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Dollarization in a Small Open Economy – The Case of Maldives

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This paper examines the dollarization process in the Maldives. Unofficial or partial dollarization has remained rife in the Maldives since the 1990s. This is largely on account of the rapid expansion and dominance of the tourism industry, high dependence on imports and other institutional and economic factors. The paper uses cointegration technique to test for the existence of a long-run relationship between the degree of dollarization and its main determinants. The short-term dynamics are analysed by estimating an error correction model. The determinants included in the empirical model are inflation volatility, unofficial restrictions on foreign exchange, tourism inflows and the openness of the economy. All the variables, except the openness of the economy, were significant in the long-run model, while in the short-run model, all variables were significant. Unlike in many other highly dollarized economies, macroeconomic stability does not seem to influence dollarization in the Maldives. This is evident from the empirical results, which showed that the increased inflation volatility, which is used to represent the macroeconomic stability, had a negative effect on dollarization.

JEL Codes: F31, F33,

1. Introduction

Dollarization is a key issue for many developing countries, especially for small and open economies such as the Maldives. Dollarization refers to the extensive use of foreign currency in a country, either in place of the local currency or alongside it. Foreign currency may serve all three purposes of money: as a medium of exchange, a unit of account and a store of value. When the country has abandoned its local currency and uses a foreign currency as the legal tender, the country is officially or fully dollarized. Conversely, when a country uses foreign currency extensively for financial transactions and as holdings of financial assets, then the country is partially dollarized.

In the Maldives, the US dollar is extensively used alongside the local currency, rufiyaa, and the dollar serves to fulfil the three basic functions of money. Therefore, both currency substitution (foreign currency used as a medium of exchange and unit of account) and asset substitution or financial dollarization (foreign currency used as a store of value) is highly prevalent in the country. The level of partial dollarization (often referred to as just dollarization) affects the effectiveness of both exchange rate and monetary policy in the country, and is an important determinant of the choice of exchange rate regime for the country.

A high level of dollarization in an economy undermines the effectiveness of monetary policy. Dollarization is also associated with high levels of exchange rate pass-through (ERPT). When there is a high ERPT, the effectiveness of achieving a real devaluation through a nominal devaluation is reduced. Therefore, the use of a flexible exchange rate will be highly limited. The high ERPT associated with high levels of

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dollarization is also believed to be a reason behind the 'fear of floating' phenomenon faced by many developing countries. In addition, high levels of financial dollarization can create financial instability as there is an underlying risk of devaluation, which may lead to banking and currency crises. Yet, no empirical studies exist on the dollarization of the Maldives. Therefore, this paper provides the policy makers for the first time a thorough analysis of the degree and magnitude of partial dollarization in the Maldives and identifies its main determinants.

This paper is structured as follows. Section 2 briefly reviews the literature on dollarization and Section 3 analyses the extent of dollarization in the Maldives. Section 4 provides an econometric analysis of dollarization in the Maldives, by using cointegration techniques to establish the existence of a long-run relationship between the degree of dollarization and its main determinants. The short-term dynamics of dollarization are analysed by estimating an error-correction model (ECM). Section 5 concludes the paper with some policy implications.

2. Literature Review

There is no consistency in the definitions of dollarization used in the literature. In the early literature, the focus was on currency substitution and the term dollarization was used interchangeably to describe the same phenomenon. Calvo and Vegh (1992) define currency substitution as the use of multiple currencies as a medium of exchange. They define dollarization as the use of a foreign currency to fulfil other functions of money—namely as a store of value and as a unit of account. In contrast, asset substitution occurs when residents of a country hold financial assets in a foreign currency as a means of storing value, rather than for settling payments. A recent strand of literature focuses on the dollarization of liabilities, and has broadened asset substitution to include liability dollarization (Levy-Yeyati, 2006). The dollarization of both assets and liabilities is referred to as financial dollarization.

The most common measurement of dollarization is the ratio of foreign currency deposits in the domestic banking system to broad money (DR1). Another related measure is the ratio of foreign currency deposits to total deposits (DR2). However, these measures of dollarization may be grossly underestimated, as they cover only the foreign currency deposits in the banking system. This is because foreign currency in circulation in the domestic economy (which will show the level of currency substitution) and foreign currency deposits held abroad by the country's residents are equally important to gauge the full extent of dollarization in the country. In most of the developing countries, as is the case in the Maldives, data on foreign currency in circulation and foreign currency deposits held abroad by residents are not available.[1] There are other measures of dollarization such as loan dollarization (the ratio of loans denominated in foreign currency to total loans) and public debt dollarization (the ratio of foreign currency denominated public debt to the total public debt of the country) (Levy-Yeyati, 2006).

Reinhart, Rogoff and Savastano (2003) argue that the commonly used measurements of dollarization are too narrow and are insufficient to gauge the true extent of dollarization in the developing countries. They used a much broader measure of dollarization[2] in a study of dollarization in developing countries, by constructing a composite index of three indicators of dollarization. These are foreign

currency bank deposits as a percentage of broad money; total external debt as a percentage of GNP; and foreign currency denominated or linked domestic debt of the government as a percentage of total domestic debt of the government.

