

# **OPEN-ECONOMY MACROECONOMICS - AN EVOLUTIONARY PERSPECTIVE**

**DR. DEBA PRASAD RATH**  
**RBI Chair Professor**  
**Council for Social Development, Hyderabad**

**21 January 2025**



## **COUNCIL FOR SOCIAL DEVELOPMENT**

**(An Autonomous Research Institute supported by Indian Council of Social Science Research,  
Government of Telangana and Reserve Bank of India)**

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# OPEN-ECONOMY MACROECONOMICS - AN EVOLUTIONARY PERSPECTIVE

## ABSTRACT

*In today's interconnected world, truly closed economies exist more as theoretical constructs than as practical realities, with openness shaping the foundation of modern economic systems. While macroeconomics has matured as a discipline, open-economy macroeconomics continues to expand in scope and complexity—equipping economists to answer numerous questions being raised in policy circles. This lecture explores the enduring relevance of open economy macroeconomics, arguing that it is even more critical today than during the dominance of the Mundell-Fleming model. Resilient and adaptive—more akin to a dandelion than a fragile orchid—the field remains deeply entwined with globalization and increasingly informs responses to contemporary challenges such as Central Bank Digital Currencies, cryptocurrencies, climate policy, and international trade. An updated empirical analysis of the Covered Interest Parity gap using Indian data underscores the field's practical policy relevance, particularly in guiding central bank interventions in foreign exchange markets to safeguard economic stability.*

## **Key words:**

*Open Economy, Covered Interest Parity, DSGE, Openness indicators, Trade theory*

JEL Codes: F41, F31, F15

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## SECTION I: Motivating the Topic

“The world remains a closed economy, but its regions and countries are becoming increasingly open,” wrote Robert Mundell in his 1963 paper *Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates*.

Today, the global economy faces a convergence of crises: climate change, environmental degradation, geopolitical tensions, volatile inflation, inequality, technological disruption, cybersecurity threats, public health emergencies, energy shortages, debt surges, and financial instability. These interconnected challenges affect growth, stability, and sustainability, demanding coordinated and innovative responses. Against this backdrop, one may ask whether open economy macroeconomics remains as relevant as before. The short answer is yes. This lecture supports that claim by offering an evolutionary perspective on the discipline, drawing on insights from multiple schools of thought.

To begin, a brief overview of the field. If macroeconomics is the study of a country’s heartbeat, open-economy macroeconomics listens to how it beats in rhythm with the world. Alongside macroeconomics—which has evolved into a “mature science” (Blanchard, 2025)—open economy macroeconomics represents a dynamic and adaptable branch that examines how domestic economies interact with the global environment. It emphasizes the international dimensions of monetary, fiscal, and exchange rate policies, as well as the determinants of current account balances, national income, and inflation. Episodes such as financial crises, trade wars, and shifts in trade agreements highlight how external forces shape domestic outcomes (Frankel, 2004).

Open economy macroeconomics may be considered “mature” in that it rests on a strong theoretical foundation and is widely applied in both policy and academic circles. Yet its models continue to be refined, its empirical challenges remain unresolved, as the global economy is ever-evolving. Thus, it is more accurately described as a field still maturing—growing in

complexity and sophistication to better address real-world challenges—rather than one that has reached a final, static state.

Over time, mainstream research has increasingly integrated open economy considerations, shifting away from a closed-economy bias toward more global frameworks informed by theoretical advances, empirical evidence, and policy imperatives. This transition reflects both the deep interconnectedness of economies and the limitations of closed-economy models in capturing real-world dynamics. Today, open economy macroeconomics occupies a central role in theory, policy analysis, and empirical research—a position reinforced by tools such as Dynamic Stochastic General Equilibrium (DSGE) modelling and by the lessons of crises that underscored the costs of neglecting cross-border linkages.

With this background in mind, the lecture is organized as follows:

- **Section II** traces the evolution of macroeconomic models across different schools of thought, from trade theory to international finance, highlighting milestones in the development of open economy literature.
- **Section III** reviews India's openness indicators and examines Covered Interest Parity (CIP) gaps in light of recent empirical evidence.
- **Section IV** illustrates how DSGE models provide a theoretically rigorous yet flexible framework for real-time policy evaluation in an interconnected global economy.
- **Section V** concludes with reflections on emerging trends, policy insights, and the challenges likely to shape open economy macroeconomics in the years ahead.

## **SECTION II: Macroeconomic Models and their Evolution**

*"In a world of integrated global markets, economic policies in one country are transmitted rapidly across the world" (Barry Eichengreen, Globalizing Capital, 1996).*

Foreign trade theory laid the foundation for open economy macroeconomics, with an early focus on the real side of international exchange. Initially, trade theory examined how countries exchange goods and services, emphasizing

comparative advantage, specialization, and the resulting gains from trade. Classical models, such as Ricardo (1817), and neoclassical models, such as Heckscher–Ohlin (1933), highlighted production differences, resource endowments, and relative prices as the basis for trade. These frameworks largely assumed balanced trade and abstracted from monetary and financial factors. Smith and Ricardo were strong advocates of free trade, while later contributions introduced concepts such as the Law of One Price and Purchasing Power Parity, extending the analysis toward price alignment across borders.

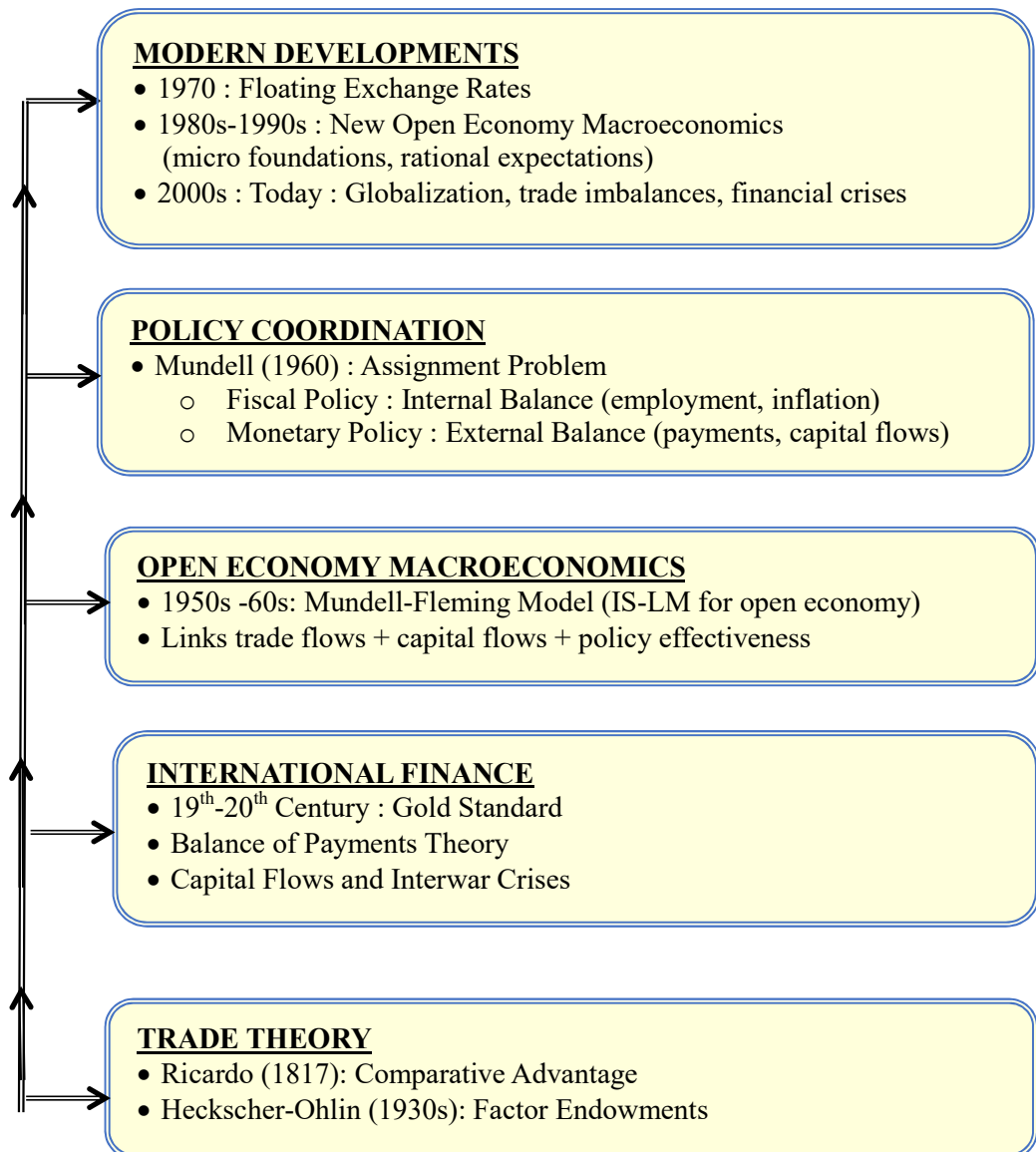
Chart 1 outlines the progression from trade theory to international finance, culminating in open economy macroeconomics, illustrating how trade theory provides the real foundations, international finance adds monetary and financial linkages, and together they evolve into the integrated field of open economy macroeconomics.

