



ISSN: 2189-9126

# 国際開発研究フォーラム

FORUM OF INTERNATIONAL DEVELOPMENT STUDIES

## 研究論文

ARTICLE

### **Impossible Trinity Analysis: The Choice of Exchange Rate Regime Empirical Evidence from Multinomial Logit Model**

Sreyleak MON

52-3

名古屋大学大学院国際開発研究科  
GRADUATE SCHOOL OF INTERNATIONAL DEVELOPMENT  
NAGOYA UNIVERSITY

# Impossible Trinity Analysis: The Choice of Exchange Rate Regime Empirical Evidence from Multinomial Logit Model

Sreyleak MON\*

## Abstract

The implication of trilemma policy is still controversial in recent macroeconomic nexus. The trilemma implies only two out of three objectives can be attainable hence the policymakers need to choose which one to abandon. This paper contributes to the literature by applying a multinomial logit model, where the exchange rate regime is the categorical dependent variable, with the combination of financial integration and monetary independence over 18 years for 171 countries. Also, I divide the sample into three income-groups, according to the World Bank classifications. Those groups are low-income, middle-income, and high-income economies. There are three main findings: (i) the impossible trinity holds at rounding the corner where a high degree of the financial integration and monetary independence coexist with the intermediate regime, (ii) at least, there is a quadratic relation between exchange rate regime and financial integration for the low-income economies, and (iii) the controlled variables—logarithm of real GDP, ratio of the average of exports plus imports to GDP, standard deviation of the terms of trade, inflation rate, share of mineral export to total export, total reserves in months of imports, dummy variable for ASEAN countries—incorporated in this paper, are significant in choosing an exchange rate regime with different impact magnitude.

**Keywords:** Impossible Trinity, Financial Integration, Monetary Independence, Multinomial Logit Model, Exchange Rate Regime

## 1. Introduction

The impossible trinity theorem has become a fundamental of macroeconomics of open economies in the 1980s, by which time capital controls have almost been abandoned with the conflicts of the pegged exchange rate and monetary autarky. From the late 1990s, economists included the new terminology “trilemma” into the broader economic literature. Then, they developed methodologies to empirically validate this critical hypothesis in international macroeconomics (Obstfeld et al. 2005). For more than two decades, developing countries have attempted to increase the level of financial openness.

However, the validating of the trilemma paradigm remains a challenge. The combinations of the three policy options are possible; nonetheless, mismanagement of them leads to severe economic

---

\* Third Year Student of Doctoral Program in GSID, Asian Satellite Institute, Nagoya University. This paper was part of her dissertation at GSID. The author would like to thank Prof. Masakazu Someya for his great support and guidance. A sincere appreciation and thanks to Prof. Tetsuo Umemura and Prof. Carlos Mendez for their valuable comments.

downturn, for example, the Asian financial crisis. Those relevant countries neglected the impossible trinity policy while maintaining capital flows, monetary policy independence, and peg exchange rate regime. The impact was severe as their foreign reserves emptied, and currency collapsed.

As no many papers have empirically verified the trilemma by examining the choice of exchange rate regime using the interaction of financial integration and monetary independence, this paper contributes to this policy lack. Concerning the financial integration or capital mobility, both de jure and de facto measurements are employed to mitigate the limitations, which are gaps between actual and government regulatory aspects. To validate this hypothesis, I use multinomial logit models over 171 countries during the period from 1999 to 2016 with the categorical exchange rate regime as the dependent variable. The data is also categorized into three income groups: low, middle, and high.

## **2. Literature Review**

### **2.1. The Trilemma Suggests Essential Policy Guidance**

Obstfeld et al. (2005) show that with the absence of capital control, pegs are aligned with less monetary independence, and non-pegs coexist with considerable monetary autarky. Moreover, under the peg exchange rate, local interest rates react quickly and have a stronger long-run relationship with policy rate than the non-peg. Subsequently, Aizenman et al. (2010) examine the impossible trinity policy mix<sup>1</sup> in developing economies on combining at most two policies on economic outcomes. They find that (i) monetary independence distracts output volatility, but a more stable exchange rate implies more output volatility where accumulating the international reserves can mitigate the situation (ii) higher monetary autonomy links to a higher inflation level while the high level of exchange rate stability and financial integration might lower the level of inflation (iii) the adopted policy for exchange rate stability and a medium level of financial development might increase output volatility; more financial openness and financial development should lower output volatility.

Klein and Shambaugh's (2015) work on rounding the corner of trilemma policy. Their paper confirms the impossible trinity under the intermediate binary choices of the trilemma policy variables. They argue that strong capital controls or floating exchange rates could allow an economy to maintain their monetary autarky. Nonetheless, partial capital controls do not allow a country to preserve high-level monetary control. The moderate level of exchange rate flexibility allows for some room for monetary autonomy, particularly regarding emerging and developing countries.

### **2.2. Criticism of Trilemma Policy after the Financial Crisis**

The Trilemma framework has been criticized for not reflecting the actual circumstances that some of the East Asian countries over the past decade could keep open capital markets, the monetary policy discretion, and some degree of exchange rate movement (Grenville 2011). Those countries

are Singapore and Malaysia, allowing free capital flow with interest rate differential and managed float exchange rate. They try to increase the FX reserve holdings by running the interest rate level to what they need. They have to intervene heavily to resist the large exchange rate volatility to keep it in a manageable band.

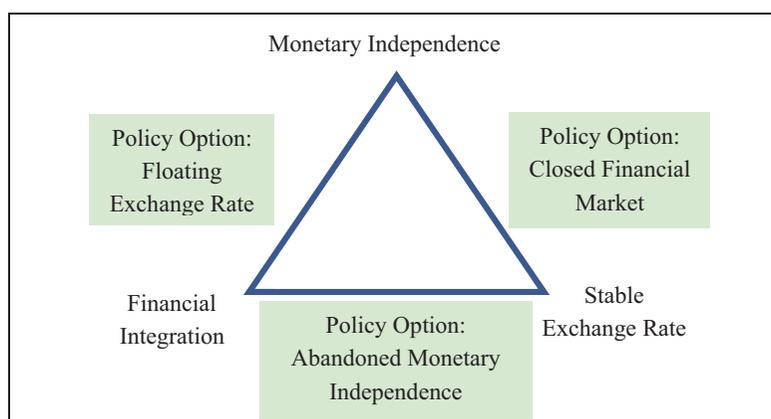
There is also a lack of model specification on suitable instruments to tackle financial stability due to capital flight crises in the context of the trilemma policy goal after the financial turmoil of the 1990s (Aizenman 2019). This is known as the transformation into a quadrilemma where policy instruments have been added. Concisely, the emerging economies' policy has converged to the trilemma middle ground consisting of the managed-floating regime, low level of financial openness, and feasible but limited monetary policy. Aizenman suggests the critical policy instruments to cope with financial stability: international reserves management, swap transactions among central banks, and macroeconomic prudential regulations.

After the global financial crisis, the trilemma has been transformed into a dilemma or irreconcilable duo (Rey 2015). Indeed, monetary independence is possible if and only if under a well-managed capital account regardless of the exchange rate regime. In the international financial system, the global financial cycle determinants are the monetary policy of an important economy that impacts global banks' leverage, capital flows, and credit growth. To cope with that cycle and the dilemma, the author suggests some policy options: (i) managing capital controls, (ii) monitoring credit growth and leverage by applying macroprudential policies, and (iii) imposing limits on leverage for financial intermediaries.