Dollarization is a commonly prevalent phenomenon in many developing countries. While Latin American countries are well known for their dollarized economies, partly due to academia's focus on this region, the phenomenon is equally common in several emerging market economies, transition economies, African countries and Asian countries (Levy-Yeyati, 2006). Table 1 shows the dollarization ratios, measured as the ratio of foreign currency deposits to total deposits, for different regions along with the ratios for the Maldives for the period 1996-2001. As can be seen, it is quite high in Latin American countries and transition countries. The Maldives also has similar levels of dollarization. According to Baliño, et al.(1999), a dollarization ratio higher than 30 per cent indicates that the economy is highly dollarized.

Table 1: Average Foreign Currency Deposits to Total Deposits (in percent)

Regions	No. of Countries	1996	1997	1998	1999	2000	2001
South America	8	45.8	46.1	49.4	53.2	54	55.9
Transition economies	26	37.3	38.9	43.5	44.3	46.9	47.4
Middle East	7	36.5	37.2	37.3	37.5	38.2	41.9
Africa	14	27.9	27.3	27.8	28.9	32.7	33.2
Asia	13	24.9	28	26.8	28.8	28.7	28.2
Central America and Mexico	7	20.6	20.8	22	22.1	22.5	24.7
Caribbean	10	6.3	7.6	6.8	6.7	6.1	6.2
Industrial countries	14	7.4	7.5	7.5	6.7	7	6.6
Maldives		**49.5**	**55.5**	**57.1**	**50**	**43**	**54.2**

Source: Data compiled from IFS online database (IFS)

Similar results were obtained by Reinhart, Rogoff and Savastano (2003) from their composite indices of dollarization constructed for a large sample of developing countries. South America was found to be the most dollarized region, followed by Africa, Central Asian countries, and the Middle East. Degree of dollarization based on the composite dollarization index for individual countries for the period 1996–2001 reveals that half of the countries in the very high category are from the Western hemisphere, and of these the majority are South American countries.

The literature explaining the factors that contribute to dollarization investigates the contribution of two main categories of variables: economic and institutional. Economic variables, such as interest rates on local and foreign currency deposits and bonds, and expected devaluation, are commonly used. However, due to the difficulty in obtaining data on expected devaluation, other proxies such as the actual rate of devaluation or its lagged values, real exchange rates, domestic inflation rates, current account deficits and foreign reserves of central banks are often used in econometric studies (Vetlov, 2001). Some of the key institutional factors used in the literature are the openness of the economy; institutional constraints or regulations on holding foreign currency and capital controls; the depth of the financial market; the exchange

rate regime; and degree of policy credibility (De Nicoló & Honohan, 2003; Levy-Yeyati, 2006; Savastano, 1996).

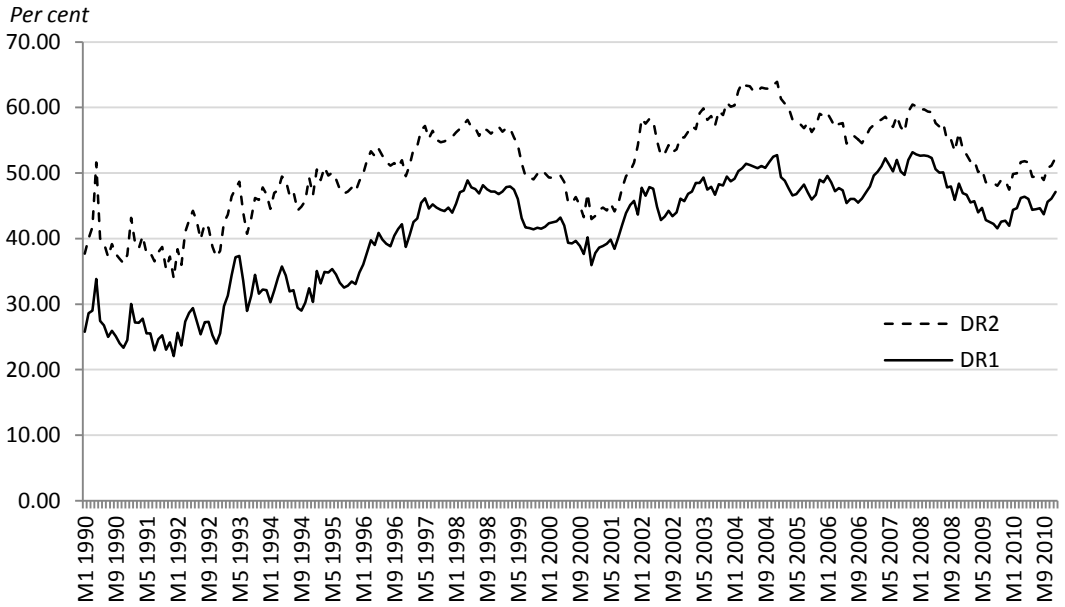
There are very few studies on small island developing economies like the Maldives. One study on Jamaica, by Bailey (2005), investigated the relationship between financial dollarization and inflation, using a VAR analysis. The empirical estimation revealed a positive relationship between inflation and financial dollarization in Jamaica, signalling that a relatively stable exchange rate is required to reduce dollarization in the country. Another study on Jamaica, using a portfolio approach, concluded that dollarization is mainly influenced by the high volatility of inflation relative to the volatility of the real effective exchange rates (Haughton, 2004).

