Inflation Dynamics in the Maldives

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INFLATION DYNAMICS IN THE MALDIVES

by: Azeema Adam*

Abstract

The paper examines the factors that drive inflation in the Maldives, with a focus on the relationship between the exchange rate and inflation. Using cointegration and error correction techniques on monthly data from January 1990 to December 2010, the results show that the exchange rate pass through is extremely high in the long run. The long run analysis also demonstrated the neutrality of money in the sense that an increase in money supply leads to an almost proportionate increase in the price level over time. While some degree of price stickiness was found to exist in the short run, the results support the theory of absolute Purchasing Power Parity in the longer run.

1. Introduction

In small and open developing countries, fixed exchange rate policies are often used to stabilise domestic prices and control inflation. In the Maldives too, due to its high degree of openness and the small size of the economy, a pegged exchange rate system has been in place since 1994. To determine the efficacy of the pegged exchange rate regime in controlling inflation, it is important to analyse the dynamics of inflation in the Maldives empirically. Macroeconomic research in the Maldives is extremely limited, with this being the first study to model and analyse the dynamics of inflation in the country.

The paper examines the exchange rate and inflation relationship in the Maldives, while also identifying the factors, other than the exchange rate, that drive inflation in the Maldives. In small open economies, foreign prices also play a significant role in influencing domestic inflation, as these countries are heavily dependent on imports and are price takers in the international market. Therefore, it is important to identify the relative role that the exchange rate plays in influencing inflation, as compared to other factors, such as foreign prices.

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In order to understand the relationship between inflation and exchange rates, it is important to identify the degree and speed of exchange rate pass-through (ERPT) to domestic prices. ERPT refers to the extent to which changes in exchange rate are reflected in domestic prices, such as import prices, export prices and consumer prices. If the change in nominal exchange rate (NER) is fully transmitted to the domestic prices, the ERPT is complete. If there is no change in domestic prices from a change in exchange rate, then the pass-through is zero. In most cases, domestic prices respond to a change in nominal exchange, but not by the full extent of the change in exchange rate. This is called incomplete or partial ERPT. The extent of ERPT has important implications for the choice of exchange rate regime. If the ERPT is high or nearly complete, a flexible exchange rate will mean greater exchange rate volatility and higher volatility in inflation.

The paper is structured as follows. Following this introduction, Section 2 reviews the theoretical and empirical literature on the causes of inflation. In Section 3, the ERPT literature is reviewed. The CPI is chosen as the measure of inflation in modelling inflation in the Maldives, as this is the most commonly used measure of inflation in the country. Moreover, it is the only price index available on a monthly basis for the period used in this study (1990–2010). Therefore, to understand the process of inflation in the Maldives, the composition of the CPI is analysed in Section 4. Next, Section 5 describes the developments and sources of inflation in the Maldives. Section 6 outlines the theoretical and empirical framework, description of the data and the methodology used in modelling inflation in the Maldives are presented. The econometric techniques of cointegration and the vector error correction model (VECM) are used to model inflation. This is followed by a discussion of the results from the estimated model. In addition, the relationship between inflation and the exchange rate is further analysed using variance decomposition and impulse response functions. This identifies the extent of ERPT to domestic prices. The last section of this paper, Section 7, is the conclusion.

2. Review of Literature on Inflation

2.1 Theoretical Literature on Inflation

There are a number of theories on inflation. The two most prominent theories are the demand-pull and cost-push theories, with most theories and models of inflation based around these two theories. However, considering that these two causes of inflation are

not always straightforward and it is difficult to identify the actual source of inflation, different approaches of looking at the causes of inflation exist in the literature. The debate on inflation is generally centred on two main schools: Keynesian and Monetarist. An alternative view that is gaining prominence in explaining inflation in developing countries is the structuralist view.

In the simplest terms, demand-pull inflation is caused by 'too much money chasing too few goods'. This creates an increase in demand for goods and services in the economy, leading to an increase in the price level. In contrast, cost-push inflation refers to a general increase in price level associated with a reduction in aggregate supply. A contraction in aggregate supply might result from an increase in the cost of the inputs of production or from a supply shock to the economy, such as a flood or drought. For example, a rise in the cost of inputs for a firm will induce the firm to raise their prices to compensate for the higher costs and maintain their real value of profits. In this situation, workers seeing their real wages fall demand higher nominal wages. This in turn pushes up the cost of production and the general price level in the economy (Ball, 2007). Several factors may cause cost-push inflation, including:

- A rise in prices of non-labour inputs, such as oil prices
- An increase in interest rates (increasing the cost of borrowing, which is also an input price)
- Increases in wages
- An increase in indirect taxes, such as value-added tax or import duties or the removal of subsidies
- An increase in the price of imported raw materials due to changes in exchange rates, international commodity prices or external shocks

Various theories are used to explain the causes of inflation as put forward by different schools of thought. The theory of PPP is the simplest approach to explain inflation for a small open economy. The PPP theory postulates that inflation in one country must equal the inflation of another country when expressed in a common currency. This is expressed in Equation 1:

$$P = E_t + p_t^f \qquad (1)$$

where P is the domestic price level, E_t is the NER and p_t^f is the foreign price level. According to Equation 1, on the assumption that PPP holds, under a fixed exchange rate regime, domestic prices will adjust to equalise with foreign prices. If the exchange rate

regime is flexible, the changes in NER will equalise to maintain PPP. However, PPP may not hold in the short run, or sometimes even in the long run (Isard, 1995). Regardless of the validity of the PPP, the above equation can be seen as an equation for imported inflation. Imported inflation is referred to as an increase in domestic prices, due to an increase in the prices of imports. The prices of imports are influenced by changes in exchange rates and foreign prices. Therefore, if the economy is heavily import-dependent, inflation in the country may be determined by the exchange rate and foreign prices.

Following from classical economists such as David Hume, Adam Smith, David Ricardo and James Stuart Mill, and neo-classical economists such as Leon Walras, Alfred Marshal and Arthur C Pigou, inflation was always considered to arise from changes in money supply, based on the quantity theory of money (Trevithick & Mulvey, 1975). Such thinking was later revived by the monetarists and, as famously put forward by the most prominent monetarist of recent times, Milton Friedman, 'inflation is always and everywhere a monetary phenomenon' Friedman argued that there is a stable and positive relationship between inflation and money supply (Friedman, 1963). According to monetarists, inflation is caused by excess aggregate demand in the economy caused by an excess supply of money. This phenomenon in explained by the quantity theory of money, which was originally explained by Fisher's equation of exchange as:

$$MV = PT \qquad (2)$$

where M is money supply, V is velocity of money, P is the price level and T is transactions in the economy. As it is difficult to measure T, it is normally proxied by aggregate income, Y. Therefore, the equation is normally stated as:

$$MV = PY \qquad (3)$$

Equation 3 is an accounting identity and shows that the nominal expenditure on all goods and services in the economy should equal the value of output in the economy. The above equation assumes that velocity is fixed in the short run. The equation also assumes that the economy is in equilibrium and at full employment, thus giving a constant output. Therefore, the price level P can only rise from an increase in money supply, M. To control inflation, money supply has to be limited, which makes monetary policy the most effective tool to tackle inflation. One of the criticisms of this view is that velocity can vary even in the short run. Consequently, controlling the money supply may not suppress inflation. This has led some monetarists to concede that, while inflation is caused by money growth, this might not always hold true in the very short term (Ball, 2007).

According to the Keynesian approach to inflation, inflation is a result of excess demand in the economy.[1] That is, excess demand in the economy will create an inflation gap, which is the difference between aggregate demand and the potential level of output at full employment. Any of the factors influencing the aggregate demand in the economy can create excess demand. These components are shown in Equation 4:

$$AD = C + I + G + (X - M) \tag{4}$$

where AD is aggregate demand (the sum of all spending in the economy), C is consumer expenditure, I is investment, G is government expenditure, X is exports and M is imports. A rise in consumption due to lower inflation, a tax cut or increased consumer confidence could lead to a rise in aggregate demand. Likewise, higher government spending or increased investments by the private sector or an improvement in exports of the country could cause an increase in aggregate demand. This would lead to a higher equilibrium price level and equilibrium output level.

