

The Impossible Trinity: Relevance in Contemporary Economies

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Abstract - The infinity trinity or the trilemma has been a significant macroeconomic phenomenon. The emerging, non-emerging market and the industrialized countries approach the trilemma in different ways. The accumulation of International reserves has affected the patterns of trilemma worldwide. The theoretical validity of the trilemma shall be looked upon backed by empirical data showing failure of countries trying to disprove it. The specific reaction of India to the trinity in the last couple of decades and the extent of trade-offs between the three variables, has also been discussed. The theory has also received considerable criticism in Keynesian model. The placing of such criticism and the rationale behind the theory shall be seen against each other. The question dealt in this paper is weather the concept remains relevant in the contemporary world economy despite the criticism it has faced.

Index terms – capital movement, foreign exchange rate, international reserves, monetary policy, Mundell-fleming trilemma, the impossible trinity, three variables



1. INTRODUCTION

The impossible trinity or the Mundell-Fleming trilemma, more commonly known as the trilemma, is a theory in international economics which claims that it is impossible to achieve all three policy goals among, a fixed foreign exchange rate, free capital movement and an independent monetary policy, in any economy at the same point of time. According to this theory the economies face a trade-off, due to instrumental scarcity, where increasing one variable of trilemma would lead to decreasing weighted average of the other.

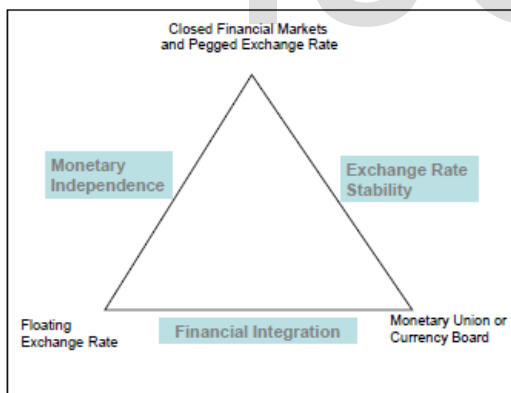


Fig.1: The Impossible Trinity

The three variables of the trinity must be understood as the edges of this triangle and the trilemma binds them to function only near two edges at a time. As countries do not operate on vertices this concept has to be verified by measuring the trade-off between the variables.

The first section of this paper gives a brief literature review relevant to the discussions carried on in this paper. The second section looks at the role of international reserves (IR) in the affecting the reactions of the countries towards trinity. The third section explains the approach taken by ACI in verifying the

constraint imposed by trilemma variables on each other, followed by particular case of India facing the constraints. Further, a few theoretical critiques are presented against the concept to check its relevance in the contemporary world economy followed by the conclusion of the paper.

2. LITERATURE REVIEW

The economic logic and usefulness of the impossible trinity was argued by Eichengreen (1996), Bordo and Flandreau (2003), Obstfeld and Taylor (2004), Aizenman Chinn and Ito in (2013), Aizenman and Glick (2008) and Aizenman (2010). The most relevant of these works have been done by the Aizenman Chinn and Ito (referred to as ACI further in the paper). ACI has included the factor of international reserve in their study to verify the constraint imposed by the variables in presence of international reserve. The role of international reserves in affecting trinity reactions is also discussed at length by Mansour (2014). Hutchison, Sengupta and Singh (2012) and Sengupta (2016) both have followed the indices developed by ACI to check the relevance of trinity in Indian context. The major criticism faced by this concept remain in theory. In the paper by Palley(2009) The concept of trinity was questioned in the Keynesian model saying even though, the economic logic stands with the constant trade-offs among the three variables, most of the countries do not aim to achieve capital mobility. Flood and rose (1999) approach the trilemma by challenging the notion of constraint posed by nature of exchange rates regimes.