### 2.3. Impossible Trinity

The trilemma implies that since only two out of the three objectives can be attainable, policymakers need to choose which one to abandon. The following “Trilemma Triangle” explains those policy

**Figure 1 Trilemma Triangle Diagram**



Source: Author.

choices. First, the “floating exchange rate” is aligned with financial integration and monetary autonomy—the choice of the U.S in the last five decades. Second, the “closed financial market” coexists with monetary autarky but stable exchange rate—the developing countries’ trilemma policy in the 1980s. Third, the “giving up monetary independence” aligns with peg and financial openness—the choice of countries forming the currency union. The trilemma does not say that if you have a floating rate and an open capital account, you can be insulated from foreign monetary policy (i.e., interest rate) shocks. Besides, monetary policy may be used to influence the size and nature of the shock. Still, it is unlikely that it can completely offset all effects of international financial shocks.

## **2.4. Exchange Rate Regime Classifications**

Many economists classify exchange rate regimes according to what countries act—de facto—and the announced policy—de jure (Obstfeld et al. 2005; Reinhart & Rogoff 2004). However, the problem is the mismatch between the official reporting and prevailing exchange rate arrangements. First, the actual exchange rate is more stable than the policy announcement. Second, if a government reports the pegged regime, they could not implement it as the peg exchange rate needs more frequent foreign exchange market intervention to limit actual variability. It is worth mentioning that, according to Yagci (2001), a more stable exchange rate regime is favorable by the countries in the European Union, dollarization economies, and countries with low policy credibility.

Given these reasons, “de facto” might be the better exchange rate classification to capture the related economic activities. Hence, in this paper, I apply two de facto classifications: (i) the IMF and (ii) Ilzetzki, Reinhart, and Rogoff (2017).

### **2.4.1. IMF Exchange Rate Arrangement (De Facto—IMF)**

The IMF staff examines the de facto exchange rate classification based on the member’s actual arrangement, which is different from the government’s announcement. This classification is ranked according to the degree of flexibility and exchange rate paths for both formal and informal commitments. The IMF revised the system classification in early 2009, particularly regarding the de facto system.<sup>2</sup>

To fit the model specification in this paper without losing its originality, I reclassify this exchange rate arrangement into three categories: (1) if peg; (2) if intermediate and; (3) if float. From “no separate legal tender” to “conventional pegged” regimes, I classify them as “peg.” From “stabilized arrangement” to “pegged exchange rate within horizontal bands” regimes, they are classified as “intermediate” regime. The last regime is “float,” which is categorized from “float” to “free float.” I drop the “other managed arrangement” regime as it cannot fall into any of these three-categories.

**Table 1 De Facto IMF Classification Regimes**

IMF Code	Reclassification Code	Definition
1	1	Exchange arrangement with no separate legal tender
2	1	Currency board arrangement
3	1	Conventional pegged arrangement
4	2	Stabilized arrangement
5	2	Crawling peg
6	2	Crawl-like arrangement
7	2	Pegged exchange rate within horizontal bands
8	3	Floating
9	3	Free-floating
10	N/A	Other managed arrangement

Note: For the reclassification code, 1 is for peg, 2 if intermediate, and 3 if float.

Source: IMF Exchange Rate Arrangement (Last revision in 2009).

#### 2.4.2. Ilzetzki, Reinhart, and Rogoff Classification (De Facto—IRR)

This classification was first established by Ilzetzki, Reinhart, and Rogoff in 2004 and was updated in 2017. This approach is well-known as de facto as it is based on exchange rate variability by incorporating FX markets and country chronologies. In 2017, the authors extended their work by addressing (i) the anchor or reference currency classification, (ii) the inflation targeting classification, and (iii) the Eurozone countries' treatment.

Table 2 provides the full scheme of the exchange rate regime and the numeric classification. The lower numbers indicate less exchange rate flexibility. For simplicity, I reclassify their exchange rate regime classification into three-types: (1) if peg; (2) if intermediate and; (3) if float. From “no separate legal tender” to “de facto peg” regimes, I classify them as “peg.” Under these regimes, the host country normally pegs its currency to one another, or the currency of another country circulates as the sole legal tender (formal dollarization). From “pre-announced crawling peg (moving band  $< + / - 1\%$ ” to “moving band ( $< + / - 2\%$ ) by allowing both appreciation or depreciation”, these regimes are classified as intermediate.

Last but not least, from “managed float (de facto moving band  $+ / - 5\%$ )” to “freely falling,” these regimes are classified as “float”; since by construction, the authors choose only the countries which are most transparently floating. I also include “freely falling” in the “float” category because the authors assume, under this regime, the 12-month inflation is greater than 40% for a 5-year window<sup>3</sup>. I drop the “dual market (parallel market data is missing)” regime as it is unclear into which category it falls. In other words, in a dual exchange rate system, currencies can be exchanged in the market at

**Table 2 De Facto Ilzetzki, Reinhart, and Rogoff's Classification**

IRR Code	Reclassification Code	Definition
1	1	No separate legal tender or currency union
2	1	Pre announced peg or currency board arrangement
3	1	Pre announced horizontal band that is narrower than or equal to $\pm 2\%$
4	1	De facto peg
5	2	Pre announced crawling peg; de facto moving band narrower than or equal to $\pm 1\%$
6	2	Pre announced crawling band that is narrower than or equal to $\pm 2\%$ or de facto horizontal band that is narrower than or equal to $\pm 2\%$
7	2	De facto crawling peg
8	2	The de facto crawling band that is narrower than or equal to $\pm 2\%$
9	2	Pre announced crawling band that is wider than or equal to $\pm 2\%$
10	2	The de facto crawling band that is narrower than or equal to $\pm 5\%$
11	2	The moving band that is narrower than or equal to $\pm 2\%$ (i.e., allows for both appreciation and depreciation over time)
12	3	De facto moving band $\pm 5\%$ /Managed floating
13	3	Freely floating
14	3	Freely falling
15	N/A	The dual market in which parallel market data is missing.

Note: For the reclassification code, 1 is for peg, 2 if intermediate, and 3 if float.

Source: Ilzetzki, Reinhart, and Rogoff Classification (2017) and author's reclassification code.

both fixed and floating exchange rates. Moreover, it can be a temporary solution for some countries when they are in crisis.

## 2.5. Financial Integration

Financial integration/openness is often associated with a higher economic growth rate, but the degree of openness varies across countries. It also reflects the approach towards regulating the policy on foreign investment as well as the capital flows of an individual country. It is important for a developing country to maintain some level of control in which the decision depends on their economic activities and internal policies. In this paper, I use two financial integration measurements: (1) de jure—Chinn and Ito (2018) that attaches to the government's policies and (2) de facto—Lan and Milesi-Ferretti (2017) that measures the macroeconomic effects on capital control decisions. To mitigate the limitations of each type, in this paper, I apply both of them.

### 2.5.1. De Jure-Chinn and Ito Index (KAOPEN)

Chinn and Ito calculate KAOPEN based on the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) 2017. The index consists of the information on a country's regulatory restrictions on cross-border financial transactions as of the end of 2016, and it focuses on regulatory aspects<sup>4</sup> of a country's degree of capital account openness.

The KAOPEN index, by its structure, measures the "extensity" of capital controls. One might argue that this index may also be a good proxy of capital control intensity as its correlation with Quinn<sup>5</sup> (1997, 2003) index is 83.9% (Chinn & Ito 2008). KAOPEN index is normalized from 0 to 1. The higher values indicate a higher degree of cross-border capital account openness. Two merits of this de jure index are measuring the intensity of capital control and capturing a wide range of the dataset.