As international trade expanded, issues of settlement, exchange rate management, and financing imbalances came to the fore. The growth of global capital markets, the gold standard, and the interwar financial crises underscored the importance of international finance—a field concerned with exchange rates, capital flows, and balance of payments dynamics. This line of inquiry led to the study of foreign exchange markets, interest rate differentials, and capital mobility—factors that influence not only trade patterns but also financial stability and economic growth. In essence, international finance examines how financial markets and policies shape both trade and macroeconomic outcomes.

From there, the discipline naturally expanded into open economy macroeconomics, which integrates trade and financial linkages into broader questions of national income, inflation, employment, and the conduct of monetary and fiscal policy. Unlike closed-economy models, open economy macroeconomics incorporates exchange rate regimes, capital mobility, and cross-border spillovers, highlighting how domestic outcomes are increasingly conditioned by global interdependence. This progression reflects the recognition that trade, finance, and macroeconomics cannot be

studied in isolation but must be understood as components of an integrated global system.

**Chart 1: Trade Theory, International Finance and Open Economy Macroeconomics**



Source: Author's compilation

Seminal contributions shaped this evolution. Robert Mundell and Marcus Fleming developed a model linking trade and macroeconomic policy under alternative exchange rate regimes, while Rudiger Dornbusch advanced the analysis of exchange rate dynamics, and Paul Krugman integrated trade and finance through New Trade Theory. A particularly influential contribution was Mundell's (1960) policy assignment problem, which argued that fiscal policy is best suited to achieving internal balance (employment and output stability), while monetary policy should be directed at external balance (balance of payments equilibrium). Misassignment, he warned, could generate destabilizing outcomes, such as simultaneously worsening unemployment and external deficits.

### **Mundell–Fleming Model**

For decades, the Mundell–Fleming (MF) model (developed in the early 1960s) has served as the workhorse of open economy macroeconomics, though many of its core ideas were anticipated by Meade (1951) and Swan (1955)<sup>1</sup>. The model explains the causes of short-run fluctuations in aggregate income within an open economy setting.

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<sup>1</sup> The key contributions include Fleming (1962) and Mundell (1960, 1961, and 1963). Boughton (2002) provides an excellent review of the origins of the Mundell–Fleming model, although he favours using a conventional alphabetical ordering of the names. He points out that it was Dornbusch (1976a, 1976b, 1980) who popularised the idea of citing Mundell ahead of Fleming, although up until then the model had been referred to in various ways. Kenen (1985) still preferred to put Fleming's name first, as had Tower (1972). Cooper (1976) also assigned primary credit to Fleming, although also chose to emphasise the contribution of Meade. Arndt (1973) referred to the Tinbergen–Mundell model while mentioning Fleming in a list of other contributors. Tinbergen (1952) examined the theory of economic policy, pointing out that governments need at least as many independent policy instruments as they have targets. For our purpose, such debates are of only tangential interest. For the detailed references shown in this footnote, please see Boughton, J.M. (2002).

An extension of the IS–LM framework to an open economy, the Mundell–Fleming model provides several key insights:

1. **Fixed exchange rates:** Monetary policy is largely ineffective, as capital flows offset changes in the money supply.
2. **Flexible exchange rates:** Monetary policy becomes powerful; changes in interest rates influence capital flows and exchange rates, thereby affecting net exports.
3. **Fiscal policy:** More effective under fixed exchange rates, since government spending directly raises output without being offset by currency appreciation.
4. **Capital mobility:** High mobility limits domestic policy autonomy, as international capital flows dominate domestic monetary conditions.
5. **Policy trilemma:** No country can simultaneously achieve free capital mobility, a fixed exchange rate, and independent monetary policy—only two of the three are possible at any time.

**Table 1: Exchange Rate Regimes and Policy Effectiveness**

| Policy                                          | Floating Exchange Rate | Fixed Exchange Rate |
|-------------------------------------------------|------------------------|---------------------|
| <b>Fiscal</b> ( $\uparrow G$ , $\downarrow T$ ) | Y: unaffected          | Y: $\uparrow$       |
|                                                 | e: $\uparrow$          | e: —                |
|                                                 | NX: $\downarrow$       | NX: —               |
| <b>Monetary</b> ( $\uparrow M$ )                | Y: $\uparrow$          | Y: —                |
|                                                 | e: $\downarrow$        | e: —                |
|                                                 | NX: $\uparrow$         | NX: —               |
| <b>Trade</b> (imports $\downarrow$ )            | Y: $\uparrow$          | Y: $\uparrow$       |
|                                                 | e: $\uparrow$          | e: $\uparrow$       |
|                                                 | NX: $\uparrow$         | NX: $\uparrow$      |

Notes:

1. “ $\uparrow$ ” = increase; “ $\downarrow$ ” = decrease; “—” = no effect.

2. G = government expenditure, T = taxes, M = money supply, e = exchange rate, NX = net exports.

3. A fall in imports improves the trade balance, raises net exports, and through multiplier effects, increases income (with some exchange rate appreciation depending on the regime).

Source: Author’s compilation

The effect of any economic policy (fiscal, monetary, or trade) depends on the country's exchange rate system. Under a floating exchange rate system, only monetary policy can alter national income ( $Y$ ). Under a fixed exchange rate system, only fiscal policy can alter  $Y$  (Table 1).

## **Beyond the Mundell–Fleming Model**

### **The “Redux” Paper**

Obstfeld and Rogoff's 1995 *Redux* paper marked a pivotal moment in open economy macroeconomics. It addressed significant limitations of the Mundell-Fleming model by introducing a micro-founded, stochastic, and dynamic framework, while revisiting and extending earlier models. The paper revitalized the field in several key ways: (i) reintroducing rigorous micro-foundations; (ii) integrating intertemporal optimization into a dynamic general equilibrium model, reframing current account dynamics in terms of lifetime income and consumption decisions; (iii) incorporating New Keynesian elements—such as monopolistic competition and price rigidities—which showed that monetary and fiscal policies can have real effects even under sticky prices, while also highlighting how market imperfections amplify shocks; and (iv) creating a unified model that explains real exchange rate volatility, persistent current account imbalances, and the effects of monetary shocks. By modelling forward-looking behaviour in response to policy and economic shocks, the *Redux* paper laid the groundwork for the New Open Economy Macroeconomics framework.

### **New Open Economy Macroeconomics (NOEM)**

Emerging in the 1990s, NOEM built upon *Redux* by incorporating more sophisticated intertemporal structures and realistic policy environments. This evolution gave rise to DSGE models featuring rational agents, nominal and real frictions, and robust micro-foundations, reducing susceptibility to the Lucas critique and enabling empirical validation. Since the *Redux* paper, there is an outpouring of research on open economy DSGE, a new workhorse model for OEM that incorporate imperfect competition and nominal rigidities, and an analytical framework superior alternative to MF model that is still being used as a theoretical reference point.

Models by Corsetti and Pesenti (2001) and Devereux and Engel (2003) introduced incomplete markets, nominal rigidities, and pricing-to-market behaviour to study international transmission and optimal monetary policy. NOEM clarified key concepts such as exchange rate pass-through, international risk sharing, and the welfare effects of different policy regimes, providing powerful tools for central banks and policy institutions.

## **Global Financial Crisis and Policy Debate**

The 2008 financial crisis reignited longstanding debates on macroeconomic policy among U.S. economists, with divisions between the “freshwater” schools, which emphasize market self-correction, and the “saltwater” schools, which advocate for a greater role for government intervention (Krugman, 2009). During the Keynesian post-war era, internal balance was defined as full employment and rising living standards, while external balance referred to equilibrium in international payments (Mundell, 1963; Fleming, 1962). Although many advanced economies seemed to have achieved these goals in the decades before 2008, persistent global current account imbalances raised concerns (Obstfeld and Rogoff, 2009).

The crisis ultimately exposed deep systemic vulnerabilities—from fragile financial institutions to inadequate regulatory frameworks—casting doubt on the adequacy of prevailing macroeconomic models. Recognizing factors like excessive leverage, insufficient financial regulation, and global imbalances as key weaknesses that mainstream models had underappreciated, economists called for a rethinking of the pre-crisis consensus, which had narrowly focused on low and stable inflation as the primary policy goal (Blanchard *et al.*, 2010). In response, a broader framework emerged, one that incorporates financial stability, macro-prudential risks, and the global interconnectedness of markets.