3. INTERNATIONAL RESERVES CHANGING THE PATTERNS OF TRINITY REACTIONS

The Mundell-Fleming model never considered accumulations of International reserves as a factor. However, an economy holding an ample amount of International reserves might be able to achieve a combination of all three economic goals being talked about. In such a situation, an open economy with independent monetary policy might stabilise the exchange rates with holding a sizeable amount of IR. Thus, the changing pattern of response to the trinity must be studied in context to accumulations of IRs. Financial globalization has been on the rise since the 2000s which also creates the risk of exposure to financial volatilities for the developing countries, which might be

the reason to enormous increase in international reserve accumulation. Financial stability is being an attached goal to financial integration. Considering this, ACI also included IRs as the fourth factor to check the linearity in the trilemma indices in present of IR accumulation. IR is measured in its share to GDP (IR/GDP) to study the respective increase in each economy. The increase in IR/GDP ratio has been increasing dramatically in the recent past from USD 1trillion in 1980 to USD 5 trillion in 2006. Fig. 2 shows the increase in industrial countries to be at 6-8% and at about 10-25% in developing countries. The Asian countries have shown the reserve accumulation to increase from 10% in 1980 to around 34% in 2010 excluding China. China alone increased its reserve holding from 1% in 1980 to extraordinary 48% in 2009-2010.

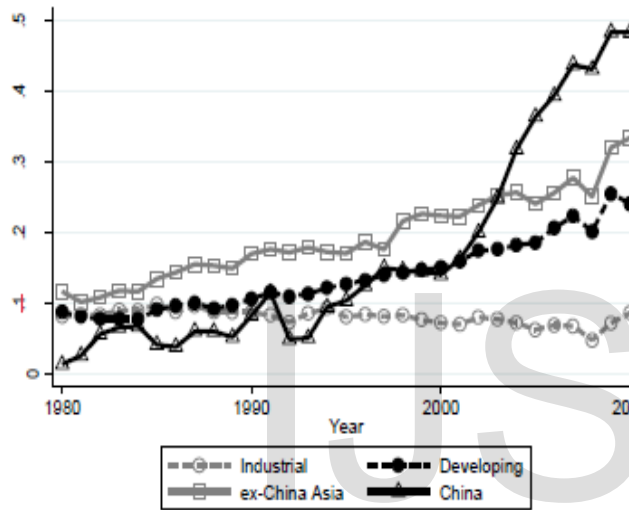


Fig. 2: International Reserves/GDP, 1980-2010

4. THEORETICAL RELEVANCE AND EMPIRICAL DATA SUPPORTING THE TRILEMMA

Testing the trilemma has been a challenge since most countries do not operate on the vertices, as the trilemma does not enforce a functional restraint on linking with the three variables. To check the robustness of the trilemma, the measurable indices of all three variables is developed to see the trade-off among the three, in the work by ACI. The data set in their experiment consists of 184 countries and the observations for the time period 1971-2010 are being analysed, divided into four sub-periods of 10 years each and is obtained from the paper by ACI.

The index of monetary independence is stated in the following terms:

$$MI = 1 - \frac{corr(i_t, i_j) + 1}{2}$$

Where i is attributed to the home countries and j to the base countries. The range being between 0 to 1. Higher the MI value of a country, the more monetary independent it is.

The index of Exchange rate stability was defined by including the standard deviation of monthly exchange rate between the home country and the base country in the following terms:

$$ERS = \frac{0.01}{0.01 + stdev(\Delta(\log(exch_rate)))}$$

To take into account any downward biases that might result by operation of this formula, a threshold of error at +/-0.33 percent is determined and if any monthly deviation lies between this threshold the exchange rate system will be considered to be "fixed".

To account the financial openness and integration the index developed by Chinn and Ito (2006, 2008) named KAOPEN shall be used. It is based on the information of restrictions to capital mobility in the IMF's annual report on *Exchange Arrangements and Exchange Restrictions (AREAER)*. As this report based upon de jure index of financial openness, it helps to understand the intentions of the policy makers of the countries. The index ranges between 0 and 1 and the higher value of the index indicates that the country is more open to globalised capital operations.