The relationship between inflation and unemployment was another concept that was used to explain wage and price inflation. Based on an empirical study in the late 1950s, Phillips (1958) found an inverse relationship between inflation and unemployment, which came to be known as the Phillips curve. As this was an empirical model, Richard Lipsey tried to provide some theoretical underpinnings to the model by examining the behaviour of wages in a micro-labour market setting. In the early 1960s, the model was taken further by Paul Samuelson and Robert Solow (Mankiw, 2009). As the Phillips curve model depicts a trade-off between wage inflation and unemployment, this has significance for both the theory of inflation and economic policymaking. The relationship between inflation and unemployment can be expressed in the following equation (see Equation 5):

$$\pi_t = (\mu + z) - \alpha u_t \tag{5}$$

where is π_t the inflation rate; u_t is the unemployment rate; z is a variable that represent all the other factors that would influence wage setting; μ is the mark-up; and α is a parameter to capture the trade-off between inflation and unemployment (Blanchard, 2003).

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[1] The distinction between Keynesians and Monetarists is not as important as it used to be, and Keynesian also considers the growth of money supply as a cause of inflation. Similarly, structuralist theory of inflation has elements from other theories of inflation.

The empirical analysis of the Phillip curve gave evidence on a short-run trade-off between wages and unemployment, but no conclusive evidence was found on the long-run trade-off between the two (Trevithick & Mulvey, 1975). Both Friedman and Edmund Phelps challenged the validity of the Phillip's curve and proposed a so-called 'expected-augmented Phillip's curve' which incorporates future expectations of inflation. This is expressed in Equation 6:

$$\pi_t = \theta\pi^e + (\mu + z) - \alpha u_t \tag{6}$$

where π^e is the expected inflation and θ is the expectations adjustment parameter. It is argued that workers form their expectation of future inflation based on past inflation. When inflation is persistent and high in the economy, workers would expect inflation to rise further in the future. These inflation expectations would be included when setting their wages. Expectations such as this, based on past behaviour, are called adaptive expectations (Salvatore, 2001).

Another dominant school of thought in explaining inflation, especially in developing countries, is the structuralist view. In contrast to the monetarists' view of inflation, structuralists believe that inflation is caused by non-monetary factors in developing countries, unlike in more developed countries. As such, price pressures mainly emanate from the real sector bottlenecks in the economy (Bernanke, 2005). It is argued that inflation is inevitable in developing countries pursing rapid growth policies, given that these countries have structural bottlenecks in the real sector of the economy. The structuralist's view of inflation is based on three main assumptions. These are '(1) relative prices … change when economic structure changes; (2) [there exists] downward inflexibility of [some] money prices; and (3) [there is] a passive money supply closing the deflationary gap caused by price increases' (Canavese, 1982).

The inflation models of structuralists identify three main factors that may cause inflation in developing countries. The first is the rigidity of food supply in the developing countries due to the bottlenecks in the agriculture sector. This is because, when countries become more industrialised, workers move from the agricultural to the industrial sector. This creates a reduction in supply in the agriculture sector, while at the same time increasing the demand for food as the population urbanises and become more affluent. The rigidity of the food supply and the inability to import food to cater for the market drives up the food prices. As prices in the industrial sector are downwardly rigid, the rise in food prices drives up the general price level in the country (Fischer & Mayer, 1981).

The second factor is the foreign exchange bottleneck, which arises when foreign exchange receipts in the country fall short of financing the high demand for imports. Increased demand for imports may come from both the private sector and the government. Demand can stem from the rapid development of the country, greater industrialisation and the increasing population of the country.

The third factor that causes inflation arises from a financial constraint that developing countries face. That is, developing countries in the process of urbanisation and industrialisation create an increased demand for both physical and social infrastructure facilities, which the government is unable to finance from its revenue. The structure of the revenue and tax systems in most of these countries is inefficient and rudimentary. Governments are therefore unable to access enhanced revenue from the increased wealth resources in the country resulting from the growth and development. Governments faced with such budget constraints often recourse to deficit financing, increasing money supply and creating inflationary pressures in the economy (Kirkpatrick & Nixon, 1976).

Apart from the factors discussed above, there are several other sources of inflation, especially in developing countries. In developing countries, fiscal imbalances are often a major source of domestic inflation, as fiscal deficits can contribute to high money growth and exchange rate depreciation (Montiel, 1989). According to adaptive expectations, people base their inflation expectations on the past behaviour of inflation, which creates inflation inertia. Inflation inertia is considered another important determinant of inflation in developing countries, especially when there is wage indexation and a history of high inflation in the country (Loungani & Swagel, 2001).

2.2   Empirical Literature on Inflation

No empirical studies on inflation have been done so far for the Maldives. This is the first attempt to examine the determinants of inflation in the Maldives empirically. While there is a considerable number of empirical studies on inflation determinants for developed and developing countries, studies on small island developing countries are still very limited. Some general studies on developing countries and the available studies on small island developing countries are discussed below. A review of these studies will help to identify the factors influencing inflation in countries similar to the Maldives and the methodologies used for empirical analysis. This will help to build and estimate a suitable econometric model of inflation for the Maldives, and allow for the comparison of results obtained for the Maldives with similar countries.

Loungani and Swagel (2001), using a sample of 53 developing countries, examined the inflationary process in these countries, focusing on the relationship between sources of inflation and exchange rate regimes. They used VAR models to look at the relationship between the variables and variance decomposition techniques to identify the effect on inflation from a shock to each of the explanatory variables in the model. The study found that the main causes of inflation are money growth and exchange rate changes due to fiscal effects. Regarding inflation inertia, past inflation accounted for about 10–20 per cent of inflation movements. However, the output gap and supply-side cost shocks were not as important in explaining inflation movements. This may be due to the use of annual data, as the influence from these two variables may be short term. The study also found that in Asian and African countries, inflation inertia was more important than fiscal variables, output gap and supply-side shocks. In contrast, in South American countries, fiscal variables were more important. Finally, fiscal variables contribute more to inflation in floating exchange rate regimes, compared to in fixed exchange rate regimes.

In modelling inflation process in Sri Lanka, Cooray (2008) found that inflation is mainly determined by real GNP, exchange rates and import prices. The money supply was also significant, but only in the long run. The determinants of inflation for Mauritius were analysed in a paper by Imam and Minoiu (2005), using quarterly data from 1977 to 2004 in a vector autoregressive framework. Two equations were estimated: a PPP equation and a monetary equation. The results showed that PPP does not hold for Mauritius and that foreign prices influence domestic inflation significantly. Further, ERPT was not very high, due to administered prices. As regards the monetary equation, the price elasticity of money was very high, at around 0.74.

As the Maldives have a pegged exchange rate to the US dollar, it would be interesting to look at inflation determinants in countries with similar exchange rate policies. A study by Kandil and Morsy (2009) on six Gulf countries that have or had pegged exchange rate regimes for a long period, studied the determinants of inflation using cointegration and ECM. The model estimated inflation as a function of NEER, foreign prices, money supply and government spending. Both foreign prices and NEER influence the domestic prices in the long run, with the former more important than the latter in determining inflation in most of the countries. However, in the short run, the external factors were important only in some countries. Monetary growth was inflationary in two countries in the long run and for only one country in the short run. Higher government spending was

disinflationary in all the countries in the long run, as it eased the capacity constraints in the economy. In the short run, a variable reflecting excess demand was included and this was significant for three countries, indicating that real output higher than the potential output is inflationary.