3. Dollarization in the Maldives

The rufiyaa is the legal tender in the Maldives. There are no restrictions in the Maldives on holding of foreign currency by residents or non-residents. There are also no capital controls, and Maldivians are free to maintain foreign currency accounts both at home and abroad, and businesses and individuals often hold rufiyaa and US dollar accounts in domestic banks. In addition, a number of taxes, charges and fees levied by the government on the tourism sector and other sectors linked to the international sector are charged in US dollars. For example, tax and non-tax revenue from the tourism sector accounts for more than 40 per cent of government revenue, which are collected in US dollars.

In the Maldives, the dollarization ratio has remained high since the mid-1990s. This measure of dollarization only includes onshore deposits, necessarily excluding offshore deposits and foreign currency in circulation in the economy because such data are not available for the Maldives. As noted earlier, DR1 and DR2 are the most easily available and used indicators of dollarization. The levels of dollarization in the Maldives as seen in Figure 1 have remained extremely high, especially over the last decade. The high dollarization ratios can be attributed to several factors, including the dominance of the tourism sector, the import dependence of the economy and the lack of restrictions on holding foreign currency and foreign currency accounts in commercial banks. Three episodes of declines in dollarization ratios are observed in Figure 1. The first episode started in early 1999, but the decline became more pronounced in the year 2000, before rising again in mid-2001. The second episode of decline in the dollarization ratio started after the 2004 Indian Ocean tsunami, when there was an abrupt decline in tourism flows. The ratio rose again in late 2007, but not to the pre-tsunami levels, and again started to decline over 2008 and 2009.

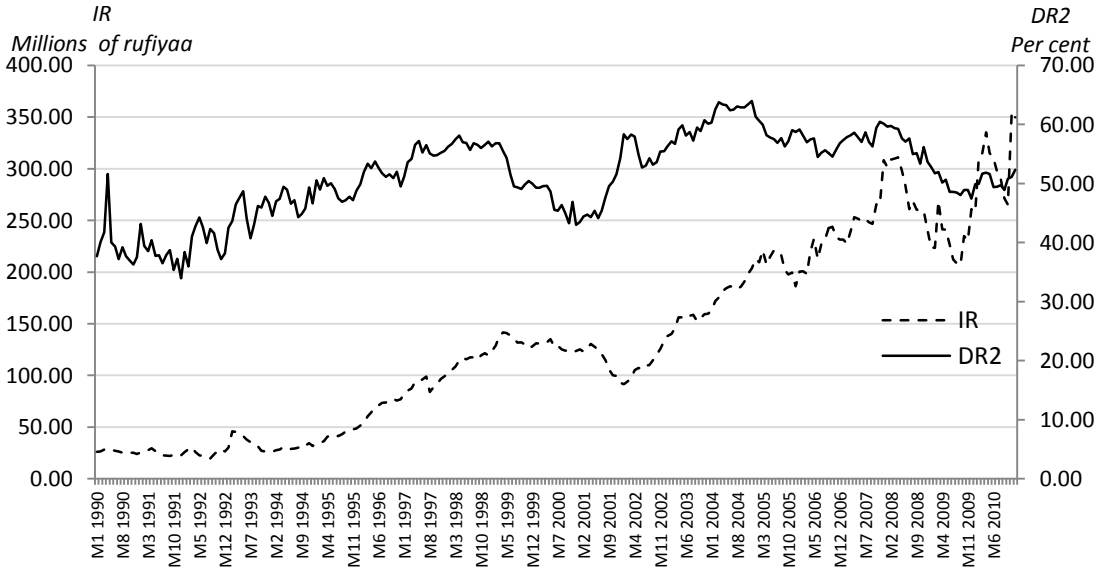
Figure 1: Degree of dollarization in the Maldives, 1990–2010



Source: Constructed from data obtained from Maldives Monetary Authority (2009, 2011)