To show that choice between these policy goals is constraining it is important to prove that increasing one trinity variable, say increasing financial openness to the global market, must result in decrease in monetary independence or lower exchange rates or a mix of both adjustments. Thus, a linear form was formulated by ACI wherein, sum of all the indexes of the variables must add up to a constant and change in the value of any one variable would lead to drop in weighted average of other two variables, where all weights are positive. ACI also included international reserve ratio in this linear equation to study the trade-off in the contemporary context. The equation developed was

$$1 = a_j MI_{i,t} + b_j ERS_{i,t} + c_j KAOPEN_{i,t} + d_j IR_{i,t} + \varepsilon_t$$

	(1) FULL	(2) 1970-72	(3) 1974-81	(4) 1983-96	(5) 1999-2010	(6) 1983-89	(7) 1991-2010	(8) 1983-2000	(9) 2002-2010
Monetary Independence	1.050 (0.041)***	0.941 (0.117)***	1.359 (0.070)***	0.852 (0.074)***	0.606 (0.086)***	1.065 (0.090)***	0.581 (0.067)***	0.825 (0.069)***	0.650 (0.093)***
Exch. Rate Stability	0.536 (0.031)***	0.598 (0.083)***	0.600 (0.081)***	0.562 (0.049)***	-0.056 (0.082)	0.590 (0.065)***	0.247 (0.074)***	0.531 (0.048)***	-0.023 (0.083)
KA Openness	0.438 (0.020)***	0.384 (0.048)***	0.292 (0.059)***	0.423 (0.033)***	0.832 (0.044)***	0.337 (0.046)***	0.699 (0.034)***	0.455 (0.030)***	0.802 (0.046)***
ERM x MI	-0.229 (0.078)***	-	0.300 (0.354)	-0.223 (0.122)*	-0.291 (0.135)**	-0.340 (0.267)	-0.126 (0.101)	-0.086 (0.098)	-0.690 (0.113)***
ERM x ERS	-0.026 (0.054)	-	0.252 (0.198)	0.017 (0.072)	0.146 (0.087)*	0.066 (0.114)	-0.039 (0.084)	-0.062 (0.064)	0.004 (0.088)
ERM x KAOPEN	0.036 (0.048)	-	-0.279 (0.131)**	0.004 (0.058)	0.080 (0.051)	0.040 (0.128)	0.079 (0.049)	-0.007 (0.052)	0.210 (0.048)***
LDC x MI	0.162 (0.046)***	0.526 (0.153)***	-0.166 (0.102)	0.451 (0.079)***	0.430 (0.091)***	0.296 (0.098)***	0.544 (0.073)***	0.479 (0.074)***	0.352 (0.100)***
LDC x ERS	-0.127 (0.033)***	-0.339 (0.098)***	-0.131 (0.090)	-0.157 (0.052)***	0.476 (0.078)***	-0.229 (0.070)***	0.171 (0.077)**	-0.131 (0.051)***	0.458 (0.077)***
LDC x KAOPEN	-0.229 (0.030)***	-0.188 (0.106)*	-0.171 (0.085)**	-0.207 (0.051)***	-0.580 (0.057)***	-0.000 (0.078)	-0.472 (0.044)***	-0.302 (0.046)***	-0.531 (0.062)***
IR as % of GDP	0.657 (0.153)***	0.596 (0.551)	-0.192 (0.682)	1.368 (0.333)***	0.649 (0.226)***	0.964 (0.467)**	0.952 (0.178)***	1.416 (0.287)***	0.624 (0.220)***
LDC x IR	-0.317 (0.166)*	-0.943 (0.580)	0.534 (0.704)	-0.019 (0.352)***	-0.171 (0.245)	-0.367 (0.490)	-0.559 (0.197)***	-1.145 (0.308)***	-0.169 (0.243)
ERM x IR	0.076 (0.295)	-	0.664 (1.082)	0.484 (0.473)	-0.562 (0.247)**	1.346 (0.702)*	-0.433 (0.323)	0.037 (0.464)	-0.277 (0.224)
Observations	0.96	0.98	0.95	0.96	0.96	0.97	0.96	0.96	0.96
Adjusted R-squared	2.421	173	471	835	705	415	1.185	1.075	525