These critiques highlighted how the 2008 crisis not only revived older freshwater–saltwater disputes but also expanded the scope of macroeconomic policy to address systemic financial resilience and the need for international coordination.

## **From Trilemma to “Dilemma” – Helene Rey’s Contribution**

The classic "Impossible Trinity"—the principle that a country cannot simultaneously maintain a fixed exchange rate, free capital mobility, and an independent monetary policy—was reinterpreted by H  l  ne Rey (2015) as a "dilemma" or "irreconcilable duo." Rey contended that even under flexible exchange rate regimes, global financial cycles—primarily driven by U.S. monetary policy—significantly constrain domestic monetary autonomy. These global dynamics influence domestic credit conditions and asset prices through capital flows and leverage cycles, contributing to procyclical boom-bust patterns.

In response, Rey advocates for the use of macro-prudential tools and capital flow management in conjunction with traditional inflation targeting. Her policy recommendations include: (a) implementing targeted capital controls; (b) addressing the sources of global financial cycles, particularly the monetary policies of major central banks; (c) applying countercyclical macro-prudential measures to moderate credit growth and leverage during economic expansions; and (d) imposing structural limits on leverage across financial intermediaries (Rey, 2013; 2015).

## **International Monetary Fund (IMF) and the Integrated Policy Framework (IPF)**

The Global Financial Crisis and the COVID-19 pandemic revealed significant gaps in conventional frameworks, which heavily relied on monetary and fiscal tools and assumed that flexible exchange rates would provide insulation. In practice, however, large and volatile capital flows, financial frictions, and deviations from Covered Interest Parity (CIP) called for a more comprehensive toolkit.

The IMF’s Integrated Policy Framework (IPF) addresses these challenges by considering monetary, fiscal, exchange rate, and capital flow management policies jointly. It acknowledges the interactions between these policies and incorporates country-specific factors such as exchange rate regimes, financial depth, and vulnerability to flow reversals. The IPF promotes policy

mixes where, for instance, capital flow measures complement monetary policy when rate adjustments alone are insufficient. Similarly, foreign exchange (FX) interventions and macro-prudential measures can help stabilize shallow or volatile markets.

Under the IPF, FX intervention is justified in the face of large shocks, especially when combined with frictions like unhedged FX mismatches, shallow markets, or risks of de-anchored inflation expectations. In India, despite relatively deep FX markets, temporary shallowness can still occur. The IPF thus validates India's pragmatic approach, combining monetary policy, FX management, and macro-prudential oversight to maintain stability amid global volatility (IMF, 2023).

### **SECTION III: Openness Indicators and CIP Gap - Indian Evidence**

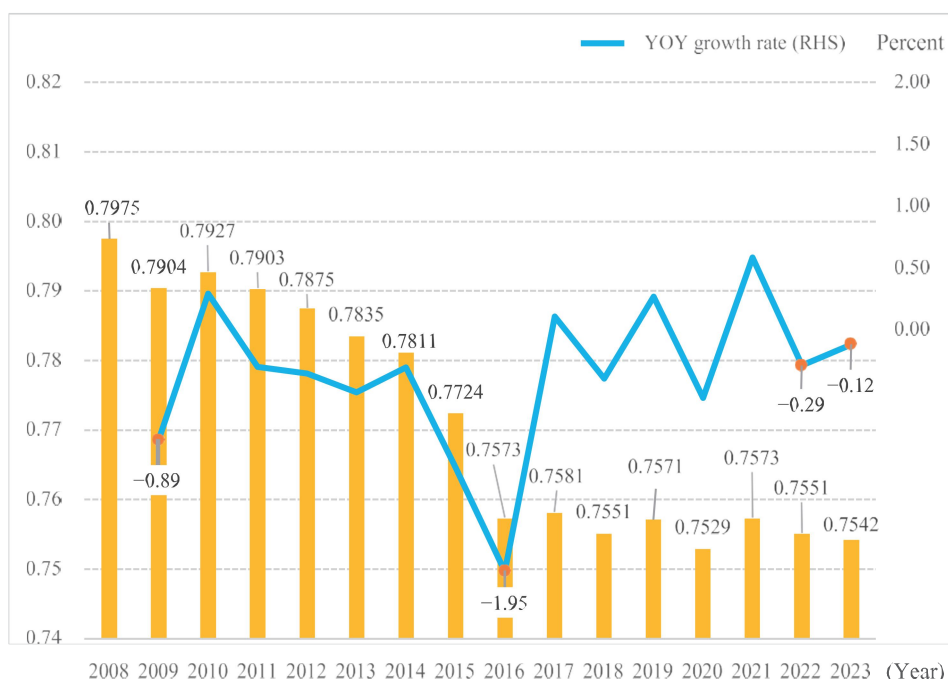
Economic openness is a key dimension of development analysis, reflecting the extent to which a country integrates with global markets. For India, the shift from inward-looking policies in the 1970s to the post-1991 liberalization and outward-oriented economy makes the question of openness analytically central. A systematic, updated assessment of India's evolving openness within a global context highlights the impact of reforms and external shocks, providing an evidence base for contemporary debates on trade, industrial, and financial policy.

India has experienced major structural breaks—such as the 1991 reforms, WTO accession, the 2008 global financial crisis, and the 2020 COVID-19 shock—while recent shifts in global trade, supply chains, and capital flows call for fresh comparative analysis. This assessment distinguishes between *de facto* openness (actual flows) and *de jure* openness (policy frameworks).

*De facto* openness includes metrics like trade openness (exports and imports as a percentage of GDP) and foreign direct investment (FDI) inflows. *De jure* openness, on the other hand, encompasses tariff levels and capital account openness indices. India's path toward economic liberalization has been shaped by the dual drivers of trade openness and financial openness, both of which underlie the measures mentioned above.

In addition, composite indices, such as the World Openness Index by the Institute of World Economics and Politics, offer a multi-dimensional perspective, incorporating social and cultural linkages alongside economic factors. Such an analysis allows us to identify three dynamics in India's openness relative to global averages: catch-up, overshoot, or lagging.

**Chart 2: World Openness Index (2008-2023)**

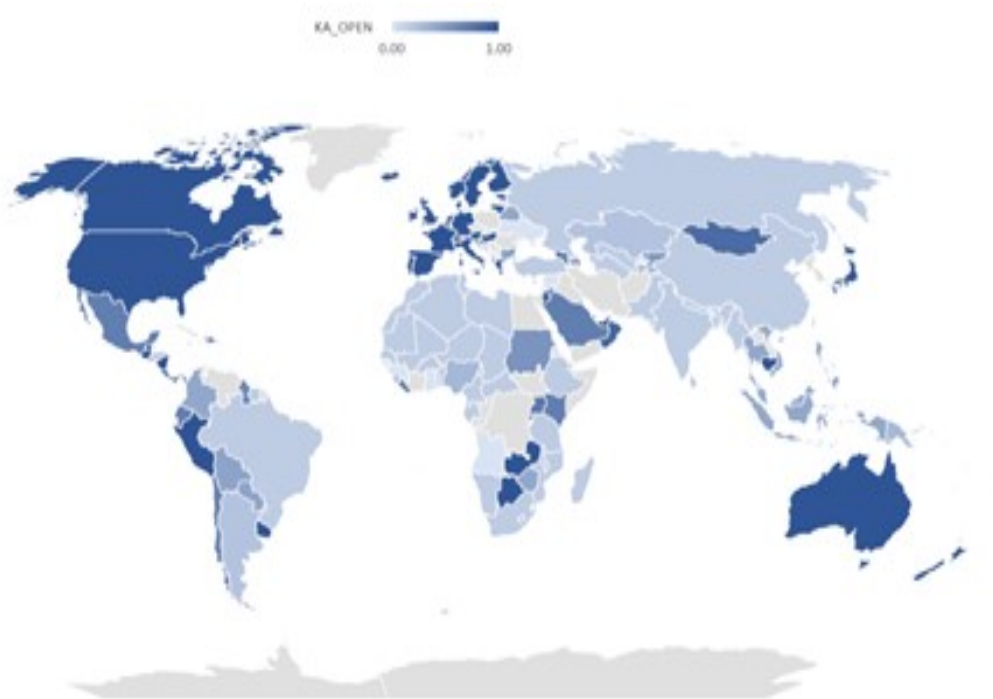


Source: Institute of World Economics and Politics (2024). World Openness Report, 2024

Turning first to the global picture, the trend in composite openness remains concerning (Chart 2). In 2023, the World Openness Index declined by 0.12 per cent year-on-year (YoY) to 0.7542, remaining below pre-pandemic levels—0.38 per cent lower than in 2019 and 5.43 per cent below the 2008 level. In 2023, both economic and cultural openness contracted, while social openness increased. The global economic openness index stood at 0.9112, marking a 0.2 per cent YoY decline, though it was 3 per cent higher than in 2019, yet still 5 per cent lower than in 2008. Chart 2 reflects ongoing

fluctuations in openness, highlighting a mixed trajectory of progress and setbacks in global integration<sup>2</sup>.