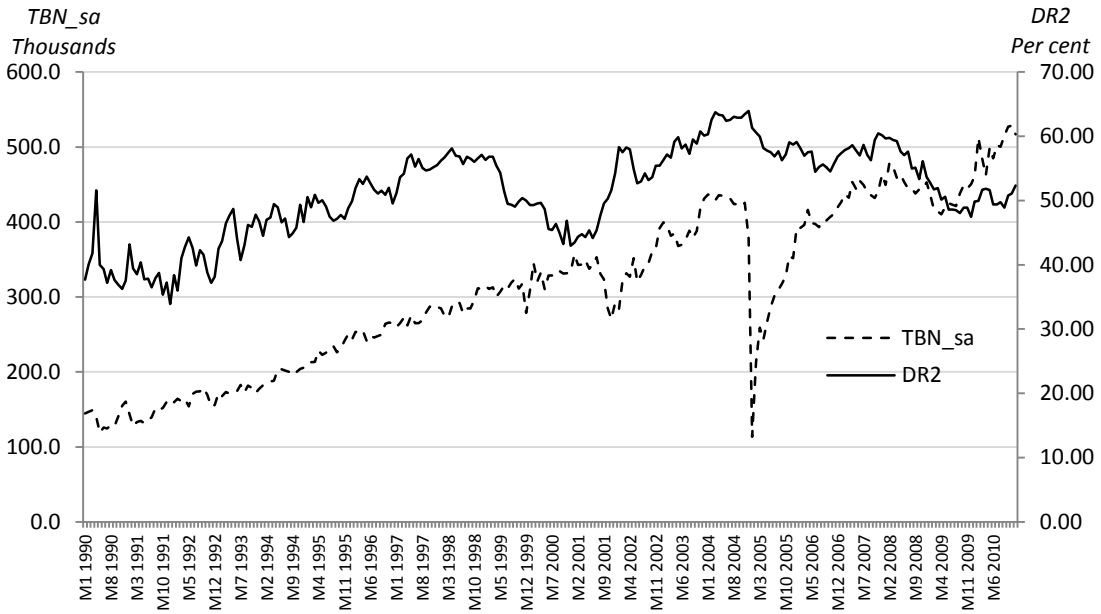
In the dollarization literature, a fall in the dollarization ratio is taken as an indication of macroeconomic stability and low inflation (Levy-Yeyati & Sturzenegger, 2001). However, in the case of the Maldives the fall in dollarization ratios are associated with macroeconomic instability, especially following shocks to the tourism sector and international reserves of the country. This can be seen in Figures 2 and 3. The dollarization ratio tracks both international reserves and tourism flows (indicated by seasonally adjusted bed nights) relatively closely.

Figure 2: Dollarization ratio (DR2) and international reserves (IR), 1990–2010



Source: Constructed from data obtained from Maldives Monetary Authority *(2009, 2011)*

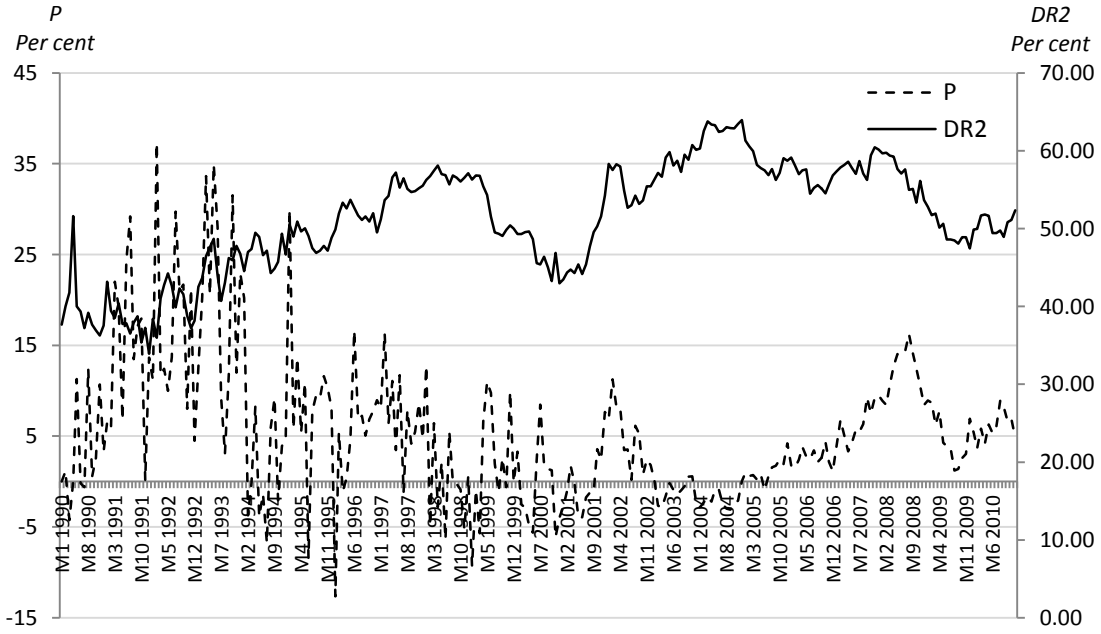
Figure 3: Dollarization ratio (DR2) and tourist bed nights, seasonally adjusted, (TBN_sa), 1990–2010



Source: Constructed from data obtained from Maldives Monetary Authority *(2009, 2011)*

There should be a strong positive relationship between the dollarization ratio and the inflation rate. However, this relationship is not strong for the Maldives, as can be seen from Figure 4.

Figure 4: Dollarization ratio (DR2) and inflation rate (P), 1990–2010



Source: Constructed from data obtained from Maldives Monetary Authority *(2009, 2011)*

Table 2 shows simple correlation coefficients between the dollarization ratio and inflation, tourist bed nights and international reserves. Inflation has a weak and negative relationship with dollarization in the Maldives. Meanwhile, as also observed

from the graphs above, both international reserves and tourist bed nights are positively and highly correlated with DR2.