Table 1: Regression Table for The Linear Relationship Between Trilemma Indices
 $1 = a_j MI_{i,t} + b_j ERS_{i,t} + c_j KAOPEN_{i,t} + d_j IR_{i,t} + \varepsilon_t$

The table 1 shows that the substitution of value of indices in the above formula have resulted in the approximate value of the

constant, i.e., 1 in all the cases, indicating the linear relation in these policy goals.

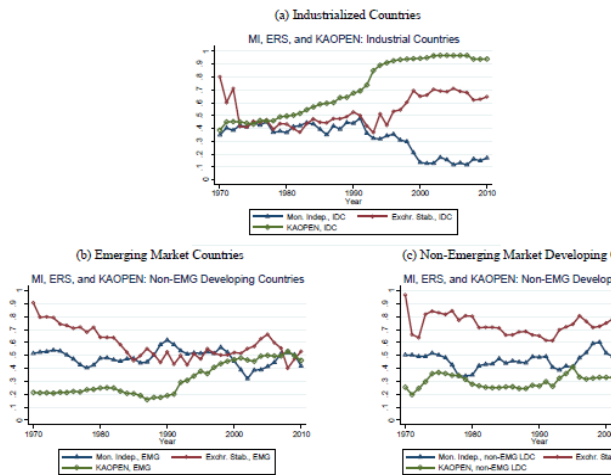


Fig. 3: The Evolution Of Trilemma Indices 1970-2010

Fig. 3 shows the evolution of trilemma indices in the countries through the decades, categorised under the three subheads of industrialised countries, emerging market economies and non-emerging market economies.

The trade-off can also be seen with the use of the diamond charts that summarize the trilemma trends in the industrialized countries, emerging market economies and non-emerging market developing countries. The four vertices of the diamond graph measure the monetary independence, exchange rate stability, IR/GDP ratio, and financial integration. The origin represents no monetary independence, floating exchange rate system, zero international reserves and closed capital markets.