There have been a few studies on inflation for the Caribbean country of Barbados. Downes (1985) examined the factors influencing inflation in the country and found that import prices and interest rates are the main determinants of inflation (contributing 73 per cent and 7 per cent, respectively), whereas wage rate changes were found to be insignificant. Cumberbach (1995) also found similar results for Barbados, with the main determinant of inflation being import prices, although he found that the consumer credit rate, unit labour costs and real national income also contributes significantly to inflation in the country. Using cointegration and ECM, Downes, Holder and Leon (1991) also investigated the long-run relationship and short-run dynamics of inflation in Barbados. Wages, productivity, unemployment, price of tradables and import prices were found to influence the inflationary process in Barbados. Inflation in Barbados has been shown to have a close relationship to the movements in the tourism sector, indicating the importance of demand-side factors in explaining inflation in the country. In most of the studies on small open economies, according to Coppin (1993), the demand-side factors are ignored, with the assumption that inflation is mostly due to external factors. To fill this gap, he examined the determinants of inflation in Barbados, to check whether demand-side effects, such as the level of real tourism activity, or supply-side effects, such as imported inflation and interest rates, are more important in explaining inflation in the country. He also examined the seasonal patterns in inflation in the country. Both demand-side and supply-side factors were shown to influence inflation in Barbados.

Holder and Worrel (1985) analysed whether domestic factors are more important than foreign factors in the inflation process in three Caribbean countries: Barbados, Jamaica and Trinidad and Tobago. Using least square regressions on a log-linear model, they found that foreign prices, exchange rate changes and trade barriers were important sources of inflation in all three countries. Domestic interest rates were important in determining inflation only in Barbados, while wages were important only in Jamaica.

A study by DaCosta and Greenidge (2008) on four Caribbean countries analysed the determinants of inflation in these countries using annual data from 1970 to 2006. Dynamic OLS were used to estimate their model, which included a large number of

variables. They included inflation rate, oil prices, world prices, real national income, interest rates, unemployment rate, money supply and exchange rates. While not all the variables were significant for all the countries, for most of the countries, world prices, real national income, money supply, exchange rates and interest rates were important determinants of inflation.

The causes of inflation in Fiji were studied by Dewan, Hussein and Morling (1999), using a basic mark-up model similar to the model described in Equation 5. The main variables in the model were consumer price inflation, unit labour costs, import prices and output gap. The model was estimated as an unrestricted error-correction model. The results showed that about 75 per cent of the long-run movement in inflation comes from import prices and about 25 per cent from labour costs.

The above discussion on theoretical and empirical literature on inflation shows that there are a number of factors influencing developing countries, and no single theory can explain inflation in a given country. Moreover, the empirical evidence suggests that variables from different theories are important in explaining inflation in different countries. The factors identified by the literature as important determinants of inflation include money growth; exchange rate; fiscal deficit; real output gap; foreign prices; expected inflation; interest rates; nominal wages; unit labour costs; unemployment rates; and tax rates. Several studies model the determinants of inflation, drawing from different theories of inflation and using factors that seem to suit the particularities of the country or countries in focus. In a similar manner, this study will also take both external sector and monetary sector variables to model the inflation process in the Maldives.

3. Review of Literature on Exchange Rate Pass-Through

The effect of exchange rate changes on domestic prices has become an area of increasing interest for both academics and policy makers in developed and developing countries. As stated in the introduction of this paper, the ERPT refers to the percentage change in the domestic prices, generally import prices, from a 1 per cent change in exchange rate. Percentage change in exchange rate to consumer prices or any other domestic prices, such as producer prices or wholesale prices are also referred to as ERPT. When a change in exchange rate is fully transmitted to import prices, then ERPT is said to be complete. In contrast, it can be zero if a change in exchange rate has no effect on import prices. In general, most countries experience incomplete or partial ERPT, which is when some exchange rate changes are reflected in import prices to some extent (Menon, 1995).

The degree and speed of ERPT has important implications for the choice of exchange rate regime. A fundamental argument in favour of flexible exchange rate regimes is their ability to adjust relative prices of a country when there is a country-specific real shock to the economy. This assumes that changes to NERs are quickly transmitted to import prices, leading to an expenditure-switching effect between imported goods and home-produced goods. Therefore, a high ERPT is required for this price adjustment process of flexible exchange rate regimes to work (Bache, 2006). However, as mentioned earlier, a flexible exchange rate regime in a high ERPT environment will mean greater exchange rate volatility and higher volatility in inflation. Therefore, in countries in which price stability is the prime objective, a fixed exchange rate regime is preferred if the ERPT is high.

There are two stages of ERPT: in the first stage, exchange rate changes are transmitted to import prices; and in the second stage, import price changes are transmitted to consumer prices. The extent to which the consumer prices reflect the changes in import prices will depend on the share of imported goods in the domestic consumer basket. In addition, consumer prices in the domestic economy may also rise if higher import prices induce consumers to switch to domestically produced goods, which will increase the aggregate domestic demand in the economy. This will create an upward pressure on the domestic prices as well as on the nominal wages (Bailliu & Bouakez, 2004).

As mentioned previously, ERPT is mostly incomplete and this reflects a departure from the LOP in traded prices. According to LOP, goods that are homogenous must sell for the same price when converted to the same currency, regardless of where it is sold and assuming that there are no transportation costs or barriers to trade. Due to the types of trade costs and pricing to market (PTM) strategies adopted by firms, LOP does not hold in the real world. PTM refers to industry's practice of discriminating price according to different destination markets. This is one of the most important determinants of ERPT. Exporters will be more willing to absorb the costs of exchange rate changes, leaving their prices unchanged, if they believe that other players in the market will not raise their prices and that consumers are relatively price sensitive. This is because they do not want to lose their market share, especially in large and important export markets such as the US. As a result, PTM in such a situation will be high and ERPT will be low. In contrast, when exporters face a highly differentiated market, they will be less likely to adjust their prices to exchange rate changes and importers will bear the costs. In this case, PTM will be low and ERPT will be high (Bailliu & Bouakez, 2004).

The invoice currency of exports is also important for ERPT and the optimal exchange rate regime. According to Devereux and Engel (2002), if exports are invoiced in producer currency, exchange rate changes are fully, or to a large extent, reflected in import prices. In such a situation, ERPT will be high and a flexible exchange rate regime would be beneficial in adjusting to country-specific external shocks. However, if exports are invoiced in local currency, the exchange rate has little effect on the import prices. In this case, the ERPT will be low and no benefits can be attained from having a flexible exchange rate regime.

The inflationary environment in a country, as discussed earlier, is also known to be a key factor in determining the ERPT. According to Taylor (2000), the decline in ERPT in developed countries is mainly the result of the low inflation that these countries have experienced since the 1980s or early 1990s. When inflation is low and stable, there is less persistent inflation, which leads to a reduction in the expected persistence of costs and price changes. Therefore, in a low-inflation environment, producers are more reluctant to pass on the costs to consumers. They fear that the other competitors might not follow the price increase and they might lose their market share. As a result, firms lose their pricing power, leading to a low ERPT.

Taylor's hypothesis of low inflation leading to low ERPT was tested by Choudhri and Hakura (2006) in a cross-sectional study of 71 countries using new open economy macroeconomic models. They found evidence of a strong and positive link between the average inflation rate and ERPT. However, this evidence is far from conclusive, as shown by Campa and Goldberg (2002) in their study of 25 OECD countries. They found that there is only a weak association between high inflation and exchange rate volatility and high ERPT. Moreover, microeconomic factors, such as the composition of imports, are more important in determining the ERPT. In a review of ERPT literature on Asian countries, Ghosh and Rajan (2007) found that pass-through tends to be high in countries that are relatively smaller and more open, and which have higher import content, limited domestic substitutes for imported goods and more exchange rate volatility.[2] Exchange rate misalignment has also been considered as a determinant of ERPT in some studies (Goldfajn & Werlang, 2000).

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2   Low ERPT when there is greater exchange rate volatility may also be due to the menu costs faced by firms. Menu costs are essentially costs associated with changing a firm's prices. However, menu costs may also include costs such as updating computer systems, re-tagging items and hiring consultants to develop new pricing strategies when prices changes.

Most of the earlier empirical studies on ERPT are based on developed countries, especially larger economies like the US. However, in recent years, more cross-sectional studies and country-specific studies on developing countries have emerged, as there is now greater interest in the exchange rate issues of these countries. However, there are still not many studies on small island developing countries like the Maldives.