### 2.5.2. De Facto-Lane and Milesi Ferretti (LMF)

Lane and Milesi Ferretti (2017) present the latest data to calculate this index. They use the standard decomposition of assets and liability presented in the balance of payment version 6.

I calculate the index using the following formula:

$$LMF\ Index = \frac{Total\ Assets + Total\ Liabilities}{Nominal\ GDP} \quad (1)$$

where

- Total Assets = Portfolio Equity Assets + FDI Assets + Portfolio Debt Assets  
+ FX Reserves Minus Gold
- Total Liabilities = Portfolio Equity Liabilities + FDI Liabilities + Portfolio Debt Liabilities
- The higher the value, the more open of an economy to international/cross-border capital flow.

## 2.6. Monetary Independence (MI)

Many works of literature explain the independence of the monetary policy of one country as the freedom of the central bank to set the policy rates (Aizenman et al. 2008, 2010, 2011; Obstfeld et al. 2005; Shambaugh 2004). Hence, to test the trilemma hypothesis, the common method is to estimate the correlation level between the short-term interest rate across countries then test their strength with the exchange rate movement and capital account openness.

In this paper, I consider the Chinn and Ito index as the monetary policy variable. It is constructed as the measurement of yearly correlation of monthly interest rates between home and base country<sup>6</sup>. The index value is normalized to be from 0 to 1. The higher value of the index presents more monetary independence or a better position for policymakers to stabilize the economy through monetary policy tools. Chinn and Ito (2018) retrieve the data from the International Financial Statistics and Bloomberg.

### 3. Research Methodology and Data

#### 3.1. Research Methodology

This paper discusses the validity of the impossible trinity by assessing the determinant of the exchange rate regime in relation to monetary independence and financial openness. For this purpose, the multinomial logit model is used<sup>7</sup>. In the model, the exchange rate regimes are the categorical dependent variable with three alternatives. Several pieces of literature also apply a multinomial logit model to study the appropriateness of exchange rate regime choices (Aliyev 2014<sup>8</sup>; Aşıcı 2011<sup>9</sup>; Ondina et al. 2011<sup>10</sup>). I use the lagged controlled variables in this model since the determination or decision of this period exchange rate regime is according to previous period economic activities.

I construct the model as the following:

$$ERR_{i,t} = \beta_1 + \beta_2 FI_{i,t-1} + \beta_3 FI_{i,t-1} * MI_{i,t-1} + \beta_4 FI_{i,t-1}^2 + \sum_{k=1}^6 \theta_k X_{i,t-x} + \epsilon_{i,t} \quad (2)$$

where

- *i*: different countries in the panel setting
- ERR: the exchange rate regimes, the categorical dependent variable where equals 1 if peg; 2 if intermediate; and 3 if float. Intermediate, 2, is the baseline regime.
- MI: monetary independence of the central bank. Chinn and Ito calculated this index.
- FI: financial integration (openness)—Chinn and Ito (KAOPEN-de jure) and Lan and Milesi-Ferretti (LMF-de facto).
- X: a vector of other control variables that are expected to influence the exchange rate regime:
  - SIZE: logarithm of real GDP
  - TRADE: the ratio of the average of exports plus imports to GDP
  - TOTSH: standard deviation of the terms of trade (export as the capacity to import) over the previous five years
  - INF: inflation rate
  - MINEXP: share of mineral export to total export
  - MoI: total reserves in months of imports
  - ASEAN: the dummy variable for ASEAN countries, 1 if ASEAN and 0 if non-ASEAN.
- $\epsilon_{i,t}$ : the error term with standard properties
- $FI_{i,t-1} * MI_{i,t-1}$ : the cross-term between the degree of financial openness and monetary independence that explains the impossible trinity validity.
- *x* exhibits the number of lags. I apply a 1-year lag for all the regressors except TOTSH and INF as I suspect that they might have reverse Granger causality with ERR. Table 3 presents the suggested number of lags for TOTSH and INF to solve this problem. The lag-specification varies according to the data set of each income group. For example, for full-sample estimation, we need to include 2 year-lag for TOTSH to avoid the Granger causes from ERR to TOTSH. If we compare

**Table 3 Result of Granger Causality Test-Report on Number of Lags**

Null Hypothesis	Full sample	High-income	Middle-income	Low-income
INF does not GC IMF_ERR	1 (0.068)	7 (1.000)	1 (0.878)	1 (0.023)
IMF_ERR does not GC INF	1 (0.193)	7 (0.942)	1 (0.864)	1 (0.389)
TOTSH does not GC IMF_ERR	3 (0.943)	1 (0.664)	4 (0.778)	1 (0.897)
IMF_ERR does not GC TOTSH	3 (0.257)	1 (0.685)	4 (0.346)	1 (0.187)
INF does not GC IRR_ERR	1 (0.003)	5 (0.710)	1 (0.087)	1 (0.018)
IRR_ERR does not GC INF	1 (0.447)	5 (0.238)	1 (0.336)	1 (0.984)
TOTSH does not GC IRR_ERR	2 (0.000)	1 (0.878)	2 (0.000)	1 (0.723)
IRR_ERR does not GC TOTSH	2 (0.402)	1 (0.864)	2 (0.724)	1 (0.576)

Notes:

- IMF\_ERR: IMF exchange rate classification
- IRR\_ERR: Ilzetzki, Reinhart, and Rogoff Classification
- GC: Granger cause
- The number in the bracket represents the p-value. If the p-value < 0.1 or 10%, we reject the null hypothesis.

across samples, the lags are up to four years for TOTSH and seven years for INF. This comes with economic intuition. If there is a shock to term of trade or high and persistent inflationary pressure in the medium term, the central bank may decide to adjust the exchange rate level to absorb that disturbance.

- $\theta$  is the parameter of the six controlled variables.

### 3.2. Data

I mainly retrieve annual data for 171 countries from the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (IMF-AREAER) and the World Bank Development Indicators (WDI) for the period from 1999 to 2016. The data sources are described in Table 4.

Given 18 years and 171 countries, the total number of observations should be 3,078. However, due to 1,237 missing observations in TOTSH, there are only 1,841 observations available. The observations shown in the regression outcomes are therefore smaller than they should be.

**Table 4 Statistical Summary for Full Sample**

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
IMF	De facto IMF Exchange rate arrangement (2017)	2,899	2.0289	0.9261	1	3
IRR	De facto Ilzetzi, Reinhart and Rogoff Exchange rate arrangement (2017)	3,071	1.6720	0.6721	1	3
FI	Chinn-Ito FI index	2,989	0.5302	0.3728	0	1
	Lane Milesi-Ferretti FI index	2,894	5.0770	20.6747	0.07	370.88
MI	Monetary Independence Index	2,901	0.4153	0.2159	0	0.96
SIZE	Logarithm of GDP	3,016	24.1158	2.2866	18.603	29.8823
TRADE	Ratio of [export + import]/2 to GDP	2,430	0.4420	0.2759	0.0008	2.18
TOTSH	Term of trade volatility, standard deviation of the logarithm of terms of trade over the previous five years weighted by the degree	1,841	0.3416	0.4114	0.0120	4.2918
INF	Inflation	2,921	6.5689	18.7061	- 18.11	513.91
MINEXP	Share of mineral export to total export	3,056	1.1133	1.256	0.0126	14.2623
MoI	Total reserves in months of imports	2,689	4.7863	5.0568	0.0101	79.2372

### 3.3. Variable Behavior

In this section, I discuss the expected result for each explanatory variable by providing the relevant literature as the followings:

- **SIZE:** An increase in GDP tends to increase the propensity in choosing float (Ondina et al. 2011). The large GDP economies might involve a lot of economic activities that are normally associated with different disturbances or are even vulnerable to external shocks. To deal with this unpredictable situation, large economies might adopt a floating exchange rate regime aiming to absorb and eliminate those harmful impacts (Edwards & Yeyati 2005). Also, the large economies could be large exporters or important global financial market players who might encounter different types of risks, including financial risks or currency mismatches. On top of that, more exchange rate flexibility is associated with the reduction of currency mismatch (Gadanecz & Mehrotra 2013).
- **TRADE:** The floating regime discourages trading activities. If a country allows the exchange rate to be highly volatile, the profit margin from imports or exports will face uncertainty.