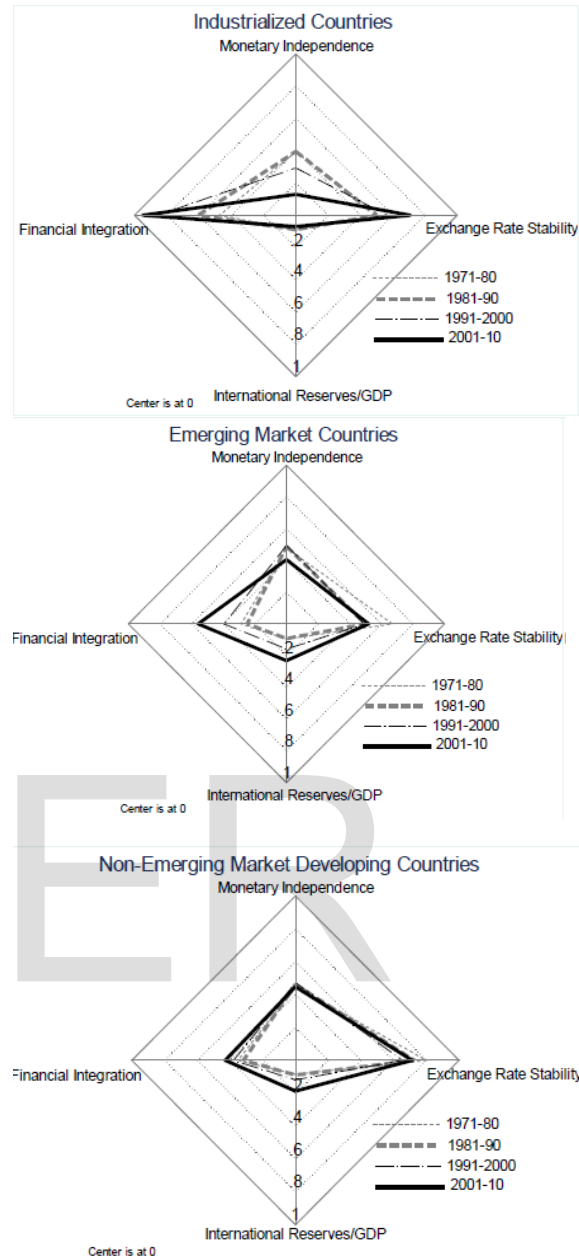


Fig. 4: The Trilemma and International Reserves Configurations over Time

The above graphs (Fig. 4) show that the industrialized countries and emerging market countries have been increasingly open to capital mobility than non-emerging countries. The trade-off is seen by loss of monetary independence in the former two. A drop in exchange rate stability is also seen in the emerging market countries. The non-emerging countries have been swinging around the same indices which is more leaning to higher exchange rate stability. With highest amount of IR, the emerging market countries has achieved the most balanced policy goals among three.

5. THE TRILEMMA PATTERNS IN INDIA

The policies implemented in 1991 after Balance of Payment crisis in India, emphasised the three goals of liberalisation, privatisation, and globalisation of the Indian economy. These policies opened the closed market of the country to the world. The aim is to examine the restraining effect of this financial integration on exchange rate and interest rate policies of India. The Indian capital account is only open to non-debt flows like FDI and portfolio and closed to other debt flows (Sengupta, 2016). The exchange rate in India is managed floating exchange rate regime and is intervened by RBI whenever in dire need of stabilization (Sengupta, 2016). The international reserves in India doubled from being \$150 billion in 2005 to \$300 billion in 2010.

In the Indian context the most relevant empirical study exploring trilemma trade-offs was given by Hutchison, Sengupta and Singh (2012). The data being analysed is taken for a period of over fifteen years on a quarterly basis and is sub-divided into three time frames being 1996 – 2001, 2001- 2005, 2005- 2009. The exchange rate statistics is obtained from Global financial database (www.globalfinancialdata.com). The ACI index is used for the calculation of monetary independence and exchange rate stability. The constant set to check the linearity in the equation is 2 in this case. The data on International reserves is taken from the RBI database (RBI, 2009). The fig. 5 shows the evolution of each trilemma variable along with international reserve ratio in the specified time frame.

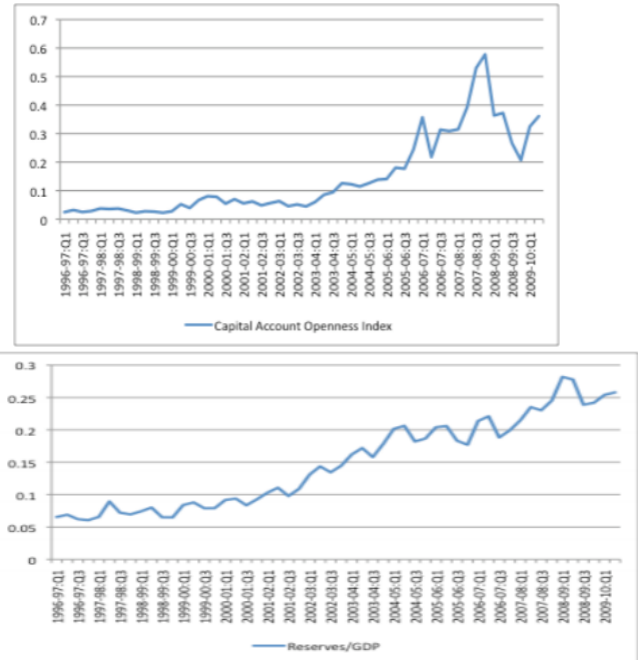
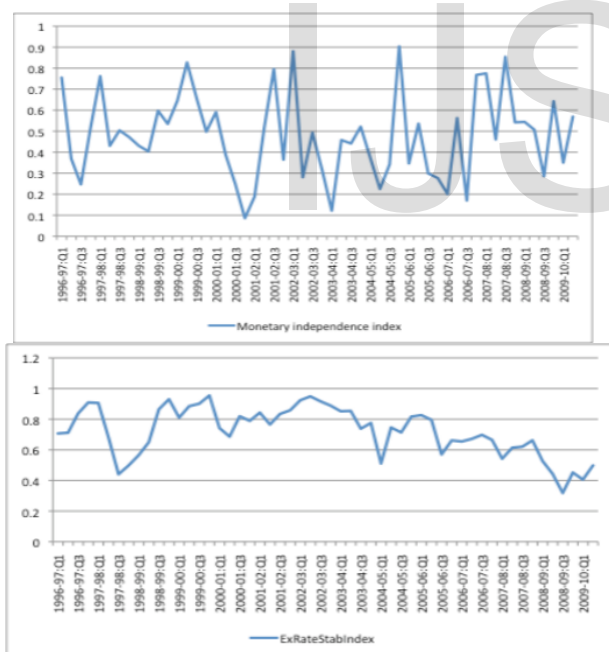