**Chart 3: Capital Account Openness (KAOPEN) – 2022**



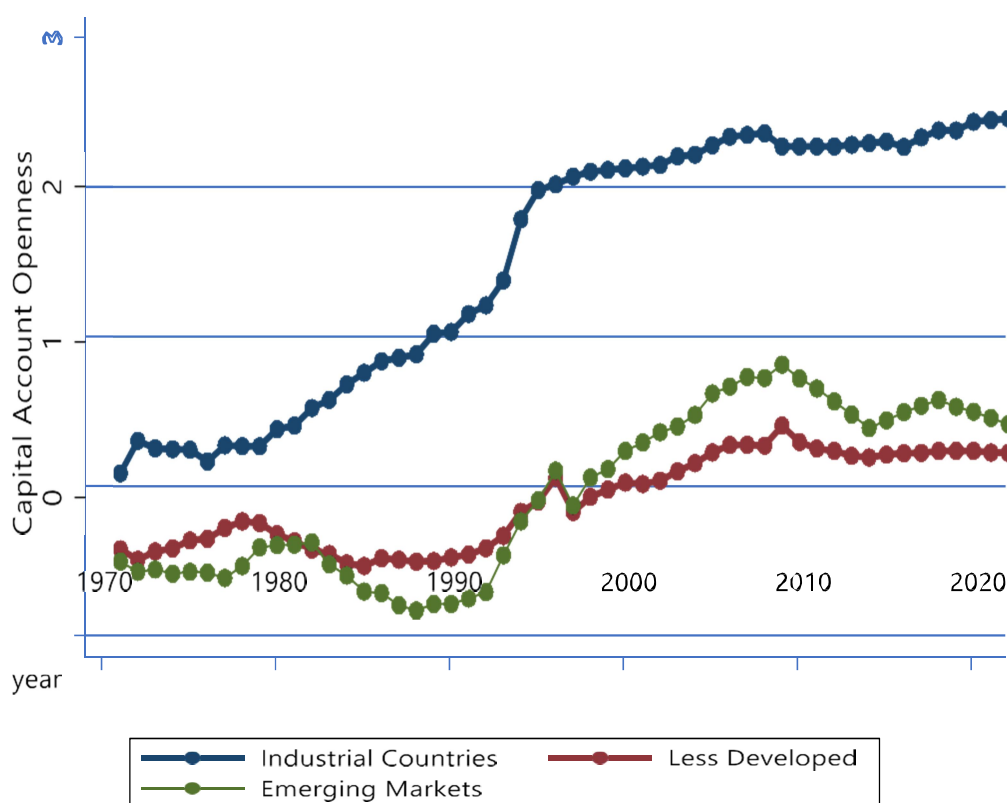
Source: [https://web.pdx.edu/~ito/Chinn-Ito\\_website.htm](https://web.pdx.edu/~ito/Chinn-Ito_website.htm)

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<sup>2</sup> According to World Openness Report, 2024 covering 129 economies, positive drivers include digital innovation, green development, Global South growth, multilateral reforms, and momentum toward the UN 2030 Sustainable Development Goals (SDGs). However, openness has been constrained by geopolitical conflicts, expanded security concerns, rising anti-globalization and unilateralism, and stronger inward-looking trends. Economic openness covers indicators such as international trade in goods and services, international direct investment, and securities investment. Social openness covers indicators such as international tourists, international students, and immigrants. Cultural openness covers indicators such as international trade in intellectual property rights, patent application, scientific literature citation, and international trade in cultural goods.

Second, there are significant cross-country differences in capital account openness, as measured by the Chinn–Ito index (KAOPEN) (Chart 3 and Chart 4). Developed by Chinn and Ito (2006), the KAOPEN index quantifies the degree of a country’s capital account openness based on information from the IMF’s *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER). It uses binary indicators of legal restrictions on cross-border financial transactions—such as controls on capital inflows/outflows, multiple exchange rates, current account restrictions, and export surrender requirements—and applies principal component analysis to construct a single summary measure.

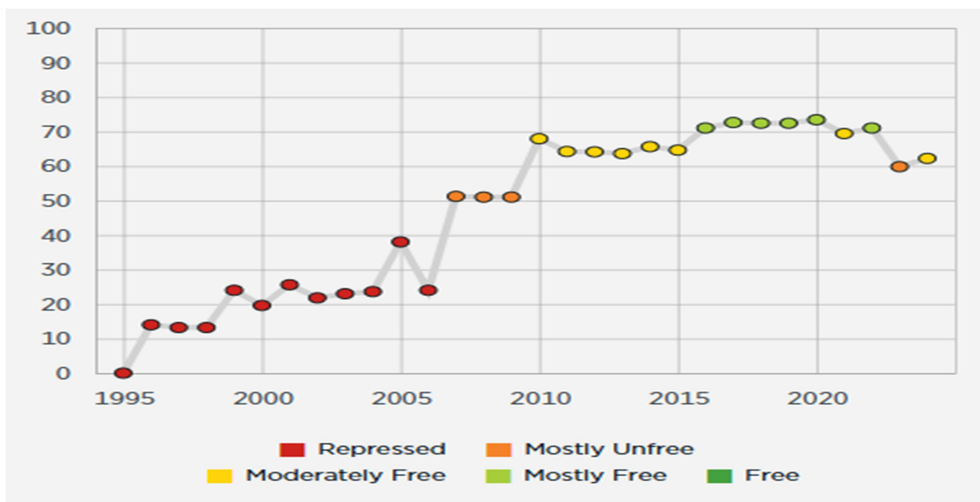
**Chart 4: Development of KAOPEN for Different Income Groups, 1970 – 2021**



Source: [https://web.pdx.edu/~ito/Chinn-Ito\\_website.htm](https://web.pdx.edu/~ito/Chinn-Ito_website.htm)

Chart 4 tracks changes in the Chinn–Ito index across countries grouped by income level from 1970 to 2021. High-income countries generally exhibit consistently higher KAOPEN scores, reflecting early and sustained liberalization of capital flows. In contrast, middle- and low-income countries tend to start with more restrictive financial regimes and show gradual liberalization over time. While high-income countries appear to have plateaued at relatively high levels of openness, middle- and low-income economies display more dynamic upward trends—particularly from the late 20<sup>th</sup> century onward—indicating progressive financial liberalization efforts.

**Chart 5: World Bank’s Trade Freedom Index**



Note: (i) y-axis: Absolute value of the index, ranging from 0 (repressed) to 100 (free).  
(ii) Higher values indicate fewer barriers and greater freedom, the score is based on (a) the trade-weighted average tariff rate, and (b) a qualitative assessment of non-tariff barriers (NTBs).

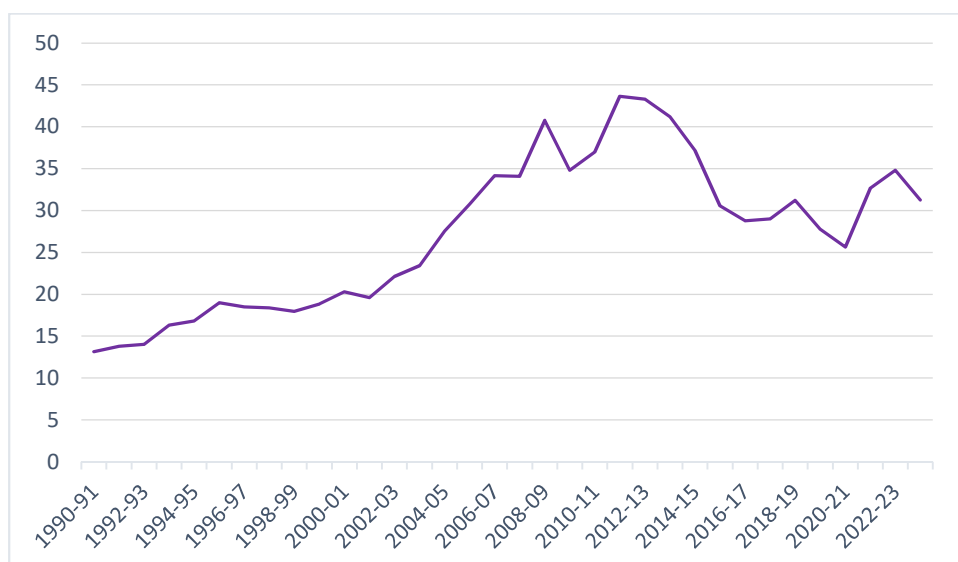
Source: World Bank

Third, the World Bank’s Trade Freedom Index—a composite measure of tariff and non-tariff barriers—shows a slight improvement in 2024 (Chart 5). The index offers a comparative snapshot of countries’ trade policies, highlighting the wide variation in openness to trade and its influence on broader economic integration with global markets.