In a comprehensive survey of the literature on ERPT, Menon (1995) found that of the 43 studies that were included in his survey, more than half were on the US and Japan and many of the rest were on developed countries as well. The general conclusion from these studies is that pass-through is incomplete and time or lags taken for the transmission of exchange rate changes to prices are generally extensive. The empirical evidence on ERPT in developed countries shows that the ERPT in these countries has declined substantially since the 1980s and 1990s (Bailliu & Bouakez, 2004). Empirical literature on developing countries indicates that ERPT is very country specific and results cannot be generalised across the developing countries.

In a study of eight East Asian countries, Ito, Sasaki and Sato (2002) found that ERPT to import prices in Thailand was more than complete (over 166 per cent) while pass-through to consumer prices was at 26 per cent. Meanwhile, ERPT to import prices for Korea was not statistically significant, although it showed a 13 per cent pass-through to consumer prices. Ghosh and Rajan (2007) also examined the ERPT for Thailand and Korea and found that ERPT was higher for Thailand than for Korea. They did not find evidence of a reduction in ERPT for either of these countries, and in fact found ERPT to be higher since the Asian crisis. This was largely owing to the greater openness of the economy and greater volatility in exchange rates.

In a study of 25 developing countries, Barhoumi (2006) found evidence of high ERPT in the long-run,[3] but the degree of pass-through was heterogeneous among the countries. He further examined the cross-country differences by taking into consideration the different exchange rate regimes and trade distortions in these countries. He found that fixed exchange rate regimes and lower trade barriers potentially lead to a higher ERPT to import prices in the long run compared to countries with floating exchange rate regimes and higher trade barriers.

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3   Long-run is taken as 12 months.

As mentioned earlier, there are only a few studies of ERPT in small countries like the Maldives. Looking at Jamaica, McFarlene (2002) analysed the ERPT to consumer prices in Jamaica, using monthly data from January 1990 to December 2001. He found that the degree of ERPT remains high for the country, but the speed of ERPT has declined substantially when the period 1990–1995 is compared to the latter period, 1996–2001. While the high pass-through is associated with the openness of the economy, the relative size of the economy and the relative elasticities of supply and demand in the country, the reduction in the speed of ERPT may be attributable to the more favourable macroeconomic environment. In particular, the low and stable inflation during the period 1996–2001 compared to the earlier period (1990–1995) may explain the reduction. Wimalasuriya (2007) empirically analysed the ERPT in Sri Lanka into different domestic prices, using monthly data from 2000–2005. She found the ERPT to be high for both import prices and consumer prices, though the pass-through effect is lower for consumer prices compared to import prices. He also found that pass-through to producer prices was complete within six months.

From the above review of the literature on ERPT, the following general conclusions can be made:

- ERPT is incomplete and pass-through decreases along the production chain (such as from import prices to manufacturing or wholesale prices to consumer prices).
- Both microeconomic as well as macroeconomic factors influence the degree of ERPT.
- ERPT has generally declined for developed countries.
- The degree of pass-through shows substantial cross-country heterogeneity. It also varies among different studies and across time horizons.
- Studies on small island economies are scarce.

As regards the extent of ERPT, it is expected to be high if the country has the following characteristics:

- High degree of openness of the economy
- Large share of imported goods in the consumer basket
- Imports invoiced in producer currency prices
- Low PTM
- Low trade barriers

o   A fixed exchange rate regime

As the Maldives has most of these characteristics, it is expected that the ERPT to domestic prices will be high.

4. Developments and Sources of Inflation in the Maldives

## 4.1   Structure and Composition of Consumer Price Index

The extent of ERPT and the importance of different factors that influence domestic inflation depend very much on the composition of the CPI. The CPI is compiled on a monthly basis for the whole country (CPI National), for the capital Male' (CPI Male') and for the region, which excludes the capital Male' (CPI Atolls). However, only CPI Male' is available for any considerable length of time, as National and Atoll indices are only available from 2006. The CPI index has 13 categories, with the largest weights allocated for food (31 per cent) and housing, electricity, gas and other fuel (25 per cent).

The exchange rate effect on prices is expected to be very high in the Maldives, as the tradable sector is very large, while the non-tradable sector is very small. An analysis of the consumer basket used for the CPI, which was decomposed into tradables and non-tradables showed that about 90 per cent of the tradable goods in the CPI are imports and about 58 per cent of the total CPI basket comprises imported goods. While the services in the consumption basket were classified as non-tradables, these services are also greatly influenced by exchange rates in the country. Consequently, very few items in the consumer basket in the Maldives are devoid of any influence from foreign factors such as international prices and exchange rates.

4.2   Inflation Developments

Inflation in the Maldives has been volatile in the period under review (1990–2013), with two episodes of very high inflation, as can be seen in Figure 1. Food prices are the main source of inflation in the country, as these constitute about one-third of the CPI basket. Most of the goods in the consumer basket are imported and this makes domestic inflation vulnerable to international prices.

Figure 1: Annual Inflation Rates, 1986–2013
(percent)
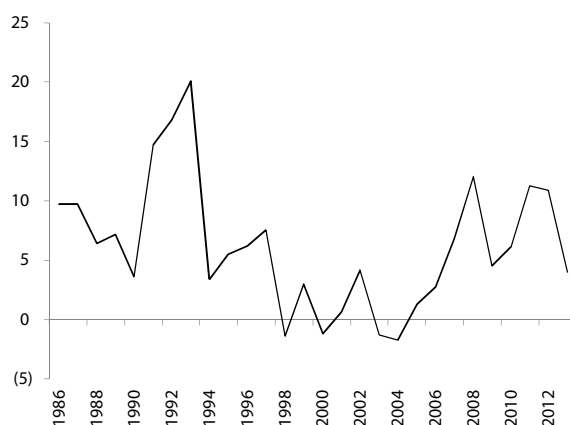
Inflation, which came down from almost 10 per cent in 1986 to about 4 per cent in 1990, increased to a record high of 20 per cent over the following three years. This was a time of serious macroeconomic imbalance in the country, stemming from both external and domestic factors. On the external front, the tourism and fisheries sectors, which were the dominant sectors in the economy, were adversely affected by weak tourism markets and low international fish prices. The current account deficit as a percentage of GDP rose to almost 17 per cent in 1993, from just about 6 per cent in the previous two years. On the domestic front, following surplus budgets in 1987 and 1988, the deficit ballooned in the subsequent years, reaching a high of 14 per cent of GDP in 1991. The growing budget deficits largely resulted from the government's recurrent expenditure, owing to increases in wages and salaries for government employees and extravagant spending on two events: the 25th Anniversary of Independence of the Maldives and the hosting of the annual conference of the South Asian Association for Regional Cooperation (SAARC) in 1991. The deficit was financed mainly by monetisation and, as a result, monetary growth became excessive (an annual growth of 36 per cent in broad money).

Following this episode of macroeconomic destabilisation, the government implemented several macroeconomic and structural reforms in 1994. This included the formal adoption of an exchange rate peg to the US dollar, moving away from the previous policy of a highly managed exchange rate regime. Due to the stabilisation measures, the government budget deficit and the current account deficit as a percentage of GDP was

reduced dramatically to 5 and 3 per cent respectively, in 1994. Consequently, inflation also came down to 3 per cent at the end of the year. Inflation remained subdued in the second half of the 1990s, mainly because of the steady appreciation of the nominal effective exchange rate, which had been taking place since 1995. The low prices of fish in the domestic market also contributed to the low inflation. Moreover, imported prices of clothing and footwear declined in 2000, contributing to the overall decline in prices in 2000 and a negative rate of inflation for the year. The public sector[4] wage increase of 35 per cent in September 1999 did not seem to affect overall inflation in 2000.