Fig. 5: Evolution Of Individual Trilemma Indices And International Reserves In India, 1996-2010; In Order – Monetary Independence Index, Exchange Rate Stability Index, Capital Account Openness Index, Reserves/GDP.



In each of the period, the indices sum up to 2 proving the constraint the variables impose on each other. The average is calculated for all the indices along with international reserve ratio over the divided time frame to compare on the diamond graph. This approach was disseminated by ACI where origin represents no monetary independence, floating exchange rate system, zero international reserves and closed capital markets.

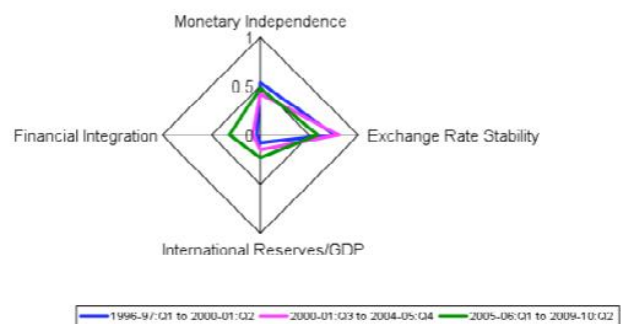


Fig. 6: The Trilemma and International Reserve Configurations over time in India

The diamond graph for India (Fig. 6) shows a constant increase in international reserves and financial institutions while trying to balance the indices of exchange rate stability and monetary independence. In the second time frame, as financial integration increases and the exchange rate is retained and even

strengthened, monetary independence takes a massive hit. In the third phase, as the capital mobility is still growing, the exchange rate stability falls to compensate for recuperating monetary independence. The trade-off and instrumental constraint by the variable are well established in this data.

6. KEYNESIAN CASE AGAINST TRINITY

The Keynesian model of macroeconomics believes that the goal of financial integration or capital mobility laid down by Mundell-Fleming model, is an undesirable goal for any economy. It claims that financial integration with the world might result into macro-economic problems of unemployment and inflation (Palley, 2009).