Given this reason, for some countries whose profit margin is already small, they rather tend to stabilize their exchange rate.

- **TOTSH:** It is measured by the term of trade volatility, i.e., the standard deviation of the term of trade changes over the last five years. If the incidence of real shock becomes more significant, the propensity in choosing a floating exchange rate regime increases. Indeed, the economic shock can be defined as an unanticipated shock on the supply or demand side. This phenomenon could be explained in the Asian Financial Crisis, where Thailand gave up the peg exchange rate regime to absorb shock (Broda 2004).
- **INF:** High inflation level aligns with the floating exchange rate regime, or lower inflation degree indicates greater exchange rate stability. Many studies show that high exchange rate stability is linked to lower inflation (Aizenman et al. 2011; Alogoskoufis & Smith 1991).
- **Mol:** High international reserves coexist with a high propensity to choose peg since the main purpose of holding high reserves might be for frequent FX intervention to maintain the exchange rate at a certain level. Those countries with a fixed exchange rate regime need to have higher international reserves because the exchange rate cannot absorb the shocks.

## 4. Results:

It is important to mention once again that there are three categorical dependent variables: 1 if peg, 2 if the intermediate (baseline), and 3 if float. I interpret the outcomes by reading the sign of point estimates. For instance, if it is positive, the propensity in choosing the peg or float to intermediate regime increases and vice versa if the coefficient is negative. Since the IMF classification results are good enough to represent the IRR classification, I only discuss them in the following subsections and leave the IRR classification results to Appendix 1. To keep the discussion more concentrated, I only focus on de facto—FI while leaving the outcomes under de jure—FI to the Appendix 1 for reference.

For the robustness check, I also regressed all the four samples using the binary logit model, where the intermediate regime is the baseline. I got the same sign of estimates to what was found under the multinomial logit regressions.

### 4.1. Full Sample

#### **First Comparison: Pegged Regime Relative to Intermediate Regime under the IMF Classification and De Facto—FI (Table 5)**

- The coefficient of FI is positive, which suggests that a high degree of financial integration is aligned with a peg. This result might be the case for some countries that still fear to float the exchange rate while allowing free capital movement.
- The important term that explains the trilemma condition is the interaction between financial

Table 5 Regression Outcomes under IMF Classification and De Facto – FI

Controlled variable	Full Sample 1,089 Obs. and R <sup>2</sup> = 0.256		Low-income 104 Obs. and R <sup>2</sup> = 0.566		High-income 488 Obs. and R <sup>2</sup> = 0.437		Middle-income 485 Obs. and R <sup>2</sup> = 0.281	
	Peg	Float	Peg	Float	Peg	Float	Peg	Float
L.FI	0.388***	0.501***	-103.13***	-6.564	0.283*	0.379**	0.590	-0.193
L.FI_MI	-0.473***	-0.698***	52.643*	-0.763	-0.241 <sup>+</sup>	-0.548***	-2.323***	-0.258
L.FI <sup>2</sup>	-0.001	-0.001	11.081*	5.250	N/A	N/A	0.019	0.041
L.SIZE	-0.097	0.351***	-6.107	-0.346	-0.649**	0.173	-0.173	0.486***
L.TRADE	0.495	-2.30663**	-24.491	-2.814	-1.328	-3.272***	0.818	-1.156
L.TOTSH	1.735***	-0.463	24.322	-5.808**	3.357*	-1.484	2.950***	0.643
L.INF	-0.071***	-0.046***	0.223	0.163***	-0.196**	0.022	-0.080**	-0.052***
L.MINEXP	0.314***	-0.046	-6.266*	-0.916***	1.468*	1.355*	0.814***	0.160
L.MoI	-0.042***	-0.071***	4.791*	0.431*	0.125	0.125*	-0.046	-0.025
ASEAN	-2.119***	-0.096	..	..	..	..	..	..

Notes:

- L.: Lag operator. The decision on number of lags is based on the result of Granger causality tests. Theoretically, the TOTSH and INF might have reverse Granger causality with ERR. The specified lags in these regressions are to avoid this issue. TOTSH: lag 3 for full sample, lag 1 for low-income, lag 1 for high-income, and lag 4 for middle-income. INF: Lag 1 for full sample, lag 1 for low-income, lag 7 for high-income, and lag 1 for middle-income.
- The exchange rate regime (ERR) is the categorical dependent variable where intermediate is the baseline.
- Significantly different from zero at 80% (<sup>+</sup>), 90% (\*), 95% (\*\*), 99% (\*\*\*) confidence level.
- I dropped F<sup>2</sup> from the high-income sample regression to solve the problem with “convergence not achieved” after running the MLOGIT model.

- openness and monetary independence, FI\_MI. The coefficient of FI\_MI is negative, meaning that large MI and FI coexists with the propensity in adopting the intermediate regime where this outcome is consistent with the impossible trinity hypothesis.
- The coefficient of TOTSH is positive. The high level of the term of trade volatility coexists with the high propensity in choosing peg.
  - The coefficient of INF is negative. The high inflation level is associated with an intermediate regime. High inflation countries would choose to float their exchange rate. According to the purchasing power parity theorem and the law of one price, with the appropriate exchange rate level, every consumer in any location should have the same purchasing power. With this regard, if one economy has a high inflation level, the exchange rate will adjust more frequently to stabilize the purchasing power.
  - The coefficient of MINEXP is positive; a high level of mineral exports is associated with a peg, or large mineral exporters would peg their exchange rate.
  - The sign of the coefficient of MoI is negative, meaning that high international reserves are associated with the intermediate regime.
  - The coefficient of ASEAN is negative, suggesting that the ASEAN countries adopt an intermediate regime. This outcome is in-line with the middle-income section finding that most of the ASEAN countries are classified as middle-income (i.e., lower and upper-middle-income).

#### **Second Comparison: Floating Regime Relative to the Intermediate Regime under the IMF Classification and De Facto—FI (Table 5)**

The FI coefficient is positive; the high degree of financial openness is associated with the floating regime. The free capital movement might encounter vulnerabilities from a sudden stop of capital inflow or the capital outflow surge. According to Edwards and Yeyati (2005), the more flexible exchange rate can absorb those shocks. For this part, we do not get consistent results with the first comparison. This outcome suggests that countries with a high level of FI in this group might adopt a different exchange rate regime.

The coefficient of FI\_MI is negative, meaning that large FI and MI coexist with intermediate regimes. We got the same conclusion that as of the first comparison. The coefficient of SIZE is positive. The high GDP level is associated with the propensity of choosing float. The coefficient of TRADE is negative. The large share of trade to GDP coexists with the intermediate regime. The coefficient of INF is negative; the higher inflation level is concerning the intermediate regime. The coefficient of MoI is negative; the high level of international reserve is associated with the intermediate regime. To maintain the exchange rate level in a band, the central bank can conduct FX intervention more frequently; thus, the international reserves increase. Under full sample estimation, countries with a high degree of FI and MI prefer the intermediate regime, which is the middle ground

of the peg and float. However, since the results of FI under the two comparisons are not consistent, we might conclude that regardless of the FI level, different countries adopt different exchange rate regime.