In a small open economy like the Maldives, a devaluation of the exchange rate is expected to feed through to inflation through higher import prices. In 2001, the rufiyaa was devalued by 9 per cent against the US dollar. While the average rate of inflation[5] for the year did not increase substantially in 2001 (see Figure 1), the year-on-year inflation registered a significant increase. The monthly inflation rates during 2001 and 2002 are shown in Figure 2. The year-on-year inflation rate at the end of 2001 was about 7 per cent, in contrast to the negative rates of inflation in the first half of the year. The inflation rate, excluding the more volatile domestic prices[6], is also shown in Figure 2. This figure reveals that inflation was already rising prior to the July 2001 devaluation. This is because, in the period leading up to the devaluation, the foreign exchange market was very tight and there was a large black market. As a result, the cost of imports was on the rise in local currency terms, as the black market exchange rate was significantly higher than the officially fixed rate. The resulting increase in domestic consumer prices is an indication of the high ERPT in the economy. The high import costs associated with the exchange rate devaluation was passed on to the consumers, especially for food imports.[7] This was despite the decline in the fish index and the depressed demand in the economy, due to the private sector wage reductions in response to the economic downturn following the 11 September terrorist attack in the US. Following the stabilisation of the high import prices in the second half of 2001 and in the following year, the inflation rate fell steadily over the period 2002–2004.

4   The public sector in the Maldives is large, with the government administration accounting for about 13 per cent of GDP.

5   The annual inflation rate here is calculated using the average monthly indices of CPI for the year, as this is more representative of the actual inflation during the year than the year-on-year inflation rates. However, the latter are also useful when analysing the monthly developments.

6   Fish and fish products have a 5 per cent weight in the CPI basket. The fish index is usually very volatile, reflecting the daily demand and supply of fresh fish in the local fish market in Male'. The year-on-year increase in the fish index in 2001 was 30 per cent.

7   As discussed in Section 5.4, most of the items in the food category, apart from fish, are imported.

Figure 2: Inflation Rates and Inflation Excluding Fish Prices, 2001–202

(percent)
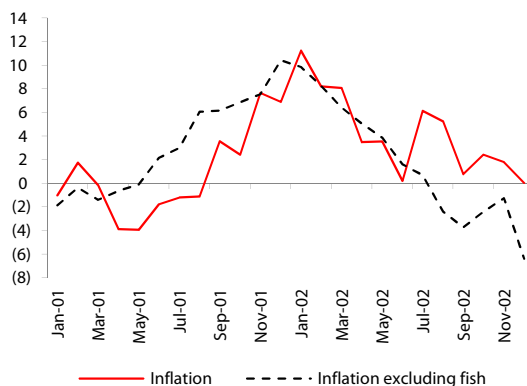
In the years following the 2004 tsunami, inflation began to rise again in the Maldives. As the reconstruction of the islands and tourist resorts damaged by the tsunami began, supply-side bottlenecks arose, as all construction materials are imported. While there is an unlimited supply of goods available for import from international markets, the handling capacity for imports into the Maldives is limited, as the existing customs and port infrastructure is constrained. As a result, upward pressure was placed on the price of consumer goods. This was also a period of rising global food prices and oil prices, which further contributed to rising inflation. Another factor contributing to the upward surge in inflation in the years following the 2004 tsunami is related to the increased migration of people from the outer islands to the capital, Male'. This increased the demand for rental properties in Male' and, given the shortage of such properties on the island, drove up rental prices. The only dampening effect on inflation during the post-tsunami period came from the decline in the communication index because of the reduced telecommunication rates stemming from the opening up of the mobile phone services sector. At the end of 2008, inflation reached a peak of 12 per cent as the prices of most of goods and services in the consumer basket increased significantly. However, inflation rates were moderated somewhat in 2009 and 2010, to 5 per cent and 6 per cent, respectively. This reflected the deceleration of world commodity prices and domestic fish prices.

Inflation picked up again considerably in 2011 and 2012, due to a combination of international and domestic factors. During the first half of 2011, a substantial rise in global food and energy prices resulted in elevated levels of domestic prices, owing to

the high proportion of imported items in the CPI basket. As such, world food prices rose by an average of 34 per cent in annual terms during the first quarter of the year, while crude oil prices also rose significantly. Despite world commodity prices easing towards the end of the year, inflationary pressures were further aggravated in the domestic economy, due to the depreciation of the rufiyaa by roughly 20 per cent, following the change in the exchange rate regime in April 2011. The increase in the cost borne by importers was immediately reflected in high domestic prices, and by the end of the year, prices had hiked up by about 17 per cent. Furthermore, the introduction of the goods and services tax (GST) in October 2011 and the subsequent increase in its rate from 3.5 per cent to 6 per cent in January 2012 also contributed to an increase in inflation levels. However, the effect of GST on inflation was relatively muted, as a number of essential goods and services are taxed at 0 per cent under the GST Act. Other domestic factors such as fish prices continued to play a significant role in driving inflation during this period, as erratic price hikes were observed in the domestic fish market. By 2013, as the base effects of the rufiyaa depreciation dissipated and domestic fish prices stabilised, inflation levels decelerated gradually to about 4 per cent.

Based on the above analysis of the developments in inflation, together with the main variables identified in the theoretical and empirical literature, expected sources of inflation for the Maldives are described in the next section.

4.3 Sources of Inflation

Being a small and open economy, it is generally believed that inflation in the Maldives is imported. Apart from exchange rate movements, which would be reflected on the imported value of a good, the final price of an imported good that is sold in the domestic market is also influenced by changes in costs associated with structural factors such as transportation, storage, finance, insurance, wholesaling and retailing. However, due to the unavailability of data on these structural factors, it is not possible to examine their contribution to inflation.

Drawing from the theoretical and empirical literature and the analysis on the developments of inflation in the Maldives in the past two decades (1990–2010), several sources are identified as possible determinants of inflation. They include the NEER, foreign prices, monetary factors (money supply, credit to the private sector and credit to the government), budget expenditure, real GDP and wage levels. The relationships between these variables and inflation are discussed below.

Nominal exchange rates and inflation

The NEER used in this study is the import-weighted exchange rate. As the Maldives have a fixed exchange rate to the US dollar, the changes in the US dollar against the major trading partners of the Maldives changes the exchange rate between the Maldivian rufiyaa and the currencies of its major trading partners accordingly. Given that the Maldives trades very little with the US, the exchange rate changes of major trading partners is captured in the NEER.

The developments in the NEER are shown in Figure 3. In this paper NEER measured in terms of domestic currency units per unit of foreign currency is used. Therefore, a decline in the value of the NEER represents an appreciation of the Maldives rufiyaa against an import-weighted basket of currencies, while an increase represents a depreciation. Depreciation of the NEER makes the imports into the country more expensive, resulting in higher import prices. This directly translates to higher consumer prices in the Maldives. As most of the inputs in the domestic production of goods and services are also imported, higher import prices of inputs also influence consumer prices. As such, a depreciation of the currency should be associated with an increase in inflation and an appreciation should lead to a decline in inflation. The developments seen in Figure 3 seem to suggest the existence of such a relationship, especially in more recent years.

Figure 3: Annual Growth in NEER and Inflation Rates (p), 1991–2010
(percent)
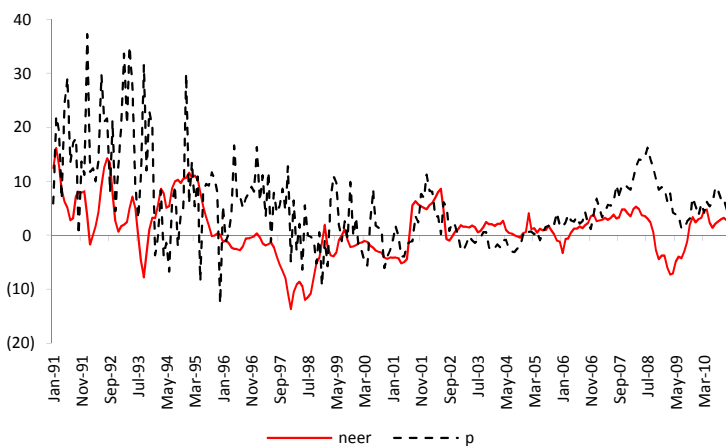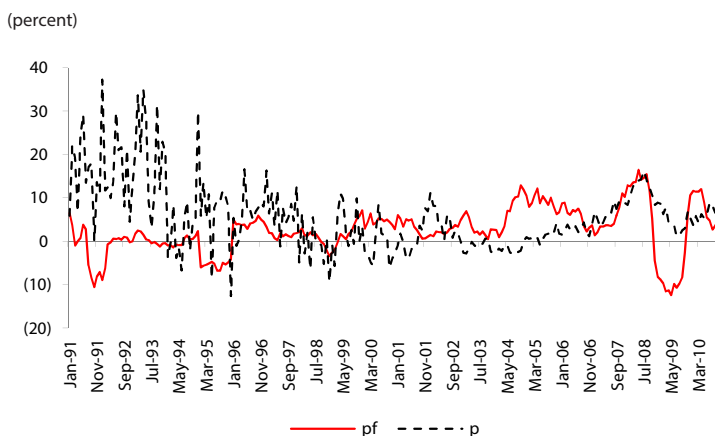

Source: Maldives Monetary Authority (2009,2011)

Foreign prices

Foreign inflation can transmit to inflation in the domestic economy directly and indirectly. Higher import prices will be reflected almost instantaneously in the goods imported for final consumption and this will normally show as a proportional increase. Higher import prices of inputs into production are indirectly transmitted to consumption goods, with a time lag before the higher prices are reflected in the domestic prices of these goods.