Turning to India, the country's journey toward economic liberalization has followed two parallel paths: trade openness and financial openness. Notably, trade liberalization has progressed more rapidly than financial liberalization. Over the years, India has strategically opened its trade regime to stimulate growth, whereas financial liberalization has proceeded more cautiously—largely due to concerns over macroeconomic stability, exchange rate volatility, and vulnerability to financial crises.

India's external trade-to-GDP ratio has generally trended upward from 1990–91 to 2022–23, reflecting the effects of liberalization, tariff reductions, and deeper global integration (Chart 6). However, after 2012–13, the ratio declined due to a global economic slowdown and weaker export performance. The COVID-19 pandemic further disrupted trade flows, though recovery has since been driven by strong performance in IT services and pharmaceutical exports. Volatility in 2022–23 was shaped by global inflationary pressures and heightened geopolitical risks, particularly the Russia–Ukraine conflict.

**Chart 6: External Trade (Exports + Imports) to GDP Ratio (%)**



Source: IMF

Export and import growth rates have fluctuated in response to global economic cycles and domestic policy changes (Chart 7). Imports tended to rise during periods of strong domestic demand, while major crises—such as the 1991 balance of payments crisis, the 2008 global financial crisis, and the COVID-19 pandemic—led to sharp contractions in trade. However, trade rebounded strongly in the post-COVID period. Since 2000, India’s share in global trade has steadily increased, with a notable acceleration during the post-pandemic recovery (GoI, *Economic Survey*, 2021–22).

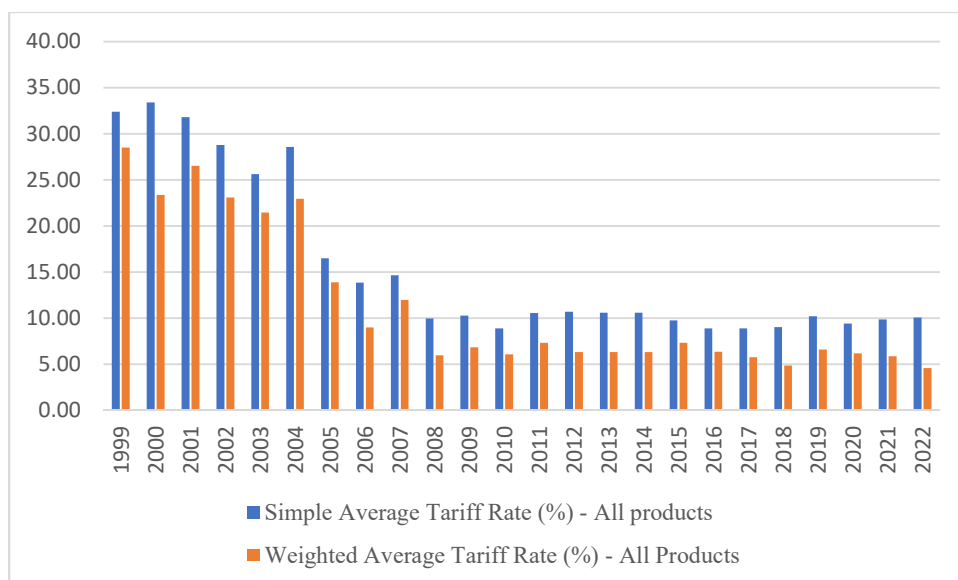
**Chart 7: Export and Import Growth Rates**



Source: RBI

Tariff rates in India declined sharply from 1990–91 onwards as the country embarked on a process of trade liberalization in the early 1990s. This shift was accompanied by a strong push to reduce tariffs and expand trade relations. As part of its broader economic reforms, India became a member of the World Trade Organization (WTO) in 1995. This move led to a series of agreements aimed at reducing trade barriers and promoting free-market policies, reflecting a clear shift towards economic openness. Between 1990 and 2022, India’s weighted average tariff rate (for all products) fell dramatically from 56.4 per cent in 1990 to just 4.6 per cent in 2022, signalling a profound shift toward greater trade liberalization (Chart 8).

**Chart 8: Tariff Rates**

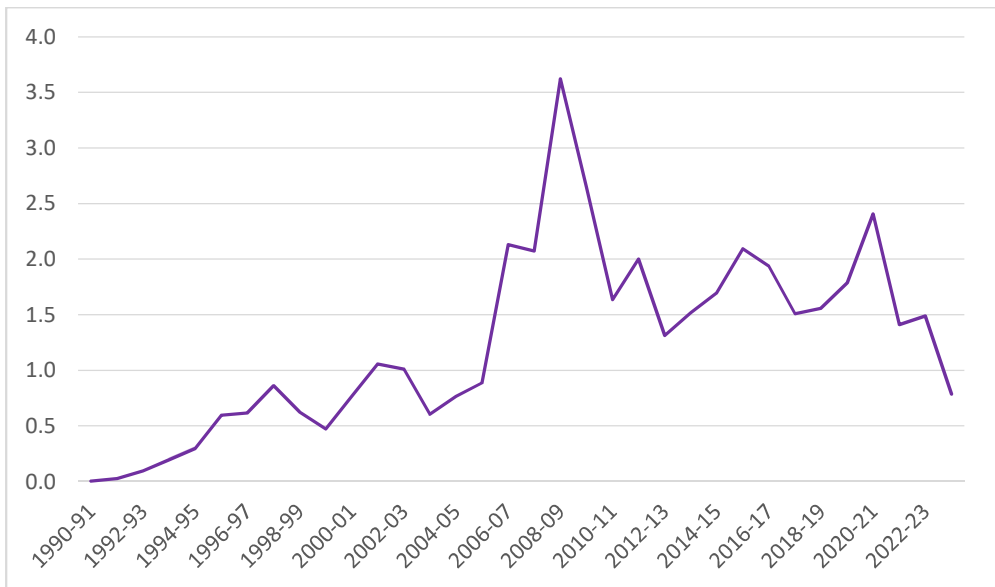


Note: The weighted mean applied tariff is the average of effectively applied rates, weighted by the product import shares from each partner country. The simple mean applied tariff is the unweighted average of effectively applied rates for all products subject to tariffs, calculated across all traded goods.

Source: WDI Database, World Bank

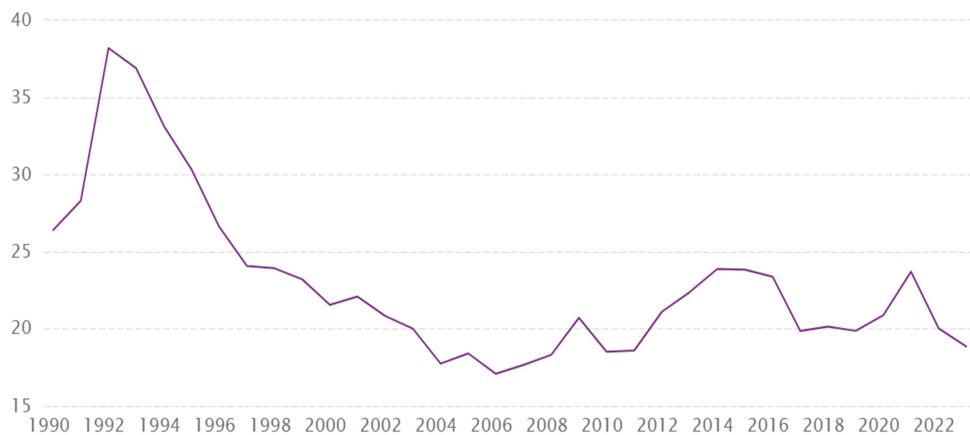
Since 2000, the net FDI inflows-to-GDP ratio has increased from negligible levels in the early 1990s to more substantial but fluctuating levels in the 2010s, with cyclical dips corresponding to global shocks such as the Global Financial Crisis and the COVID-19 pandemic. However, it declined sharply in 2022–23 amid heightened global uncertainty (Chart 9). The external debt-to-GDP ratio, which had peaked at over 35 per cent during the 1991 balance of payments crisis, declined steadily to around 18 per cent in the 2000s. However, it rose to approximately 24 per cent by 2014 and increased further in 2020 following COVID-related disruptions (Chart 10).

**Chart 9: Net FDI Inflow to GDP Ratio**



Source: RBI

**Chart 10: External Debt to GDP Ratio**



Source: RBI

India's Chinn–Ito Financial Openness Index (KAOPEN) for 2021 stands at – 1.242. Reported values for the entire period from 1970 to 2021 remain constant at this level, indicating no significant change in India's statutory financial openness during this time (Table 2).