I obtained consistent results from the previous literature, as explained in the expected variable behavior section for SIZE and TRADE. Countries with high GDP levels tend to choose a more flexible exchange rate, and the large share of trade to GDP coexists with a more stable regime. For TOTSH, INF, MINEXP, and MoI this is quite different. The coefficient of TOTSH is positive and significant only under the first comparison. This means the high degree of term of trade volatility is associated with a more stable exchange rate regime. Countries holding large international reserves and persistently high inflation levels might adopt an intermediate regime. Countries with a high share of mineral exports to total exports tend to peg their exchange rate.

#### **4.2. Low-income Economies**

I report the regression results under the low-income sample in Table 5. The coefficient of FI is negative and significant, only under the first comparison, suggesting that the high level of financial integration coexists with an intermediate regime. As the coefficient of  $FI^2$  is positive and significant at 10%, there should be a quadratic relation between the exchange rate regime and financial integration. First, the exchange rate moves from peg to intermediate, then from intermediate to peg as FI increases. To the best of my knowledge, it is rare to find papers in this area incorporating the financial openness in quadratic form. Hence, this finding should be a critical contribution to the literature. Regarding the MINEXP, countries with a large share of mineral exports to total exports tend to adopt an intermediate regime. However, I could not get consistent results for the MoI as under the peg versus intermediate; the result is peg; yet, under the float versus intermediate, it is float. This outcome might be proof of different policies for low-income countries with high international reserves levels regarding the choice of exchange rate regime. The negative coefficient of TOTSH under the second comparison means the high term of trade volatility is associated with an intermediate regime.

#### **4.3. High-income Economies**

Table 5 summarizes the choices of exchange rate regimes for the high-income economies. Under the first comparison, the coefficient of the interaction term is negative and significant at 20 % level, which means the higher degree of FI and MI are associated with the intermediate regime. At least, this result can prove the theory of the impossible trinity. However, under the second comparison, the coefficient of  $FI\_MI$  is negative and significant at 1%. This outcome proposes a higher propensity in choosing an intermediate regime rather than float where the FI and MI are at a high level. The intermediate regime is also the choice for the high GDP level, the share of trade to GDP, and inflation. The high term of trade volatility is in-line with the peg, whereas the high level of international

reserves is associated with the float. However, I got two results for MINEXP where the first is peg under the first comparison, and the second is float under the second comparison.

#### 4.4. Middle-income Economies

Table 5 captures the regression result for middle-income economies. Under the pegged regime as the dependent variable, with the high degree of FI and MI, these countries tend to choose an intermediate regime. The higher degree of TOTSH and mineral export are aligned with a peg. Under both peg and float, the high INF level is in-line with an intermediate regime. Under a float, the large degree of SIZE is associated with a floating regime.

#### 4.5. Discussion of the Impossible Trinity Results across All Samples

I emphasize more on the impossible trinity results across all samples (summarized in Table 6). The regressions propose the intermediate regime if the level of monetary independence and financial openness are high. This middle ground exchange rate regime outcome is in-line with the economic condition evolving and consistent with Klein and Shambaugh's (2015) finding. After the series of crises particularly the Asian Financial Crisis and Global Financial Crisis, most countries exhibit fear to float or purely peg. They also hold large FX reserves and intervene to keep the exchange rate in the manageable band. For instance, as argued by Grenvill (2011), Singapore and Malaysia adopt managed float meanwhile, the capital moves freely with the interest rate differential.

**Table 6 Summary of Impossible Trinity Results Across All Samples**

Underlined ERR	Full sample	High-income	Middle-income	Low-income
Peg vs Intermediate	Intermediate	Intermediate	Intermediate	Peg
Float vs Intermediate	Intermediate	Intermediate	Not significant	Not significant

Note: The majority of the regression results of the interaction term-FI\_MI-propose the intermediate regime as the choice.

## 5. Conclusion:

This paper contributes to the literature of rounding the corner of policy trilemma argument, which is in-line with the suggestion of Klein and Shambaugh (2015). I got consistent results for high- and middle-income groups where a higher degree of financial openness and monetary independence are in line with the higher propensity to choose an intermediate exchange rate regime. However, low-income economies do not hold the trilemma condition. The exchange rate regime that is associated with a high financial integration level varies according to different economies. Also, the low-income group's results evince the quadratic relationship between the exchange rate regime and financial integration as

the financial integration level increases.

Under the full sample estimation, I also got significant evidence for other controlled variables—log GDP, the share of trade to GDP, the term of trade volatility, inflation, the share of mineral exports to total exports, and total reserves in months of imports—that affect the choice of exchange rate regime. Countries with a high GDP level coexist with a more flexible exchange rate, whereas the floating exchange rate discourages trading activities. High level of inflation and international reserves are in-line with the intermediate regime, whereas a high level of the term of trade volatility and share of mineral exports to total exports are associated with the pegged regime.

Even though some outcomes of the controlled variables are still not consistent across all samples, most of them are well in-line with economic intuition and empirical studies. These findings should serve as the critical policy guidelines for policymakers in choosing an appropriate exchange rate regime. Future studies on core monetary policy frameworks such as exchange rate, policy rate, and/or inflation targeting could be implemented by applying this research methodology where the researchers are able to specify categorical dependent variables and the three classifications of datasets which are low-, middle-, and high-income economies. However, the dataset for low-income group is still limited. To deepen this analysis, scholars might also incorporate variables on the structural break to capture the unexpected change in parameters, and crisis dummy variables both the financial and business turmoil.

## Notes

---

- 1 The combination of monetary autarky, exchange rate stability, and financial openness with two economic outcome policies.
- 2 The important changes include: i/ using floating and free floating with better definitions instead of managed and independent floating ii/ specifying the difference between fixed and crawling pegs, and all arrangements regarding the peg-like or crawl-like iii/ improving the classification to be more transparent based on rules and specific information with clearer circumscribed role for analysis. (Kokenyne et al. 2009: 7)
- 3 The 12-month inflation for 5 years (i.e. year  $t$  and the preceding 4 years) is greater than 40 %. This hyperinflation could lead to a huge depreciation on exchange rate. Also, the authors called it as “free-falling”.
- 4 KAOPEN is constructed based on four main categories: i/ the presence of multiple exchange rate, ii/ restrictions on current account transactions, iii/ restrictions on capital account transactions, and iv/ the requirement of the surrender of export proceeds.
- 5 According to Quinn (1997), this measure evaluates the intensity of the government policies by regulating financial transactions across time.
- 6 The base country is the home country’s monetary policy with which it closely links. Those countries are Australia, Belgium, France, Germany, India, Malaysia, South Africa, the United Kingdom, and the United States. The IMF’s AREAER and Central Intelligence Agency (CIA) Factbook determine those countries.
- 7 This regression analysis is conducted when the dependent variable has more than two levels. For a nominal dependent variable with  $j$  categories, it is better to apply the multinomial logit model as it is able to estimate only  $j-1$  logit equations while the binary logit model needs to regress  $j$  equations.
- 8 The author mentions that multinomial logit model is the most applicable method in the context of discrete choice

- analysis and the dependent variable is categorical with more than two alternatives.
- 9 The author uses multinomial logit model to study the appropriate choice of exchange rate regime into the standard early warning crisis framework.
- 10 Multinomial logit model is used in a panel data set to determine the suitable exchange rate regimes. They also reclassify the exchange rate into three regimes which are fixed, intermediate, and flexible.