The best indicator of foreign prices is the import price index. However, such data is not available for the Maldives. Instead, the PPI of the Maldives' major trading partners, weighted by their import share in the total imports of the Maldives, is used in this paper.

The growth in foreign prices, as measured by the PPI of the major trading partners, is shown in Figure 4, along with the rate of inflation. As in the case of the NEER, the inflation rate moves in tandem with the changes in foreign prices. However, the changes in inflation and the foreign prices are not proportional. This is expected, as domestic inflation is influenced by other factors, such as the prices of non-tradable items in the consumption basket.

Figure 4: Annual Growth in Foreign Prices (pf) and Inflation Rates (p), 1991–2010

(percent)

Source: Data constructed from IFS Database (2009)and Maldives Monetary Authority (2009, 2011)

Figure 5: Annual Growth in World Food Prices and Food Inflation Rates, 1990–2010

(percent)
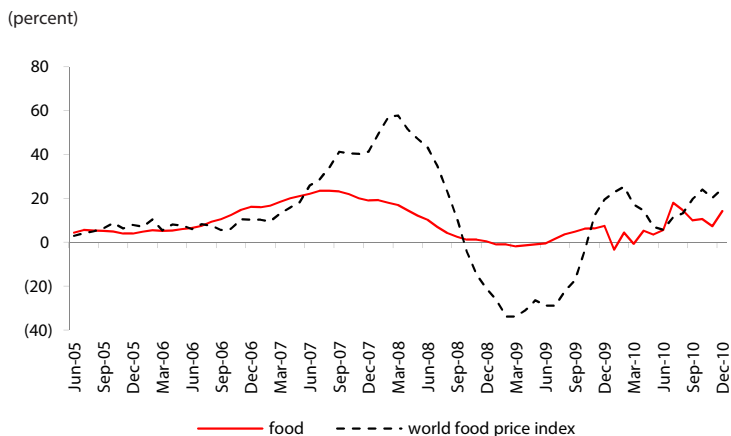
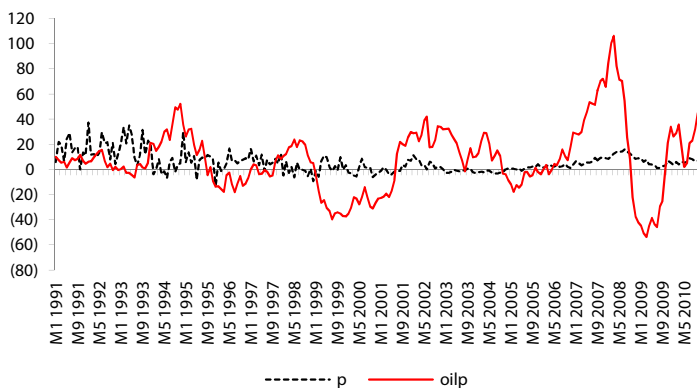Source: FAO (2011) and Maldives Monetary Authority (2009, 2011)

As mentioned before, about one-third of the CPI consists of food items, the majority of which is imported. Therefore, the relationship between world food prices and food inflation in the country becomes important.[8] Developments in world food prices, together with domestic food inflation (as a percentage change in the food price index), are shown in Figure 5. Domestic food prices are shown to respond to changes in world food prices, but the rate of increase in domestic food prices is slight compared to the increase in world food prices. Moreover, the fall in world food prices has had a subdued effect on domestic food inflation. The reason for the limited relationship between the two factors may relate to the administered prices of staple foods in the country, these being rice and flour.

The price of oil affects the domestic economy in most countries. The Maldives is particularly dependent on oil imports, as the main industries of the country have high dependence on and a highly inelastic demand for oil. Oil imports account for about 20 per cent of total imports in value terms. In the case of tourism, oil affects the transportation of both goods and tourists to the tourist resorts. In addition, each resort generates its own power, requiring oil supplies. As regards the fisheries sector, the consumption of oil is high, especially given that large fishing vessels are now engaged in fishing activities. Given that the Maldives are a small chain of islands, with 200 inhabited islands spread across 900,000 square kilometres, sea transport is paramount to the economy.

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8   The food price index is only available from June 2004 on a comparable basis.

Figure 6: Annual Growth in International Oil Prices (oilp) and Inflation Rates (p), 1991–2010

(percent)

As Male' is the hub of the wholesale and retail sectors, most of the goods consumed in the rest of the country are distributed from Male'. However, the direct impact of oil observed on the domestic consumer prices in Male' (which is the CPI index used in this analysis, as discussed earlier) is very little. Consumer goods and services that are influenced by international oil prices, such as electricity charges in Male', are heavily regulated and subsidised by the government. Therefore, the direct impact of oil price changes is not observed in the domestic consumer prices. The lack of responsiveness of inflation to oil prices is evident from Figure 6.

Monetary growth and inflation

According to the monetarist view of inflation, excessive growth in money creates inflation. Figure 7 shows the developments in inflation together with broad money (M2) in the Maldives. This is the widest monetary aggregate of money supply and measures the total liquidity in the system. Given the high credit demand in the economy, especially from the tourism sector, and the frequent deficit monetisation by the government, the growth in M2 has remained high in most years. This is seen in Figure 8 in the rapid expansion in credit to the government as well as to the private sector. The decline in private sector credit in 2009 and 2010 reflects the downturn in the economy and the increased caution on the part of commercial banks in their lending activities after the global financial crisis.

Figure 7: Annual Growth in Money Supply (M2) and Inflation Rates (p),
1991–2010

(percent)
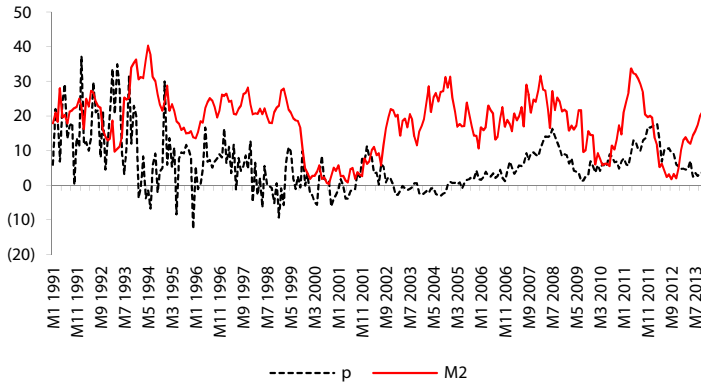
Source: Maldives Monetary Authority (2009, 2011)

While the impact of monetary expansion will be seen in inflation, probably with a lag, it can be seen from Figure 7 that there is some correlation between broad money and inflation. The rapid expansion in credit in the economy also creates inflationary pressure due to the existence of supply-side bottlenecks. As almost everything is imported in the Maldives, the rapid growth in private sector credit and credit to the government increases the demand for imports. Importers frequently face foreign currency shortages when there is a rapid increase in demand for imports. This shortage is also severe during times of tourism downturns, as it curtails foreign exchange inflows to the country. In addition, the

Figure 8: Credit to the Private Sector (cp) and Credit to the Government
(cg), 1991-2010

(millions of rufiyaa)
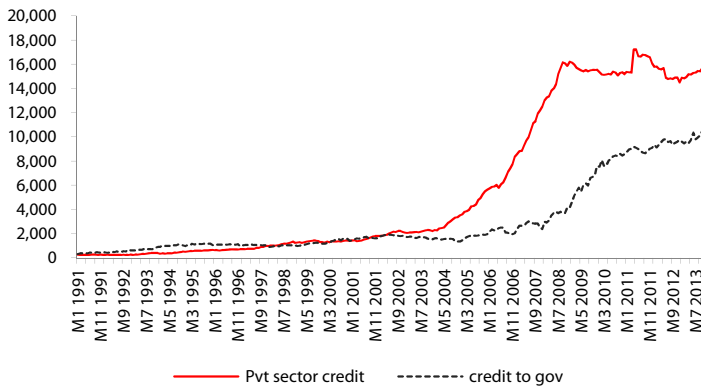
Source: Maldives Monetary Authority (2009, 2011)

limited infrastructure and capacity constraints in areas such as port facilities and inter-island transport contributes to inflation in the domestic economy.