Table 2: Correlation coefficients

	Dollarization ratio (DR2)
International Reserves	0.6
Tourist Bed Nights (seasonally adjusted)	0.7
Inflation Rate	-0.3

4. Modelling the Dollarization Process in the Maldives

Most of the empirical models used to determine the dollarization process are based on simple money demand models and portfolio-balance models. The main theoretical underpinning of these models is that the demand for foreign currency depends largely on the interest rate differentials and the exchange rate risk. However, given the fact that the dollarization process in most countries cannot be explained by simple money demand and portfolio-balance models, these models have been extended to include other macroeconomic and institutional variables (see Civcir, 2003; El-Erian, 1988; Yinusa, 2009).

This paper uses an extended version of the simple money demand model used by Rojas-Suerez (1992) and Ortiz (1983) as a basic model, to which other important variables have been added. From the basic money demand model, the following functional form of a demand for foreign currency is specified (Rojas-Suerez, 1992):

$$m_t - p_t = \alpha_0 + \alpha_1 E(p_{t+1} - p_t) + \alpha_2 y_t + \mu_t \qquad (1)$$

where m is the log of the money supply, p is the log of the price level and y is the log of aggregate real income. The term $E(p_{t+1} - p_t)$ is the opportunity cost of holding money and it is given as expected inflation rate. This assumption is valid for countries with thin financial markets in which interest rates do not respond to market conditions, such as in the Maldives, where interest rates have been fairly rigid over the past decades. Finally, μ is the error term of the relationship. It is assumed stationary if Equation 1, above, denotes a meaningful long-run relationship.

4.1 Model Specification

The empirical analysis is conducted using monthly data from January 1991 to December 2010 (240 observations), which were obtained from the Maldives Monetary Authority (2009, 2011).

Following from Equation 1, a dollarization equation for the Maldives is specified as:

$$dr2_t = \beta_0 + \beta_1 inf_t + \beta_2 ir_t t + \beta_3 tour_t + \beta_4 open_t + \mu_t \qquad (2)$$

In Equation 2, the dollarization ratio used is the dollarization ratio as measured by the ratio of foreign currency deposits to total deposits in the banking system, DR2. In the analysis of dollarization in the Maldives, this study will use DR2, as this is a better indicator than DR1. This is because DR1 underestimates the relative weight of

foreign currency in the banking system as broad money includes only the local currency in circulation and not the foreign currency in circulation. The variable inf is measured as the annual change in inflation rates. Inflation volatility is a reflection of a risky and unstable macroeconomic environment, which might induce economic agents to switch to foreign currency assets to minimise their portfolio risks. Therefore, a positive relationship is expected between the two variables. The variable ir is included as a proxy for tightness in the domestic foreign exchange market. The hypothesis here is that when the foreign exchange market is tight, the public will hoard foreign currency in the expectation of future difficulties in acquiring foreign currency from the banking system. Therefore, a decline in international reserves will increase dollarization in the economy, as this will be a sign of foreign exchange tightness in the market. However, due to the difficulties in accessing foreign currency during these periods, the effect on the dollarization ratio as measured here, using only the foreign currency deposits held in the banking system, may not show this positive relationship. In fact, a negative relationship is possible if people hoard their foreign currency holdings or switch to offshore accounts.

The variable $tour$ is the number of tourist bed nights, to approximate the foreign currency inflows into the country. It is expected that higher tourism flows induce higher dollarization ratios and a positive relationship is expected between the two.

The variable $open$ is the ratio of openness of the economy and, it is related to higher foreign currency deposits to facilitate trade. However, if greater openness is associated with higher import payments, meaning that importers have to pay more for imports, there will be fewer saving in dollars, effectively reducing the dollarization ratio. In this case, the relationship would be negative.

Apart from the above variables, other variables such as inflation differentials, inflation, expected exchange rates and reserves in months of imports, were tried in the preliminary model estimation. However, they did not provide any robust results.

4.2 Methodology

The analysis of the time-series properties of the variables used in the model show that all the variables are non-stationary. However, they become stationary after taking their first differences. Therefore, this paper employs the econometric techniques of cointegration and ECM to estimate the relationship between dollarization and its main determinants in the Maldives. This approach identifies both the long-run relationship and the short-run dynamics of the estimated model.

4.3 Empirical Results

Unit roots and order of integration

All the variables were tested for unit roots using the Adjusted Dickey Fuller (ADF) tests.[3] The number of lagged terms was determined based on the Schwarz Information Criterion. The results of the unit root tests shows that the null hypothesis of a unit root cannot be rejected at 1 per cent significance level for the variables in levels. Therefore, unit root tests were conducted on the first difference of the

variables, which showed that all the variables were stationary, indicating that each series is integrated at the same order - I(1). These results are shown in Table 3.