## References

---

- Aizenman, Chinn, Ito. 2008. Assessing the emerging global financial architecture: Measuring the trilemma's configurations overtime. *National Bureau of Economic Research*.
- Aizenman, Chinn, Ito. 2010. The emerging global financial architecture: Tracing and evaluating new patterns of the trilemma configuration. *Journal of International Money and Finance*. 29(4): 615–641.
- Aizenman, Ito. 2011. *The impossible trinity, the international monetary framework, and the Pacific Rim*. Handbook of the Economics of the Pacific Rim.
- Aizenman. 2019. A modern reincarnation of Mundell-Fleming's trilemma. *Economic Modelling*. 81: 444–454.
- Aliyev. 2014. Determinants of the Choice of Exchange Rate Regime in Oil Exporting Countries. *Academy of Sciences of the Czech Republic Economic Institute*. 527: 17–25.
- Alogoskoufis, Smith. 1991. The Phillips curve, the persistence of inflation, and the Lucas critique: Evidence from exchange-rate regimes. *The American Economic Review*. 1254–1275.
- Aşıcı. 2011. Exchange rate regime choice and currency crises. *Economic Systems*. 35(3): 419–436.
- Broda. 2004. Terms of trade and exchange rate regimes in developing countries. *Journal of International economics*. 63(1): 31–58.
- Chinn, Ito. 2008. A new measure of financial openness. *Journal of comparative policy analysis*. 10(3): 309–322.
- Edwards, Yeyati. 2005. Flexible exchange rates as shock absorbers. *European Economic Review*. 49(8): 2079–2105.
- Gadanecz, Mehrotra. 2013. The exchange rate, real economy and financial markets. *BIS paper*.
- Grenville. 2011. The impossible trinity and capital flows in East Asia. *ADB Working Paper Series*.
- Ilzetki, Reinhart, Rogoff. 2017. Exchange arrangements entering the 21st century: Which anchor will hold. *National Bureau of Economic Research*.
- Klein, Shambaugh. 2015. Rounding the corners of the policy trilemma: sources of monetary policy autonomy. *American Economic Journal: Macroeconomics*. 7(4): 33–66.
- Kokenyne, Veyrune, Habermeier, Anderson. 2009. Revised system for the classification of exchange rate arrangements. *International Monetary Fund*.
- Lane, Milesi-Ferretti. 2017. International financial integration in the aftermath of the global financial crisis. *International Monetary Fund*.
- Ondina, Rivero, de Vicente Queijeiro, Cuervo. 2011. The determinants of the choice of exchange rate regimes in Latin America: a mixed multinomial logit approach. *Cuadernos de economía*. 34(95): 55–61.
- Obstfeld, Shambaugh, Taylor. 2005. The trilemma in history: tradeoffs among exchange rates, monetary policies, and capital mobility. *Review of Economics and Statistics*. 87(3): 423–438.
- Quinn, Dennis. 1997. The Correlates of Change in International Financial Regulation. *American Political Science Review*. 91(3): 531–551.
- Quinn, Dennis. 2003. Capital Account Liberalization and Financial Globalization, 1890–1999: A Synoptic View. *International Journal of Finance and Economics*. 8(3): 189–204.
- Rogoff, Aasim, Mody, Brooks, Oomes. 2004. Evolution and Performance of Exchange Rate Regimes. *International Monetary Fund*.
- Reinhart, Rogoff. 2004. The modern history of exchange rate arrangements: a reinterpretation. *The Quarterly Journal of economics*. 119(1): 1–48.
- Rey. 2015. Dilemma not trilemma: the global financial cycle and monetary policy independence. *National Bureau of*

*Economic Research.*

Shambaugh. 2004. The effect of fixed exchange rates on monetary policy. *The Quarterly Journal of Economics*, 119(1): 301-352.

Yagci. 2001. Choice of exchange rate regimes for developing countries. *World Bank-African Region Working Paper Series*.

## Appendix 1

**Table 7 Results for Full Sample**

		Under IMF Classification		Under IRR Classification		Under IRR Classification	
		De Facto-FI 2,604 Obs R <sup>2</sup> = 0.0194	De Jure-FI 2,559 Obs R <sup>2</sup> = 0.0446	De Facto-FI 2,753 Obs R <sup>2</sup> = 0.0341	De Jure-FI 2,559 Obs R <sup>2</sup> = 0.0655	De Facto-FI 1,311 Obs R <sup>2</sup> = 0.2220	De Jure-FI 1,282 Obs R <sup>2</sup> = 0.2629
Dependent Variable (ERR)	Controlled variable	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Peg	L.FI	0.3474***	- 2.5493***	0.1589***	1.8783***	- 0.0051	3.2540***
	L.FI_MI	- 0.4762***	- 3.2121***	- 0.2731***	- 5.3501***	- 0.2750***	- 5.7683***
	L.FI <sup>2</sup>	0.0005	2.6034***	0	- 0.1858	0.0015***	- 1.2814
	L.SIZE	..	..	..	..	0.0473	- 0.1423***
	L.TRADE	..	..	..	..	2.7962***	2.1026***
	L2.TOTSH	..	..	..	..	0.1313	0.0669
	L.INF	..	..	..	..	- 0.1428***	- 0.1217***
	L.MINEXP	..	..	..	..	0.2599***	0.2101***
	L.MoI	..	..	..	..	0.0197*	0.0425***
	ASEAN	..	..	..	..	- 2.6374*	- 2.2733***
Float	L.FI	0.3674***	1.2407	- 0.0688 <sup>+</sup>	4.7669***	- 0.1234*	6.0282***
	L.FI_MI	- 0.5474***	- 2.3647***	0.0652	- 1.3298***	0.4341***	- 0.7971
	L.FI <sup>2</sup>	0.0004	0.2758	- 0.0001	- 3.8120***	- 0.0017	- 5.3779***
	L.SIZE	..	..	..	..	0.4556***	0.4427***
	L.TRADE	..	..	..	..	- 5.0505***	- 4.1918***
	L2.TOTSH	..	..	..	..	- 1.8264***	- 1.8306***
	L.INF	..	..	..	..	0.0069	0.0042
	L.MINEXP	..	..	..	..	0.0726	0.0373
	L.MoI	..	..	..	..	0.0308*	0.0269
	ASEAN	..	..	..	..	- 2.1643***	- 2.6014***

Notes: - Exchange rate regime (ERR) is the categorical dependent variable where intermediate is the baseline  
 - Significantly different from zero at the 80% (<sup>+</sup>), 90% (\*), 95% (\*\*), 99% (\*\*\*) confidence level.  
 - L.: Lag operator