Wage increases and inflation

In the Maldives, the labour market is not very developed. There are no labour unions, and labour rights are very limited. In addition, the large pool of cheap expatriate workers available from neighbouring countries has led to limited (often no) bargaining power for employees. There is no data available on the wage levels in the country, especially in the private sector. The only available information on wages is the total wage bill of the government, in annual terms. However, the total wage bill of the government is not a good indicator of the general wage levels in the country. This is because the wage bill changes with shifts in the composition of employees, such as more employees in higher positions than in the previous year. In recent years, government sector employment has been politically motivated, with extensive and erratic job promotions given to employees with certain political affiliations. Further, the wage levels of the government are generally increased after every election (every five years), often leading to a wage spiral in the private sector. This promotes inflation, as the cost of inputs in the private sector increases when the wage level rises. However, in the absence of data on wage levels, it is difficult to gauge the relationship between the two.

Real gross domestic product and inflation

According to the empirical and theoretical literature, real GDP growth eases the demand pressures in the economy, leading to a decline in the rate. Since real GDP data are only

Figure 9: Annual Growth in Real GDP (y) and Inflation Rates (p), 1986–2013
(percent)
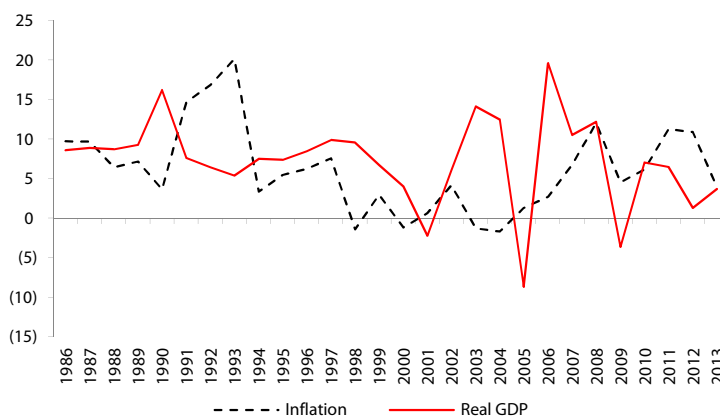
Source: Maldives Monetary Authority (2009, 2011)

Figure10: Tourist Bed Nights, Seasonally Adjusted, (tbn_sa) and Inflation Rates (p), 1990-2010
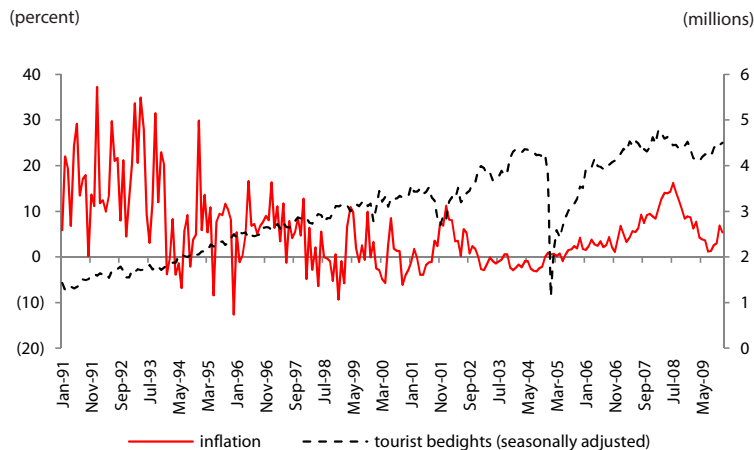
available on an annual basis, Figure 9 shows the annual developments in real GDP and inflation rates. As shown, the relationship between the two variables seems to be positive rather than negative. This might be a sign of overheating in the economy.

In a study by Coppin (1993) on Caribbean countries, he asserts that in tourism-dependent countries, the real GDP is driven by the tourism sector, and an expansion in tourism will lead to higher inflation. He argues that tourists will compete with locals for the available consumption and infrastructural goods, driving up domestic prices, assuming tourism activity does not take place in an enclave. In the case of the Maldives, tourists do not directly compete with locals for such goods, as tourism does in fact take place in an enclave (in the sense that tourists are located on separate tourist islands). These islands are solely for the purpose of tourism and almost all tourism activities take place in these islands. Given the high import dependence of the economy, which is even higher in the tourism sector, the demand for goods is met by imports. However, if the demand for imports is not met due to the structural bottlenecks in the economy, as discussed earlier, an increase in tourism could lead to a rise in inflation.

Therefore, an increase in tourist bed nights can increase or decrease inflation. In Figure 10, the relationship between tourist bed nights and inflation rates shows different trends during different periods. In the 1990s, inflation was too volatile and tourism was expanding too rapidly to discern any visual relationship between the two. During the

period 2000–2004 (prior to the tsunami), a negative relationship is seen, after which inflation seems to positively track tourist bed nights. However, since this latter period was the post-tsunami reconstruction period, the developments in inflation cannot be associated simply to tourism developments.

5. Modelling the Inflation Process in the Maldives

5.1   Theoretical Framework

Following the analysis of the sources of inflation in the Maldives in Section 4.3, this section first specifies an inflation model for the Maldives. There are several theories that have been developed to explain inflation under various circumstances. The theoretical specification for the empirical model used in this section is based on a simple model of price determination in a small open economy. Small open economies are heavily dependent on imports and are generally price takers. Therefore, domestic prices in the country are influenced by foreign prices and changes in NERs. Based on these assumptions, the model specified below uses a tradable and non-tradable sectors framework to determine overall prices in the economy:[9]

$$P_t = f(P_t{}^T, P_t{}^{NT}) \qquad\qquad (7)$$

where price P_t is a function of the prices in the tradable sector, $P_t{}^T$, and the prices in the non-tradable sector, $P_t{}^{NT}$. The prices in the tradable sector are determined by the world market and the prices of these in the domestic economy is a function of foreign prices (p_t^f) and NER (E_t), assuming that PPP holds. This is given in Equation 8:

$$P_t{}^T = f(E_t, p_t^f) \qquad\qquad (8)$$

Domestic prices will increase if the exchange rate depreciates or foreign prices increase. Equation 8 can be regarded as an equation of external inflation, as discussed in Section 2.1.

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9   The model specified here draws from inflation models used in studies of small developing economies, such as those of Cumberbach (1995), Downes, Holder, & Leon (1991), Moriyama (2009) and Williams and Adedeji (2004).

Prices in the non-tradable sector are determined in the domestic money market and this can be specified using the quantity theorem of money. This was discussed in Section 2.1 and the Equation 3 is re-stated below (see Equation 9) in the context of the framework developed here:

$$MV = P_t^{NT} Y \qquad (9)$$

where M is the money supply, V is the velocity of money, and Y is the real GDP.