Table 3: Unit root tests

Variable	No. of lags	Levels		First Differences		Result
		ADF test statistic	ADF critical val. at 5 %	ADF test statistic	ADF critical val. at 5 %	
DR2	2	-2.38	-3.43	-11.29	-3.43	I(1)
Inf	4	-2.53	-3.43	-6.80	-3.43	I(1)
Ir	4	-2.46	-3.43	-7.00	-3.43	I(1)
Tour	13	-3.29	-3.43	-4.84	-3.43	I(1)
Open	6	-2.25	-2.87	-8.28	-2.87	I(1)

Note: The null hypothesis of unit root is rejected if ADF test statistic < ADF critical value.The ADF critical values are MacKinnon (1996) one-sided p-values, provided by Eviews software.

After establishing the non-stationarity of the variables, Johansen's (1995) cointegration procedure was applied to test for cointegration of the variables. Based on a VAR model of 12 lags, the Johansen cointegration test was conducted, and the results are presented in Table 4. Both the trace statistics and maximum eigenvalue strongly rejects the null hypothesis of no cointegration, but does not reject the null that the number of cointegrating vectors is one. This means that there is one cointegrating vector in the variables included in the model.

Table 4: Johansen cointegration test

Null Hypothesis	Eigenvalue	Trace Statistic	5% Critical Value
H_o: r = 0*	0.15	72.44	69.82
H_o: r ≤ 1	0.08	36.12	47.86
H_o: r ≤ 2	0.06	17.30	29.80
H_o: r ≤ 3	0.01	4.01	15.49
H_o: r ≤ 4	0.00	0.72	3.84
Null Hypothesis	Eigenvalue	Max-Eigen Statistic	5% Critical Value
H_o: r = 0*	0.15	36.32	33.88
H_o: r ≤ 1	0.08	18.82	27.58
H_o: r ≤ 2	0.06	13.29	21.13
H_o: r ≤ 3	0.01	3.29	14.26
H_o: r ≤ 4	0.00	0.72	3.84

* Denotes rejection of the hypothesis at the 0.05 level. The trace test indicates 1 cointegrating eqn(s) at the 0.05 level. The max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

Long-run model

The cointegration test provided the coefficients for the long-run relationship of the model, as specified in Equation 2. Therefore, the estimated long-run equation is

presented in Equation 3, with the t-statistics in brackets. All the variables except, *open*, are statistically significant.

$$DR2 = -0.68 - 0.012inf - 0.365ir + 0.52tour - 0.061open \quad (3)$$
$$(-3.15) \quad (-4.03) \quad (3.07) \quad (-0.80)$$

The sign in *inf*, which is the inflation volatility, does not have the expected sign. As the inflation differential represents the stability of the macroeconomic environment, an increase in the variable indicates a worsening of the economic environment and a possible devaluation of the currency. Therefore, the theory postulates that economic agents would want to switch to foreign currency deposits, which should raise dollarization. However, the semi-elasticity of inflation volatility estimated in Equation 3 is a negative 1.2 per cent. This implies that if inflation volatility rises by one percentage point, then dollarization would fall by almost the same percentage point.

While this is counterintuitive, this negative relationship is consistent with the expected behaviour of economic agents in the Maldives, where macroeconomic instability is associated with tightness in the foreign currency market. Again, it is important to note that the dollarization ratio in the model includes only the foreign currency deposits in the banking system and does not include residents' offshore deposits and cash held domestically outside the banking system. This may explain the negative relationship between dollarization and inflation volatility. This is because high inflation and exchange rate devaluation expectations indicate a relatively tight foreign exchange market in the Maldives, which leads to dollar shortages, difficulties in accessing one's own foreign currency deposits in banks and the creation of black markets for dollars. As a result, the public may hold back their foreign currency from the banking system or transfer money to offshore accounts. The long-run negative relationship between inflation and the dollarization ratio is also common in other countries. One example is the case of Tanzania, where the dollarization ratio continued to rise even after inflation fell from over 30 per cent to single-digit levels (Kessy, 2011).

The tourism variable *tour* is of the expected sign, as more tourism inflows would mean higher dollarization. The negative sign for variable *ir*, implies that a 1 per cent increase in reserves leads to a 0.4 per cent decline in the dollarization ratio. As the official reserve position improves the foreign exchange market becomes less tight and economic agents have less need to increase their foreign currency holdings. As regards the openness of the economy, the variable was not significant.

The short-run model

To model the short-run dynamics of the dollarization model using a single-equation error-correction model, a weak exogeneity test was carried out to ensure that all the right-hand-side variables were exogenous and the left-hand-side variable, endogenous. The tests for weak exogeneity of the variables are shown in Table 5 and they reveal an asymptotically distributed χ^2 (1) test under the null hypothesis of the existence of weak exogeneity (Harris & Sollis, 2003). The results of the tests show that all the variables *inf*, *ir*, *tour* and *open* are weakly exogenous, while DR2 is endogenous to the system.