**Table 8 Results under IRR classification**

		Low-income		Middle-income		High-income	
		De Facto-FI 128 Obs R <sup>2</sup> = 0.5209	De Jure-FI 125 Obs R <sup>2</sup> = 0.4880	De Facto-FI 682 Obs R <sup>2</sup> = 0.3629	De Jure-FI 678 Obs R <sup>2</sup> = 0.3077	De Facto-FI 577 Obs R <sup>2</sup> = 0.3049	De Jure-FI 551 Obs R <sup>2</sup> = 0.3826
Dep Var (ERR)	Controlled variable	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Peg	L.FI	13.6700	- 6.7668	0.9078***	0.0985	0.2920***	2.7771***
	L.FI_MI	5.9847	15.3906	- 0.8168**	- 1.8170*	- 0.5069***	- 6.3788***
	L.FI <sup>2</sup>	- 3.2313	..	- 0.0596*	- 0.2789	..	- 0.2961***
	L.SIZE	- 2.3541	- 1.7265	- 0.2636***	- 0.3766***	- 0.0869	..
	L.TRADE	19.9667 <sup>+</sup>	13.7065**	1.1575 <sup>+</sup>	1.1930*	- 0.3370	0.6262*
	LX.TOTSH	- 28.9602*	- 24.3461**	1.4299***	1.2224***	- 0.3815*	0.5616
	LY.INF	- 0.0040	- 0.0374	- 0.0654***	- 0.0697***	- 0.0248	- 0.0185
	L.MINEXP	0.4211	0.9529	0.5298***	0.4356***	0.4285**	0.2752*
	L.MoI	- 0.0959	- 0.3829	- 0.0872***	- 0.0650***	- 0.0267	- 0.0595**
Float	L.FI	- 0.1297	2.6824	9.1082***	3.9369	- 0.2411**	- 3.2830***
	L.FI_MI	1.0654	- 0.3697	0.2088	- 1.1372	0.4494**	3.2671***
	L.FI <sup>2</sup>	- 0.0243	..	- 1.9296***	- 4.3393*	..	..
	L.SIZE	- 0.9425 <sup>+</sup>	- 0.8289 <sup>+</sup>	1.1539***	0.8143***	0.0925	0.1583
	L.TRADE	6.0775 <sup>+</sup>	9.2383**	- 13.2681***	- 4.4801***	- 18.4382***	- 29.1469***
	LX.TOTSH	- 14.0684***	- 17.0985***	- 3.8763***	- 2.8139***	- 0.4895	0.8939
	LY.INF	0.1328*	0.0934	0.0035	- 0.0173	- 0.1020	- 0.1783**
	L.MINEXP	- 0.3619	- 0.2317	- 2.0004***	- 1.6666***	0.8572***	1.0529***
	L.MoI	- 0.6137*	- 0.9067**	- 0.3196***	- 0.1465**	- 0.1857***	- 0.1816**

- Notes: - Exchange rate regime (ERR) is the categorical dependent variable where intermediate is the baseline.  
- Significantly different from zero at the 80% (<sup>+</sup>), 90% (\*), 95% (\*\*), 99% (\*\*\*) confidence level.  
- L.: Lag operator. For low-income sample, X = 1 and Y = 1; for middle-income sample, X = 2 and Y = 1; for high-income sample, X = 2 and Y = 5.  
- I dropped FI<sup>2</sup> to solve the problem with “convergence not achieved” after running the MLOGIT model.

**Table 9 Other Regression Results under IMF classification**

		Full-sample	Low-income	Middle-income	High-income
		De Jure-FI 1,066 Obs R2 = 0.2372	De Jure-FI 102 Obs R2 = 0.4927	De Jure-FI 485 Obs R2 = 0.2624	De Jure-FI 466 Obs R2 = 0.3685
Dep Var (ERR)	Controlled variable	Coef.	Coef.	Coef.	Coef.
Peg	L.FI	-4.2271***	-29.0084	-4.0063*	0.9375
	L.FI_MI	-2.0466**	30.3993	-4.9970***	-0.1537
	L.FI <sup>2</sup>	4.4781***	..	4.9481**	..
	L.SIZE	-0.0120	1.3319	-0.2545**	-0.6222***
	L.TRADE	1.2561***	-20.9190	-0.8944	-0.1721
	LX.TOTSH	1.3621***	11.2137 <sup>+</sup>	2.5028***	4.5700**
	LX.INF	-0.0816***	0.1862 <sup>+</sup>	-0.0890***	-0.2887***
	L.MINEXP	0.3122***	-1.6634**	0.7445***	0.8993 <sup>+</sup>
	L.MoI	-0.03343**	1.1099*	-0.0564**	0.1162 <sup>+</sup>
ASEAN	-2.9494***	..	..	..	
Float	L.FI	1.1285	0.2921	0.4136	2.4321**
	L.FI_MI	-3.4314***	4.1968	-0.3339	-4.3413***
	L.FI <sup>2</sup>	1.4011	..	0.2117	..
	L.SIZE	0.3429***	-1.5650**	0.4631***	0.1905
	L.TRADE	-1.2197***	-2.8381	-0.9656	-1.7090***
	LX.TOTSH	-0.6176*	-10.1028***	0.4632	-0.6193
	LX.INF	-0.0393***	0.1219**	-0.0489**	-0.0402
	L.MINEXP	-0.0253	-0.7818***	0.1926	0.8506 <sup>+</sup>
	L.MoI	-0.0633***	0.2288	-0.0397	0.1190 <sup>+</sup>
ASEAN	-0.2005	..	..	..	

Notes: - Exchange rate regime (ERR) is the categorical dependent variable where intermediate is the baseline.

- Significantly different from zero at the 80% (<sup>+</sup>), 90% (\*), 95% (\*\*), 99% (\*\*\*) confidence level.

- L.: Lag operator. For full-sample, X = 3 and Y = 1; for low-income sample, X = 1 and Y = 1; for middle-income sample, X = 4 and Y = 1; for high-income sample, X = 1 and Y = 7.

- I dropped FI<sup>2</sup> to solve the problem with “convergence not achieved” after running the MLOGIT model.

## Appendix 2

**Table 10 Data Sources**

<b>Variable</b>	<b>Sources</b>
IMF-ERR	IMF Exchange rate arrangement (2017)
IRR-ERR	Iizetzki, Reinhart and Rogoff Exchange rate arrangement (2017)
De Jure – FI	De jure Chinn and Ito index (2018)
De Facto – FI	Lane and Milesi-Ferretti (2017)
MI	Chinn and Ito (2018)
SIZE	WDI: GDP (constant 2000 US\$)
TRADE	WDI: imports of goods and services (constant 2000 US\$) WDI: exports of goods and services (constant 2000 US\$)
TOTSH	WDI: Exports as a capacity to import (constant LCU)
INF	WDI: Inflation, consumer prices (annual %)
MINEXP	World Integrated Trade Solution (WITS)
MoI	WDI

## Appendix 3

Table 11 Exchange Rate Regime Movement under the IMF Exchange Rate Classification