**Table 2: India's Financial Openness Index (KAOPEN)**

|                   |                 |
|-------------------|-----------------|
| Latest value      | -1.242          |
| Year              | 2021            |
| Measure           | Index points    |
| Data availability | 1970 – 2021     |
| Average           | -1.242          |
| Min – Max         | -1.242 : -1.242 |

Source: Chinn–Ito Index, Portland State University's website ([web.pdx.edu](http://web.pdx.edu))

The consistently low value of the KAOPEN index suggests that India remains relatively closed compared to fully liberalized financial centres. While India has gradually relaxed financial regulations since the 1980s and 1990s, financial openness has not kept pace with trade liberalization. India's trade openness—evidenced by substantial tariff reductions, strong export growth, and expanding trade agreements—contrasts sharply with its cautious approach to financial market liberalization.

This cautious stance is driven by concerns over macroeconomic volatility, capital flight, and financial instability. Under the Foreign Exchange Management Act (FEMA), India maintains a fully liberalized current account, while the capital account remains only partially convertible, following a phased and calibrated approach. Initiatives such as the Fully Accessible Route (FAR) for government securities and the establishment of Special Rupee Vostro Accounts (SRVAs) reflect selective liberalization, but comprehensive capital account convertibility remains constrained to safeguard financial stability.

This divergence between trade and financial openness is a key factor behind India's persistent deviations from Covered Interest Parity (CIP), as noted by Bhattacharya *et al.* (2013). While statutory indices like the Chinn–Ito measure track formal capital controls, CIP offers a more practical, market-based gauge of financial openness. Unlike legal indices that assume frictionless capital markets, CIP captures real-world market conditions, including arbitrage frictions, capital mobility constraints, and risk premiums.

CIP deviations in India are symptomatic of the restrictions on foreign investment and cross-border financial transactions that limit arbitrage opportunities and prevent the closure of interest rate–forward premium gaps. Notably, even in advanced economies such as the U.S. and Europe, CIP broke down during the 2008 global financial crisis—not due to changes in formal capital controls, but because of heightened counterparty risks, regulatory pressures, and balance sheet constraints.

These experiences underscore that CIP reflects operational realities—such as liquidity constraints, institutional risks, and regulatory bottlenecks—that legal openness measures may overlook. Consequently, for policy analysis, CIP serves as an essential complement to statutory indices, offering a more accurate assessment of the effectiveness of cross-border financial integration in practice.

CIP, first formalized by Keynes (1923), is often regarded as the closest equivalent to a physical law in international finance (Borio *et al.*, 2016). It posits that, under no-arbitrage conditions, the interest rate differential between two countries should equal the forward–spot exchange rate differential, assuming foreign exchange (FX) exposure is fully hedged using forward contracts. In this idealized setting, the cross-currency basis—defined as the deviation from CIP—should be approximately zero.

Empirically, however, persistent and episodic deviations from CIP have been observed, particularly in emerging market economies (EMEs). These deviations, reflected in a non-zero cross-currency basis, are attributed to funding frictions, market segmentation, and risk premia. While CIP held relatively well for most currencies in the three decades preceding the Global Financial Crisis (GFC), post-GFC periods have seen substantial and enduring departures from parity.

Several stylized facts emerge from the Indian context. CIP gaps have widened during periods of heightened uncertainty or tighter capital controls—such as during the 2013 taper tantrum and the COVID-19 shock—while liberalization measures, including the introduction of the Fully Accessible Route (FAR), have narrowed them. These patterns reflect India’s

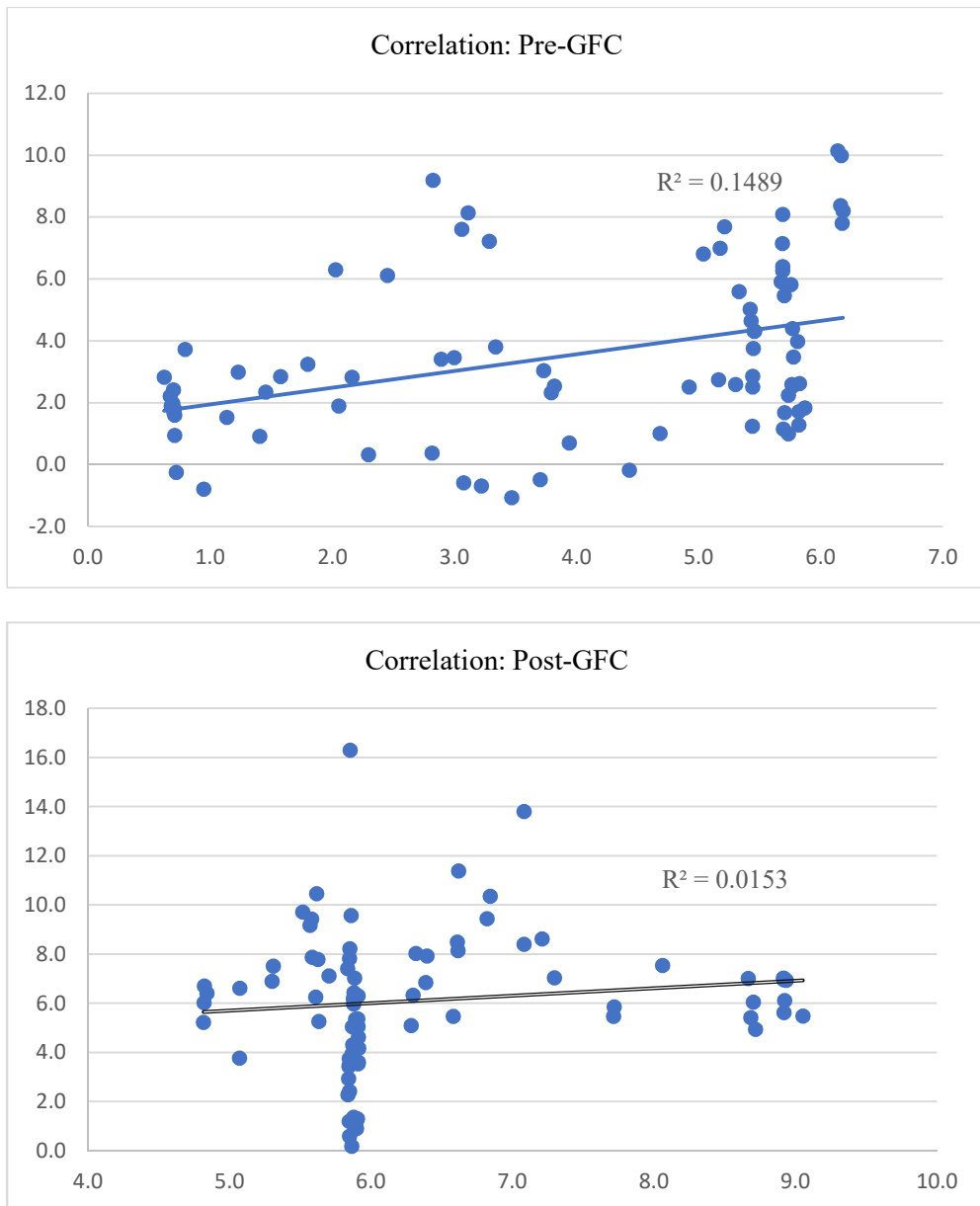
partially convertible capital account and underscore the deliberate policy trade-off between advancing financial openness and maintaining exchange rate and macroeconomic stability. Structural drivers of CIP deviations include limited access to rupee hedging instruments, capital controls, FX transaction costs, and policy interventions such as the accumulation or use of forex reserves and derivative market regulations. While reserves can dampen volatility, they do not address the underlying structural causes (Rao, V.K., 2011).

A mismatch between trade and financial openness further exacerbates these deviations. As trade liberalization progresses without a parallel expansion in financial market access, the demand for foreign currency hedging increases—particularly among firms and banks engaged in cross-border transactions. However, when supply in FX swap or cross-currency swap markets is constrained, hedging becomes costly or inaccessible. This leads to a rise in the cross-currency basis, reflecting the premium for accessing foreign currency through swaps rather than direct borrowing. The result is segmented funding markets—domestic *versus* foreign—with divergent funding costs across currency areas, which impedes arbitrage and sustains CIP violations (Siriwardane *et al.*, 2023).

Empirical research links capital account restrictions—manifested through discrepancies in funding costs and segmented money markets—to the persistence of CIP deviations. These findings support the view that market segmentation, particularly in EMEs, plays a central role in explaining why CIP often fails in practice (Rime *et al.*, 2017).