Table 5: Weak exogeneity tests

	DR2	inf	ir	tour	open
Chi-square(1)	14.92	0.32	5.03	4.65	0.30
Probability	0.00	0.57	0.02	0.03	0.58

The test for weak exogeneity runs under the assumption of one cointegrating equation. The failure to reject the null hypothesis is evidence of weak exogeneity of the variable of interest.

The weak exogeneity of the right-hand-side variables, coupled with one cointegrating equation, enables the short-run dynamics of dollarization to be modelled through a single-equation approach. The error-correction model is specified in Equation 4.

$$\begin{aligned}\Delta dr1_t = \ & \alpha_0 + \sum_{i=1}^{12} \alpha_1 \, \Delta dr1_{t-i} + \sum_{i=1}^{12} \alpha_2 \, \Delta inf_{t-i} + \sum_{i=1}^{12} \alpha_3 \, \Delta ir_{t-i} \\ & + \sum_{i=1}^{12} \alpha_4 \, \Delta tour_{t-i} + \sum_{i=1}^{14} \alpha_5 \, \Delta open_{t-i} + \delta_6 D93 \\ & + \delta_7 D01 + \delta_8 D05j + \sum_{i=1}^{3} \delta_9 \, D05_i + \sum_{i=1}^{11} \delta_{10} \, S_i \\ & + \theta_{12} ect_{t-1} + \mu \end{aligned} \tag{4}$$

The variables in the model shown in Equation 4 are as in the long-run model and Δ denotes the difference of that variable. The term ect_{t-1} represents the error-correction term in the model. Further, the model contains two step dummies, three impulse dummies and a set of seasonal dummies.[4]

The model was initially estimated with 12 lags using Ordinary Least Squares. The general-to-specific methodology was followed to achieve a parsimonious model, dropping insignificant lags and variables at each level while checking for model adequacy. The final error-correction model estimated is a very simple model, which passes diagnostic tests for normality, no serial correlation, homoscedasticity and correct functional form, as seen in Table 6.

Table 6: Diagnostic tests

Serial Correlation	Breush-Godfrey LM test	3.416 [0.06]
Functional Form	Ramsey RESET test	0.068 [0.79]
Normality	Jarque-Bera	1.771 [0.41]
Heteroscedasticity	White test	0.501 [0.90]

The stability tests for the model were used to check whether the parameters of the model were stable across various subsamples of the data used in the model.[5] The results of the model are presented below, in Table 7.

Table 7: Short-run dynamics of dollarization model

Dependent variable is dDR2

Variable	Coefficient	Standard Error	t-statistic	Prob.
$dDR2_{t-8}$	0.096	0.057	1.683	0.09
$dinf_{t-1}$	0.002	0.001	3.349	0.00
dir_{t-3}	0.041	0.016	2.598	0.01
$dtour_{t-3}$	0.019	0.005	3.744	0.00
$dopen_{t-4}$	0.012	0.005	2.710	0.01
D05*jan*	-0.04	0.0146	-2.5116	0.01
D05*feb*	-0.03	0.0149	-1.8026	0.07
S_1	0.01	0.0034	2.2899	0.02
S_3	0.01	0.0033	2.3611	0.02
S_6	-0.01	0.0035	-3.2716	0.00
ect_{t-1}	-0.04	0.0106	-3.6592	0.00

The d in front of the variables denotes the difference variables.

The results of the final short-run model show that the error-correction term, ect_{t-1}, has the right sign (negative) and is highly significant. All the variables in the model are significant, but at various lags. Apart from the tourism variable, all the other variables have different signs to the long-run model. This is, however expected, as the long-run behaviour of economic agents may differ considerably from their short-run behaviour, which influences their decisions on foreign currency holdings (that is, in the banking system). In the case of inflation volatility, the expected positive relationship is seen in the short-run model. This may result from economic agents, seeing this as a short-term effect, choosing to increase their foreign currency holdings in the banking system to protect their assets, instead of withdrawing or keeping foreign currency holdings outside the banking system, which they seem to be doing in the long run.

The lagged dollarization ratio gives some indication of the past dollarization affecting current rates, with the variable indicating that a 1 per cent increase in the dollarization ratio eight months previous has an impact of 0.1 per cent increase on the current dollarization ratio. The positive relationship between openness and dollarization suggests that higher external trade increases the demand (in the case of imports) and supply (in the case of exports) of foreign currency, thus driving up the dollarization ratio.

As in the long-run model, an increase in tourist inflows increases the dollarization ratio. The positive relationship between international reserves and dollarization is harder to interpret if the former is taken as a proxy for the condition of foreign exchange market. An increase in international reserves would mean the foreign exchange market will be less tight, reducing the need to hold foreign currency and decreasing dollarization. However, if the international reserves variable is taken as a volume measure of foreign exchange inflows into the country, there will be a positive relationship.

As regards the dummy variables, only two impulse dummies and three seasonal dummies are significant. The dummies for January 2005 and March 2005, immediately following the tsunami in December 2004, are negative, as expected,

indicating a fall in foreign currency inflows into the economy due to the sharp drop in tourist arrivals. The three seasonal dummies also have the expected signs, with the dummy variables for the months of January and March (the high season in the tourism sector), indicating the dollarization ratio is high in these months. The dummy for the month of June (the off-peak season in the tourism sector), has a negative sign.

