*	0.034
	-0.049	-0.129	-0.077
Observations	50	26	24

Note: *p < 0.1, ***p < 0.01; CAD: current account deficit; GDP: gross domestic product.
Standard deviations are given below the coefficient values.

These results highlight the deterring role of capital controls in managing capital flows in the Indian context. Since the Indian economy gradually liberalized capital controls until 2008 and relaxed capital control measures in several parts of the economy, capital controls became limited in affecting capital flows and their volatility after the GFC. However, the results emphasize that capital controls limited the repercussions of capital flow volatility on the Indian economy to some extent and potentially limited the global shock spillover to the Indian financial market in the post-GFC period.

8. Conclusion

There is a comprehensive debate over capital controls being effective tools for macroeconomic management and economic stability. This paper is an attempt to ascertain whether capital controls proved to be an effective tool for India to stabilize its economy during the Global Financial Crisis.

This paper explored the shape and intensity of the capital control regime in the Indian economy before and after the GFC, supplemented with an analysis of the role of capital control to deter capital flow volatility in India. The capital control index suggests that India still maintained significant control despite substantial liberalization in the pre-GFC period. The index analysis further shows that the process of capital account liberalization slowed down due to the GFC. Most importantly, it shows that instead of further tightening the capital control regime due to the GFC, policymakers chose to let the controls remain almost stagnant in the post-GFC period. This emphasizes the irreversible nature of market reforms in any economy. The policy action chosen during the GFC was to continue with contemporary controls and wait for further reforms until the impact of the crisis lessened and the market stabilized.

Capital account liberalization (or capital control) analysis through the capital control index was extended to analyze capital account openness and its determinants using the tobit regression model. Our results show that capital controls are effective in managing capital flow volatility in general and were partially effective post GFC. Indian economic recovery from the GFC may have been possible due to the sound capital control regime that remained stagnant during the post-GFC period. The capital control regime proved to be an important tool to better manage the crisis in developing countries such as India. As the Indian economy matures and integrates into the global financial market over time, gradual removal of capital controls should be adopted for sustained growth and development.

This research can be further extended to construct an index by combining de facto and de jure measures of capital controls, which may be better able to capture the movement in capital controls and the impact on other macroeconomic factors. Possible future research could also analyze the capital control regime by comparing a monthly index on capital controls with the exchange rate movement to determine a possible causality between capital control and the exchange rate in India.

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Appendix: Correlation table for capital inflow and outflow.

Table 3. Correlation matrix for capital inflow and outflow.

Index type	Capital inflow index	Capital outflow index
Capital inflow index	1	0.953
Capital outflow index	0.953	1

A.1 Changes in the capital control regime post GFC.

The following section contains some important policy changes in capital control on a yearly basis from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) from 2009–2013.

2009

- The limit on investments by FIIs in corporate bonds was raised from $6 billion to $15 billion.
- Banks were not allowed to grant new loans or renew existing loans in excess of Rs. 10 million (previously, Rs. 2 million) against non-resident external rupees.

The relaxation in all-in-cost ceilings allowed during the financial crisis period after approval was withdrawn. Accordingly, the all-in-cost ceilings under the approval route are the London Interbank Offered Rate (LIBOR)[5] plus 300 basis points (bps) for an average maturity period from three years to five years, and the LIBOR plus 500 bps for an average maturity period of greater than five years.

2010

- Foreign institutional investment (FII) was allowed to offer domestic government securities and foreign sovereign securities, with a rating of AAA and considered among the safest from a risk perspective, as collateral to the recognized stock exchanges in India in addition to cash. Previously, they were not

[5] The London Interbank Offered Rate is the average interest rate estimated by leading banks in London to determine what the average leading bank would be charged if it borrows from other banks.

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permitted to offer domestic government securities as collateral for their transactions in the cash segment of the market.

- External commercial borrowing (ECB) can be raised by eligible borrowers in the telecommunications sector to meet the spectrum allocation payment from rupee resources, which can be refinanced with long-term ECB under the approval route, subject to certain conditions.
- To promote development of the infrastructure sector, a separate category of non-bank financial companies (NBFCs), namely infrastructure finance companies (IFCs), was introduced.
- Takeout financing through ECB is allowed under the approval route to refinance rupee loans from domestic banks by corporate borrowers developing infrastructure in seaports, airports, roads, and power sectors.

2011

- FII was permitted for non-convertible debentures/bonds issued by NBFCs categorized as IFCs by the RBI, within an overall limit of US $25 billion, subject to conditions.
- The limit of FII in government securities of US $5 billion was increased, raising the cap to US $15 billion, and the limit of FII investment in corporate bonds of US $5 billion was also increased, raising the cap to US $20 billion. The limit for infrastructure bonds (separate from corporate bonds) was retained at US $25 billion.
- The external commercial borrowing (ECB) policy was liberalized and rationalized. The limit for eligible borrowers for ECB under the automatic route each financial year was enhanced as follows:
  - Firms in the real, industrial, and infrastructure sectors: US $750 million or equivalent (previously US $500 million or equivalent).
  - Firms in specified service sectors, namely hotels (hospitality), hospitals (healthcare), and software (IT): US $200 million or equivalent (previously US$100 million or equivalent).
  - Borrowers in the infrastructure sector may use ECB in renminbi (official currency of the People's Republic of China) up to a ceiling of US $1 billion per financial year under the approval route.
  - FDI up to 100% under the automatic route was permitted for greenfield investments in the pharmaceutical sector, and FDI up to 100% was permitted for brownfield investments (i.e., investments in existing companies) in the pharmaceutical sector under the government approval route.

2012

- Indian companies in the manufacturing and infrastructure sectors that have foreign exchange earnings may use ECB for the repayment of outstanding rupee loans for capital expenditures and/or new rupee capital expenditures under the approval route. The overall ceiling for this ECB is US $10 billion.
- Qualified foreign investors are allowed to invest in mutual funds that hold at least 25% of their assets (in debt, in equity, or both).
- Banks may grant loans against non-resident (external) rupee accounts and foreign currency non-resident (bank) accounts either to the depositors or third parties, subject to conditions.

2013

- Residents may invest in companies listed on recognized foreign stock exchanges up to the equivalent of US $75,000.
- Foreign institutional investors may invest up to US $25 billion in government securities (previously US $20 billion) and corporate debt instruments up to US $50 billion (previously US $45 billion).
- Resident individuals are allowed to make overseas direct investments subject to certain terms and conditions.

2014

- Interest rates offered by banks on non-resident external deposits may not exceed those offered on comparable domestic rupee deposits.
- The cash reserve ratio and statutory liquidity ratio maintenance exemption on incremental foreign currency non-resident (FCNR(B)) deposits and non-resident external deposits (increment over July 26, 2013) of maturity greater than three years was withdrawn.
- FII is not allowed to buy government bonds with less than three months of maturity to reduce exchange rate volatility observed by short capital inflows in the country.

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