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1 Afghanistan	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2 Albania	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3 Algeria	3	3	3	3	3	3	3	3	3	3								
4 Angola	3	3	3	3	3	3	3	1	1	2			2	2	2	2		2
5 Antigua and Barbuda	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6 Argentina	1	1	3	3	3	3	3	1	1	3	3	2	2	2	2	2	3	3
7 Armenia	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	3	3
8 Aruba	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9 Australia	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
10 Austria	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3
11 Azerbaijan	3	3	3	3	3	3	1	2	2	2	2	2	2	2	2	2		
12 Bahrain	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13 Bangladesh	1	1	1	1	3	3	3	3	1	2	2	2			2	2	2	2
14 Barbados	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15 Belarus	3	3	2	2	2	2	1	1	1	2	2	2			2	2		
16 Belgium	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3
17 Belize	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18 Benin	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1
19 Bhutan	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20 Bolivia	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2
21 Botswana	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
22 Brazil	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
23 Brunei Darussalam	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
24 Bulgaria	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25 Burkina Faso	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
26 Burundi	3	3	3	3	3	3	3	3	3	3	2	2			2	2	2	2
27 Cabo Verde	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
28 Cambodia	3	3	3	3	3	3	3	3	3	3	2	2	2	2		2		
29 Cameroon	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
30 Canada	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
31 Central African Republic	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
32 Chad	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
33 Chile	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
34 China	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2		2
35 Colombia	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
36 Comoros	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
37 Costa Rica	2	2	2	2	2	2	2	2	2					2		2	2	2
38 Croatia	3	3	3	3	3	3	3	3	1		2	2	2	2	2	2	2	2
39 Cyprus	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3
40 Czech Republic	3	3	3	3	3	3	3	3	3	3	3	3	3	3		2	2	2
41 Côte d'Ivoire	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
42 Dem. Rep. of the Congo	3	3	3	3	3	3	3	3	3	3	2			2	2	2	2	
43 Denmark	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1
44 Djibouti	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
45 Dominica	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
46 Dominican Republic	3	3	3	3	3	3	3	3	3		2	2	2	2	2	2	2	2
47 Ecuador	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
48 Egypt	1	2	2	3	3	3	1	1	3			2	2	2	2	2		3
49 El Salvador	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
50 Equatorial Guinea	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
51 Estonia	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3
52 Ethiopia	3	3	3	3	3	3	3	1	2	2	2	2	2	2	2	2	2	2
53 Fiji	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
54 Finland	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3
55 France	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3
56 Gabon	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
57 Georgia	3	3	3	3	3	3	3	3	3			3	3	2	3	3	3	3
58 Germany	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
59 Ghana	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
60 Greece	2	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3
61 Grenada	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
62 Guatemala	3	3	3	3	3	3	3	3	3	3	3	3	2	3	2	2	3	3
63 Guinea	3	3	3	1	1	3	3	3	3	3	.	.	.	.	2	2	.	.
64 Guinea-Bissau	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
65 Guyana	3	3	3	3	3	3	3	1	1	1	2	2	2	2	2	2	2	2
66 Haiti	3	3	3	3	3	3	3	3	3	3	.	.	.	2	2	2	2	.
67 Honduras	2	2	2	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2
68 Hong Kong SAR	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
69 Hungary	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3
70 Iceland	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
71 India	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
72 Indonesia	3	3	3	3	3	3	3	3	3	3	3	2	3	2	3	3	3	3
73 Ireland	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3
74 Islamic Republic of Iran	1	1	3	3	3	3	2	1	2	.	2	2	.	.	.	2	2	2
75 Israel	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3
76 Italy	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3
77 Jamaica	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2
78 Japan	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
79 Jordan	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80 Kazakhstan	3	3	3	3	3	3	3	3	1	2	2	2	2	2	2	2	3	3
81 Kenya	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
82 Kingdom of Eswatini	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
83 Korea	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
84 Kuwait	1	1	1	1	1	1	1	1	1	1	.	1	1	1	1	1	1	1
85 Kyrgyz Republic	3	3	3	3	3	3	3	3	3	.	.	.	.	.	.	.	.	.
86 Lao P.D.R.	3	3	3	3	3	3	3	3	3	.	2	2	2	2	2	2	2	2
87 Latvia	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3
88 Lebanon	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
89 Lesotho	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
90 Liberia	3	3	3	3	3	3	3	3	3	.	.	.	.	.	.	.	.	.
91 Libya	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1
92 Lithuania	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3
93 Luxembourg	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3
94 Madagascar	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
95 Malawi	3	3	3	3	3	3	3	3	1	2	.	2	.	.	3	3	3	2
96 Malaysia	1	1	1	1	1	1	3	3	3	.	.	.	.	.	.	.	.	3
97 Maldives	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
98 Mali	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
99 Malta	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3
100 Mauritania	3	3	3	3	3	3	1	1	3	.	.	.	.	.	.	2	2	2
101 Mauritius	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
102 Mexico	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
103 Micronesia	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
104 Moldova	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
105 Mongolia	3	3	3	3	3	3	3	1	1	3	3	3	3	3	3	3	3	3
106 Morocco	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
107 Mozambique	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
108 Myanmar	1	1	3	3	3	3	3	3	3	.	.	.	.	.	.	.	.	.
109 Namibia	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
110 Nepal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
111 Netherlands	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3
112 Netherlands Antilles	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
113 New Zealand	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
114 Nicaragua	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
115 Niger	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
116 Nigeria	3	3	3	3	3	3	3	1	3	.	.	.	.	.	.	.	2	2
117 Norway	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
118 Oman	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
119 Pakistan	1	3	3	3	3	3	1	1	3	3	3	2	3	3	.	.	.	2
120 Panama	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
121 Papua New Guinea	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2
122 Paraguay	3	3	3	3	3	3	3	3	3	3	.	.	.	.	3	3	3	3

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
123 Peru	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3
124 Philippines	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
125 Poland	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
126 Portugal	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3
127 Qatar	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
128 Rep. of Congo	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
129 Romania	3	3	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3
130 Russia	3	3	3	3	3	3	3	3	1	.	.	.	.	.	.	3	3	3
131 Rwanda	3	3	3	3	3	3	3	1	1	.	2	2	2	2	.	2	.	2
132 Samoa	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
133 Saudi Arabia	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
134 Senegal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
135 Seychelles	1	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3
136 Sierra Leone	3	3	3	3	3	3	3	2	1	3	3	3	3	3	3	3	3	3
137 Singapore	3	3	3	3	3	3	3	3	3	3	.	.	.	2	2	2	2	2
138 Slovak Republic	3	3	3	3	3	3	2	2	2	3	3	3	3	3	3	3	3	3
139 Slovenia	3	3	3	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3
140 Solomon Islands	1	1	2	2	2	2	1	1	1	.	.	.	.	1	1	1	1	1
141 South Africa	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
142 Spain	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3
143 Sri Lanka	2	3	3	3	3	3	3	3	1	3	2	2	3	3	2	2	2	2
144 St. Kitts and Nevis	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
145 St. Lucia	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
146 St. Vincent and the Grenadines	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
147 Suriname	3	2	1	1	1	3	1	1	1	2	2	2	2	2	2	2	2	2
148 Sweden	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
149 Switzerland	3	3	3	3	3	3	3	3	3	3	3	3	.	.	2	2	3	3
150 Syria	1	1	1	1	1	1	1	1	2	2	2	2	.	.	.	.	.	.
151 São Tomé and Príncipe	3	3	3	3	3	3	3	3	3	2	1	1	1	1	1	1	1	1
152 Tajikistan	3	3	3	3	3	3	3	3	1	.	2	2	2	2	2	2	.	2
153 Tanzania	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
154 Thailand	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
155 The Bahamas	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
156 The Gambia	3	3	3	3	3	3	3	3	3	3	3	3	3	3	.	3	.	.
157 Togo	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
158 Tonga	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
159 Trinidad and Tobago	1	1	3	3	3	1	1	1	1	2	2	2	2	2	2	2	2	2
160 Tunisia	2	3	3	2	2	3	3	3	1	3	2	2	2	2	2	2	2	3
161 Turkey	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
162 Uganda	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
163 Ukraine	3	3	3	1	1	1	1	1	3	.	.	2	2	2	3	3	3	3
164 United Kingdom	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
165 Uruguay	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
166 Vanuatu	1	1	1	1	1	1	1	1	3	.	.	.	.	.	.	.	.	.
167 Venezuela	2	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
168 Vietnam	2	2	3	3	3	3	1	1	1	.	2	2	2	2	2	2	2	2
169 Yemen	3	3	3	3	3	3	3	1	1	2	.	.	.	2	2	2	2	2
170 Zambia	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
171 Zimbabwe	1	2	3	1	1	3	1	1	1	.	1	1	1	1	1	1	1	1

## Notes

- 1 if pegged regime, 2 if intermediate regime, and 3 if float regime
- There are 179 missing observations about 5.8% of the total observations. Given this relatively small proportion, even if those missing observations turn out to be valid, the regression outcomes should not be different.