The dollarization model estimated here might not be fully representative of a theoretical model. However, the estimated relationship between dollarization (albeit a narrow definition of dollarization) and the main factors influencing dollarization in the Maldives has produced important information on the dollarization process in the Maldives.

5. Conclusion

In the Maldives, dollarization is not primarily driven by economic factors. Like in other highly dollarized economies, in the Maldives, economic agents increase their holdings of foreign currency as a means of protecting their assets (fear of exchange rate depreciation or devaluation) during times of macroeconomic instability and distress in the country. However, additional features of the economy encourage (or force) economic agents to keep high levels of foreign currency holdings. The small and openness of the economy makes the Maldives heavily dependent on imports. To make import payments, importers need foreign currency, which is often difficult to obtain from commercial banks in the country. The difficulty in obtaining foreign currency is exacerbated at times of macroeconomic instability and tightness in the foreign exchange market. Even accessing personal foreign currency deposits in the banks is difficult during such a period, and international payments are often delayed. In addition, the government requires taxes and charges from sectors such as tourism—the largest taxpayer—to be paid in US dollars.

In the light of this, the dollarization ratio as measured by the ratio of foreign currency deposits to total deposits has remained high in the Maldives. The dollarization ratio used in this study is limited in the sense that it does not include foreign currency in circulation and offshore foreign currency deposits by residents. However, it still provides an adequate indicator for analysing the dollarization process in the country, given that the legal and institutional framework has not changed significantly during the period under analysis.

The analysis of the degree of dollarization conducted here showed that it has remained high in the Maldives over the past decades. Unlike in most other highly dollarized economies, in which dollarization rose following severe macroeconomic imbalances and high and persistent inflation rates, such economic factors do not appear significant for the Maldives. Rather, dollarization has followed the growth in tourism and it has been driven by institutional and structural factors in the economy.

An empirical model using cointegration analysis and an error-correction model was estimated to understand the relationship between long-run and short-run dynamics of the dollarization process in the Maldives. While empirical estimation on small countries like the Maldives suffers due to a lack of quality and longer time-series data, the empirical model estimated here provided robust results. The results showed

that the tourism inflows, macroeconomic stability and the conditions of the foreign exchange market are the main factors influencing the dollarization process in the Maldives in the long run. In the short run, in addition to these factors, the openness of the economy also influences dollarization in the country.

A high level of dollarization in an economy undermines the effectiveness of monetary policy. The main benefit from a flexible exchange rate of an independent monetary policy cannot be efficiently used in the presence of such high and persistent levels of dollarization, such as in the Maldives. Given that the dollarization in the Maldives has not been driven by past macroeconomic instability, but has followed the growth in the tourism sector, dollarization ratios are unlikely to come down. In this context, a flexible exchange rate with more exchange rate volatility would only further escalate the dollarization in the economy, as economic agents switch to dollar assets from local currency assets to avoid exchange rate risks. The presence of such high levels of dollarization in the economy lends supports to a fixed exchange rate regime in the Maldives.

Endnotes

[1] There have been various attempts to calculate the amount of foreign currency in circulation indirectly. See for example Erasmus, Leichter, & Menkulasi (2009), among others, where they used the local currency multiplier as a proxy for the foreign currency multiplier to estimate the foreign currency in circulation in Liberia. By using the foreign currency in circulation, a broader measure of dollarization was obtained—DR3—which is the ratio of foreign currency in circulation and foreign currency deposits to Effective Broad Money (EBM). EBM differs from broad money in that the former includes foreign currency in circulation.

[2] Dollarization here also refers to the widespread use of any foreign currency, not just US dollars. In recent years, the term 'eurorisation' has also been used to refer to the use of the Euro or the adoption of the Euro in a country.

[3] The time-series data were plotted to get a graphical representation of the data to determine which ADF test equation to use in the unit root tests. The plots of the data (see Appendix 4, Figure A4.1) showed that except for the variable *open*, all other variables fluctuated around a linear trend. The variable *open* fluctuated around a non-zero mean, and therefore the test equation included a constant. The test equation that includes both a time trend and a constant was used for all other variables.

[4] The shift dummy variable D93 is to capture the 1993 macroeconomic crisis, while D01 is the shift dummy for the exchange rate devaluation in July 2001. D05 is the impulse dummy for the December 2004 tsunami impact, which is specified individually for the first three months of the year 2005. The reason for including separate dummy variables for each month instead of one annual dummy is to capture the impact of each month, as the effects of the tsunami were stronger in the first month after the tsunami as compared to the subsequent months. In addition, due to the seasonality in tourism data, monthly seasonal dummies were also included.

[5] The recursive residual plot show that residuals lie within a band of +/_ two standard errors, indicating that parameters in the equation are stable. This is further confirmed by the plots of the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMsq) with 5 per cent critical bands. In both plots, cumulative sums are within the critical bands. All three tests support the stability of the estimated model.

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