Scatter plots reveal a weaker correlation between interest rate differentials and forward premiums after the Global Financial Crisis (GFC) compared to the pre-GFC period (Chart 11). Several factors may explain this decoupling. Before the crisis, international financial markets generally assumed that CIP would hold, with forward premiums closely tracking interest rate differentials. However, post-GFC dynamics, as noted below, disrupted this relationship.

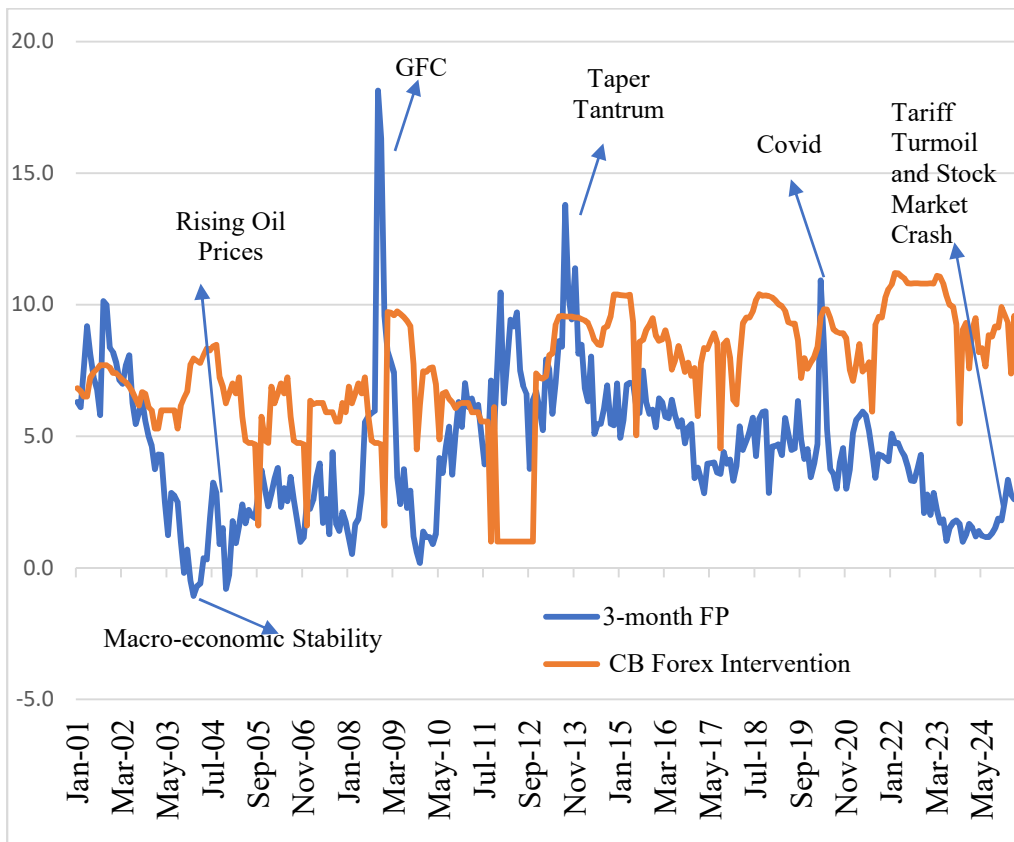
**Chart 11: Scatter Plot between Interest Differential and Forward Premium**



Note: The time frames selected for this comparison are January 2001 to September 2007 (pre-GFC, ending when the crisis began), and November 2008 to June 2015 (post-GFC). These periods were chosen to ensure an equal length of time before and after the crisis, allowing for a more balanced analysis of its impact.

Source: Author's compilation

**Chart 12: Movement of Forward Premium and Forex Intervention**



Source: Author's compilation

First, heightened risk aversion and tighter credit conditions constrained arbitrage opportunities, weakening the enforcement of CIP. Second, major central banks—most notably the U.S. Federal Reserve—adopted ultra-accommodative monetary policies, including large-scale quantitative easing, which injected excess liquidity into global markets and distorted forward rates, breaking their traditional alignment with interest differentials. Third, regulatory reforms such as Basel III introduced stricter capital and liquidity requirements for financial institutions, further limiting cross-border arbitrage activities.

Additionally, the composition of capital flows shifted. The rising prominence of Foreign Direct Investment (FDI)—which is relatively insensitive to short-term interest rate differentials—diluted the explanatory power of interest differentials over forward premiums (Panagariya, 2008). Finally, the Reserve Bank of India (RBI) has frequently intervened in the foreign exchange market to manage rupee volatility and mitigate undue appreciation or depreciation, especially during periods of global financial stress, further affecting the interest differential–forward premium relationship (Patnaik *et al.*, 2021).

The 3-month forward premium from 2001–2025 reflects key global and domestic events: low FP in 2004 (macro-economic stability, and capital inflows); rising FP in 2005 (oil price shocks, and global imbalances); spike in 2013–14 (taper tantrum); COVID-19 disruptions (capital flight, EM depreciation); and trade and tariff tensions alongside a global stock market crash of 2025 (Chart 12).

### **Our Key Findings on CIP Gaps for India**

Interesting insights emerge from the regression results on the relationship between the interest rate differential ( $i - i^*$ ) and forward premiums for Indian data across various tenors, with additional controls for policy interventions and global economic shocks (Table 3). The forward premium is consistently positive and significantly associated with the interest differential, with the magnitude of the coefficient increasing as the forward horizon extends from 1 month (0.25) to 12 months (0.58). This pattern suggests that longer-term forward rates more effectively incorporate expectations of future interest rate movements. The positive correlation strengthens as the forward period extends from 1 to 12 months, with adjusted  $R^2$  rising from 0.1628 in Model 1 to 0.3024 in Model 5, indicating longer horizons capture evolving economic and geopolitical expectations, though deviations persist, especially during global crises such as the GFC, taper tantrum, and COVID-19.

The inclusion of crisis-related dummy variables — representing the GFC and the COVID-19 pandemic, highlighting the combined impact of shocks, further improves the model fit. Global crises significantly alter dynamics, as the GFC dummy alone boosts explanatory power to 25.22 per cent, reflecting structural shifts and financial frictions. Model 8, which includes both the forward premium and crisis dummies along with central bank intervention, achieves the highest adjusted  $R^2$  of 0.4492.

The dummy variables for the GFC and COVID-19 are statistically significant and indicate that global economic crises have a material impact on the interest differential–forward premium relationship. Moreover, the interactive dummy variable combining both crises (Model 11) is negative and highly significant, suggesting a structural change in this relationship during periods of extreme financial stress. Crisis dummies significantly improve model fit (adjusted  $R^2$  up to 44.92 per cent), reflecting how shocks, risk aversion, and regulatory constraints disrupt arbitrage.

The coefficient on the Reserve Bank of India’s (RBI) net purchase or sale of U.S. dollars is statistically significant in several models (Models 6, 8, and 11), but the estimated magnitudes are negative and relatively small, implying a limited economic effect – it tends to reduce the domestic-foreign interest rate differential. RBI’s forex interventions and policy measures (*e.g.*, Fully Accessible Route) partially mitigate gaps but can’t eliminate structural causes. Persistent CIP deviations highlight India’s delicate balancing act - advancing financial openness while maintaining resilience. Monitoring these deviations is crucial for policy, as they embody the trade-offs between liberalization, market stability, and global integration. Additionally, the coefficient on capital flows is statistically insignificant, indicating that cross-border capital movements may not meaningfully influence interest differentials, particularly during periods of heightened global uncertainty, suggesting risk sentiment during crises weakens their link with interest differentials.