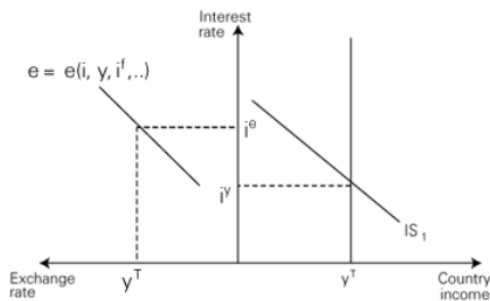


Fig. 7: Effects on Interest rate determination by exchange rate in Keynesian Model

In a fixed exchange rate system, inflow of capital will lead to currency appreciation which will compel administrative intervention. This will further lead to unwanted monetary expansion resulting in inflation in asset prices. On the other hand, capital outflows will again induce official action to maintain the exchange rate by depletion of reserves. Moreover, according to Keynes (1980), any economy requires lower interest rates to reach to the conditions of full employment in an economy. Capital outflows might lead the monetary administration to increase the domestic interest rates above the required rate at full employment level. See fig. 7 where i^Y is the desired interest rate and y^T the desired output level for full employment level. Since in the Keynesian model the exchange rate is determined in the foreign exchange market thus capital inflows have direct effects on the exchange rate of the country, increase in capital outflow and thus exchange rate will lead the authorities to increase the domestic interest rate to i^O , which is above the desired rate of i^Y , decreasing the output level to y^T , leading to macroeconomic problems of inflation and unemployment. Only when there exists a foreign exchange supply gap or deficiency of foreign money, is capital mobility desirable in a Keynesian model and not in normal circumstances. Thus, any scarcity in domestic funds is not cured by capital inflows in an economy but only the shortage of foreign money used for payment against imports.

7. QUESTION OF RELEVANCE IN CONTEMPORARY ECONOMIES

The impossible trinity developed in 1961 though have enormous empirical data backing it up, the concept seems to have two shortcomings in the present times. First, it allocates the same policy significance to all the three variables of the trilemma for all the economies, when that might not be true. Secondly, after the break down of the Bretton woods system, the countries did not hesitate to move to flexible exchange rate systems. The trinity failed to include the more important agendas like managed exchange rates, synchronized monetary decisions between countries and managed financial integration policies, which are more relevant to the contemporary scenarios.

The desirability of a degree of flexibility of the exchange rate is also not addressed by the trilemma. Devereux *et al* (2003) and Obstfeld (2006) stated the desirability of the flexible exchange rate system by all countries except the dollarized countries, where deviating from the fixed exchange rate system, more often than not, would lead to a financial crisis, (Mishkin and Savastano 2001)

For countries, whose currencies are freely convertible against each other like yen, dollar, euro, etc., the concept of trinity is not relevant (Sheel, 2014). As the currencies are freely tradable in the liquid international financial market, the economy's external and internal imbalances are hard to differ. The policy makers are independent to make policies responding to domestic business needs and cycles. The relevance of trinity has long held its grounds in EMEs, where currencies are not freely convertible, and where financial systems are much more tightly regulated. Moreover, unmanaged capital flows can aggravate inflation, stir up asset prices, and sudden changes in capital inflows can lead to instabilities and financial crisis in currency markets, Mexican crisis of 1994, east Asian crisis of 1997, Russian crisis of 1998, etc (Bustelo, 2004).

The model developed by Flood and Rose (1999), establishes that the fundamental volatility of the economy does not differ across the exchange rate regimes. Since the stability of exchange rate does not result in macroeconomic differences, the premise of Impossible Trinity that exchange rate stability, monetary independence and financial integration are functioning as a constraint over each other, falls apart.

8. CONCLUSION

The concept developed by Mundell-Fleming is though accurate but it would be more relevant in the current times if it were developed into a functional quadrilemma including the factor of international reserve as ACI tried to include into his work. The concept is farsighted and has faced only theoretical criticism with no empirical objections till date. However, the idea of absolute goals of financial integration, exchange rate stability and complete monetary independence might never be completely desirable in their pure sense, thus the idea of managed goals would render more relevant in contemporary economy. However, the question posed in the abstract of this paper maintains to be answered in affirmative as the criticism posed to this concept do not substantiate towards its irrelevance in empirical terms. This paper has also provided enough information to agree to the relevance of the phenomenon in the world economy and that of India in the recent past. Unless a structural change as big as Bretton would systems occurs, the trinity remains relevant to the macroeconomic trends of the world economy.

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