Table 3: Relation between Interest Differential and Forward Premium

| Dependent Variable: i - i*                                     | MODEL 1            | MODEL 2            | MODEL 3             | MODEL 4             | MODEL 5             | MODEL 6             | MODEL 7            | MODEL 8             | MODEL 9            | MODEL 10 | MODEL 11            |
|----------------------------------------------------------------|--------------------|--------------------|---------------------|---------------------|---------------------|---------------------|--------------------|---------------------|--------------------|----------|---------------------|
| Independent variables                                          |                    |                    |                     |                     |                     |                     |                    |                     |                    |          |                     |
| 1 MONTH FP                                                     | +0.2497<br>(7.59)* |                    |                     |                     |                     |                     |                    |                     |                    |          |                     |
| 3 MONTH FP                                                     |                    | +0.4112<br>(9.82)* |                     |                     |                     | +0.3268<br>(8.10)*  | +0.3956<br>(9.26)* | +0.2450<br>(4.60)*  | +0.3513<br>(8.79)* |          | +0.3298<br>(8.49)*  |
| 6 MONTH FP                                                     |                    |                    | +0.5116<br>(10.93)* |                     |                     |                     |                    |                     |                    |          |                     |
| 9 MONTH FP                                                     |                    |                    |                     | +0.5716<br>(11.41)* |                     |                     |                    |                     |                    |          |                     |
| 12 MONTH FP                                                    |                    |                    |                     |                     | +0.5808<br>(11.27)* |                     |                    |                     |                    |          |                     |
| NET SALE/<br>PURCHASE<br>OF USD BY<br>RESERVE BANK<br>OF INDIA |                    |                    |                     |                     |                     | -0.00049<br>(7.34)* |                    | -0.0007<br>(-9.05)* |                    |          | -0.00003<br>(4.70)* |
| GLOBAL<br>FINANCIAL CRISIS                                     |                    |                    |                     |                     |                     | +0.7966<br>(3.26)*  | +0.4505<br>(1.73)  | +1.08<br>(3.25)*    |                    |          |                     |
| INTERACTIVE<br>DUMMY (COVID<br>AND GFC)                        |                    |                    |                     |                     |                     |                     |                    |                     |                    |          | -1.317<br>(-4.76)*  |
| LOG OF CAPITAL<br>FLOWS                                        |                    |                    |                     |                     |                     |                     |                    | -0.1951<br>(-1.76)  |                    |          |                     |
| COVID 19 IMPACT                                                |                    |                    |                     |                     |                     |                     |                    |                     | -1.849<br>(-6.60)* |          |                     |
| ADJUSTED R-<br>SQUARE                                          | 0.1628             | 0.2470             | 0.2893              | 0.3073              | 0.3024              | 0.3678              | 0.2522             | 0.4492              | 0.3480             | 0.3480   | 0.3923              |

\* Significant at 1 per cent level ( $p < 0.01$ ).

Overall, India's integration with the global economy has increased since 1991, as reflected in higher trade-to-GDP ratios, tariff reductions, and FDI inflows. However, financial openness remains limited, with the Chinn–Ito index at  $-1.242$ , and selective controls indicating cautious liberalization. This asymmetry—high trade openness contrasted with cautious capital account liberalization—partially explains why deviations from the theoretically binding CIP continue, and why its CIP gaps are more structural than cyclical due to capital controls, structural frictions, and crisis shocks - highlighting the delicate policy balance between liberalisation and stability. As India's policy approach emphasizes stability over complete arbitrage, persistent CIP deviations highlight the ongoing challenge: balancing openness with stability. Monitoring these gaps is crucial for effective policymaking. The future challenge is to maintain trade competitiveness while adjusting financial openness to manage risks, avoid volatility, and ensure resilience.

## **SECTION IV: Select Real-Life Applications**

Since the 1990s, DSGE models have become essential tools in open economy macroeconomics. They integrate domestic and international channels to analyze global shocks, policy transmission, and economic interdependence. By incorporating financial frictions, heterogeneous agents, and climate risks, DSGE models provide theoretically grounded yet flexible frameworks for real-time policy evaluation in an interconnected world.

Recent developments underscore their growing relevance and applications across several domains, as outlined below:

### **1. Cryptocurrencies and CBDCs**

DSGE models have increasingly incorporated digital currencies. Asimakopoulou *et al.* (2023) demonstrate that productivity shocks in cryptocurrency markets can raise the value of fiat currencies, thereby driving monetary substitution. Their historical decomposition links cryptocurrency price movements to demand shocks, while fluctuations in fiat balances are tied to government currency dynamics. Research on Central Bank Digital Currencies (CBDCs) further shows that retail CBDCs can enhance welfare

and output; however, their design has important implications for exchange rate stability and cross-border banking (Sokol, *et al.*, 2023).

## **2. Climate Risks**

Open economy DSGE models increasingly incorporate disaster shocks, climate adaptation, and the energy transition. IMF studies show that uncertainty amplifies macroeconomic volatility, while adaptation spending can stimulate output. Multi-country E-DSGEs indicate that coordinated carbon markets deliver stronger outcomes than fragmented ones. ECB models further highlight the interactions between carbon taxes and monetary–fiscal policy (Brand *et al.*, 2023; Bems *et al.*, 2024).

## **3. Tariffs and Trade Shocks**

Recent U.S. tariff measures, along with retaliatory actions by trading partners, have dominated global policy debates given their broad impacts on trade flows, output, and welfare. Multi-region DSGE models show that tariffs reduce output primarily by lowering factor utilization rather than by reallocating resources. They also increase inflation persistence and complicate monetary policy, particularly at the effective lower bound. Evidence from IMF and CEPR models suggests that tariffs on intermediate goods impose stronger negative effects on GDP and inflation than those on finished goods, making expansionary monetary policy the optimal response despite inflation trade-offs (Gnocato *et al.*, 2025; Boer *et al.*, 2024). In the short term, tariffs act as negative supply shocks for tariff-imposing countries—depressing output while raising consumer prices—and as negative demand shocks for targeted countries—reducing both output and prices. Over the longer horizon, global output losses could reach 1 per cent of GDP, underscoring the urgency of renewed cooperation on trade policy (Cerdeiro *et al.*, 2025).

#### **4. Methodological Innovations**

Techniques such as Hamiltonian Monte Carlo, particle filters, and variational inference have significantly advanced estimation, while machine learning supports parameter calibration. Extensions to heterogeneous-agent DSGEs (HANK) and nonlinear methods improve the modelling of systemic risks and distributional effects, particularly in the wake of the 2008 financial crisis and the COVID-19 pandemic.

Nonetheless, DSGE models continue to face criticism for their reliance on simplifying assumptions—such as rational expectations and representative agents—and for their limited ability to forecast crises. These limitations have encouraged a more pluralistic approach, in which DSGEs serve as benchmarks alongside structural econometric models and agent-based frameworks that capture non-equilibrium dynamics, behavioural expectations, and high-frequency data.

Far from obsolete, DSGE models are evolving into flexible, data-rich, and computationally robust tools. They remain central as benchmarks while coexisting with complementary approaches to better address real-world complexity. Their adaptability in modelling digital currencies, climate risks, and trade shocks underscores their enduring relevance for global economic policy in an increasingly interconnected world.

#### **SECTION V: Concluding Remarks and Policy Insights**

Open economy macroeconomics has evolved alongside growing global interdependence, capital mobility, and policy spill overs. From the foundational Mundell-Fleming model to modern DSGE frameworks, the field has progressively incorporated micro foundations, frictions, and agent heterogeneity. Yet contemporary shifts—such as deglobalization, geopolitical tensions, and supply chain fragmentation—pose new challenges to established models. At the same time, the rise of digital trade, artificial intelligence, and green finance is reshaping cross-border economic dynamics. Digital services now constitute more than half of global services exports, while central banks are increasingly deploying green monetary

instruments, including incentives for green bond markets. Institutions such as the IMF and WTO continue to call for coordinated policy frameworks that balance national sovereignty with multilateral cooperation to support resilient and inclusive growth.

Looking ahead, macroeconomic models must embed climate risks, technological disruption, and geopolitical uncertainty. Addressing inequality and systematically incorporating agent-level heterogeneity will be critical for fostering inclusive development. Hybrid approaches—integrating DSGE models with machine learning, agent-based modelling, and high-frequency data—offer stronger explanatory power and predictive capacity. In an increasingly multipolar world, policy coordination frameworks will need to adapt to the realities of fragmentation and shifting global power dynamics.

For EMEs such as India, these evolving frameworks inform the design of proactive, rules-based macroeconomic policies. India’s strategy—combining exchange rate flexibility, foreign exchange interventions, and macro-prudential regulation—has been recognized by the IMF as a pragmatic and sophisticated approach to maintaining stability while supporting growth.

### Key Policy Insights

India's evolving openness strategy offers valuable lessons for navigating a multipolar, uncertain global economy—balancing integration with resilience, and openness with stability.

- **Strengthen External Resilience:** India's trade integration has deepened since 1991, but recent shocks (like COVID, Ukraine war, trade tensions) have exposed vulnerabilities tied to heavy reliance on external demand. Building resilience to such shocks should be a core policy priority *inter alia* through trade diversification, reserve adequacy, and responsive FX management.
- **Monitor Shifting Financial Relationships:** The once-stable link between interest rate differentials and forward premia has weakened since the Global Financial Crisis. This reflects structural frictions, global monetary shifts, and regulatory changes that constrain arbitrage and affect currency markets.
  - Reassess the reliance on traditional indicators like interest differentials for currency market analysis and capital flow management.
  - Continue with measured financial liberalization, supported by strong regulatory frameworks and risk-mitigation tools.
  - Invest in market infrastructure and hedging instruments to reduce segmentation and improve the efficiency of foreign exchange markets.
- **India's Openness: Trade Outpaces Finance-** India's unique profile — high trade openness but limited financial openness — explains why CIP gaps persist. The policy challenge is to balance gradual liberalisation with macro-financial stability.

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