Taking the natural logarithm of Equation 9 and solving for prices gives the domestic prices as a function of money supply, real GDP and velocity (which usually declines with financial deepening, and thus has a negative time trend). This is given in Equation 10.

$$p_t^{NT} = m_t - y_t + \theta t + \eta \qquad (10)$$

where θt is the time-trending velocity and η represents the disturbances of the velocity other than the time-trend component.

The overall price level in the economy is derived by taking the natural logarithm of Equation 8 and substituting it, together with Equation 10, into Equation 7, as specified in Equation 11.

$$p_t = f(e_t, p_t^f, m_t, y_t) \qquad (11)$$

According to Equation 11, the overall price level is positively related to the NER changes (e), foreign prices (p_t) and the money supply (m) , while negatively related to real GDP (y). An increase in real GDP is expected to depress inflation on the assumption that nominal GDP is fixed for a given money supply.

5.2 Model Specification, Data and Variables Definition

Following from Equation 11, the long-run inflation equation for the Maldives is specified in Equation 12:

$$p_t = \beta_0 + \beta_1 e_t + \beta_2 p_t^f + \beta_3 m_t + \beta_4 y_t \qquad (12)$$

The definitions of the variables and their units of measurement included in Equation 12

Table 1: Variable Definitions

Variable	Description
p	Overall price level in the economy, measured by CPI (June 2004 = 100, log transformed)
e	The NEER, defined as foreign currency per unit of domestic currency (2000 = 100, log transformed)
p^f	Foreign prices, measured as the import-weighted PPI of the major trading partners (2000 = 100, log transformed)
m	Money supply, measured using broad money supply, M2 (in millions of rufiyaa and in logs)
y	Real income in the economy, proxied by tourist bed nights (in millions of bed nights and in logs)

are given in Table 1, below.

In Equation 12, the overall CPI index for Male' is used as the general price level. As mentioned in the introduction, the CPI is the only price index available consistently for a reasonable period. The choice of CPI for Male' is dictated mainly by data availability. Since, the national CPI data is only available from 2005, and both the series follows the same trend, CPI for Male' is deemed appropriate for the inflation analysis for the country. It would also have been interesting to analyse the determinants of food inflation in the country, as this comprise about one-third of the consumer basket. However, given the lack of consistent time-series data, such an analysis was not possible.

The variable e is the NEER. The NEER is defined in terms of foreign currency per unit of domestic currency. This means that an increase in NEER is a depreciation of the local currency and a decrease in NEER is an appreciation. The NEER used here is an import-weighted exchange rate. A positive relationship is expected between the two variables and the larger the coefficient on NEER, the greater the ERPT.

The variable p^f represents the foreign prices that influence domestic inflation. As discussed in Section 5.2, there are a few choices for the foreign prices. While the best choice would be unit import prices as these would be more representative of the prices actually paid for the imports, such data are not available for the Maldives. Studies commonly use CPI or PPI of major trading partners, world food prices or international

oil prices to represent foreign prices. Of these, this study has chosen to use an import-weighted average of the PPI of the major trading partners, since the dependent variable is the overall inflation. As for the relationship between the foreign prices and domestic prices, a positive relationship is expected. Given the price taker and import dependence assumptions of small open economies, as discussed in the theoretical model, a rise in foreign prices will lead to an increase in domestic prices.

The variable m is the money supply represented by broad money, M2. The theoretical literature does not provide any guidance on which monetary indicator to use and different studies use different monetary aggregates. This analysis uses M2 as the money supply variable, as it is more representative of the total liquidity available in the economy. It is expected that an expansion in money supply will induce higher inflation.

As the data on real GDP are available only on an annual basis, a proxy variable is used to represent real income in the economy, y , in the inflation model. Given that more than one-third of the GDP is directly attributable to the tourism sector and the growth in real GDP closely tracks the growth in the tourism sector, specifically tourist bed nights, the latter is used to proxy real GDP in the Maldives. This was seen as a more suitable option than interpolating annual data into monthly data, due to the absence of any related series (with the exception of tourist bed nights) that could be used for interpolating annual real GDP data into monthly data.

The relationship between inflation and real GDP is ambiguous, as it depends on which supply-side or demand-side factors are at play. The supply-side argument posits that if an increase in the supply of goods and services outmatches the demand, prices will decline. Conversely, if the demand for goods and services is not matched by supply, domestic prices will increase. In addition, in the case of the Maldives, tourism inflows affect the rate of inflation in the country through another channel. As mentioned on several occasions, the Maldivian economy is highly dependent on imports, but the foreign currency required to purchase imports is not always readily available. Dollar shortages are common and often commercial banks impose limits on the purchase of US dollars, especially at times of low foreign exchange inflows. Further, commercial banks in the Maldives only issue letters of credit to importers if they submit the required amount of US dollars. Importers sometimes resort to higher black market rates to obtain US dollars. These factors lead to the higher prices of imported goods in the domestic market. As foreign exchange inflows are directly linked to tourism inflows, improvements

in the tourism flows ease the dollar shortages in the market. Given these factors, the relationship between the real GDP and inflation in the Maldives is ambiguous.

The empirical analysis is conducted using monthly data from January 1990 to December 2010 (240 observations). The data was obtained from the MMA (2009, 2011), with the exception of the PPI data. This was obtained from the IMF's International Finance Statistics online database (IFS Database, 2009). In addition to the variables included in the model, impulse dummies were included to capture the December 2004 tsunami impact. Instead of one impulse dummy three impulse dummies for the first three months of 2006 were included to isolate the effect 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, two shift dummies and seasonal dummies were also included.

5.3   Methodology

The inflation equation is modelled using cointegration analysis and the ECM approach.
$$Z_t = A_1 Z_{t-1} + \dots\dots + A_k Z_{t-k} + B x_t + \mu_t \tag{13}$$

The cointegrating analysis is based on an unrestricted VAR model, which can be specified as in Equation 13:

where Z_t is a (n x 1) vector of endogenous variables used in the model, which is Z_t = [$p_t, e_t, p_t^f, m_t, y_t$]', a (5 x 1) matrix, and each A_i and B representing an (n x n) or a (5 x 5) matrix of parameters. x_t is a (5 x 1) matrix of deterministic variables, such as constant and time trend, and μ_t is a (5 x 1) matrix of independently and normally distributed errors.

In this paper, the short-run dynamics of the variables in the inflation model will be analysed using impulse response functions and variance decomposition analysis in a VECM framework. Impulse response functions (IRF) trace the effect of a one standard deviation shock to one endogenous variable on the other variables in the VECM. Therefore, the IRF will allow for identifying the magnitude and persistence of consumer prices changes to variations in its main determinants of inflation. The response of consumer prices from a shock to the exchange rate change will be used to calculate the ERPT to the CPI in the Maldives. As regards the variance decomposition, they are used

to identify the percentage of the forecast variance in any variable that can be attributed to its own shocks versus shocks to other variables (Enders, 2004).

5.4 Empirical Results

Unit roots and order of integration

All the variables were tested for unit roots using the ADF test. As a plot of the time series would provide an indication of whether or not to use a constant, a constant and a trend, or none, a graphical representation of the time-series data for each variable was conducted. The plots of the data showed that all the variables fluctuated around a linear trend. Therefore, the test equation that includes both a time trend and a constant was used for testing unit roots for all the variables. To apply the ADF test, the number of lagged terms to be included in the test equation also had to be specified. This was determined based on the SIC, but additional lags were included when autocorrelation was found in the residuals, until it was eliminated. The results of the unit root tests shows that the null hypothesis of a unit root cannot be rejected at 5 per cent significance

Table 2: Unit Root Tests

Variable	No. of Lags	Levels		First Differences		Result
		ADF test stat.	ADF critical val. at 5 %	ADF test stat.	ADF critical val. at 5 %	
p	6	-2.89	-3.43	-10.77	-3.43	I(1)
e	2	-3.17	-3.43	-9.06	-3.43	I(1)
p^f	1	-1.97	-3.43	-12.08	-3.43	I(1)
m	0	-2.29	-3.43	-16.18	-3.43	I(1)
y	13	-3.28	-3.43	-4.85	-3.43	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.

levels for the variables in levels. Therefore, unit root tests were carried out on the first difference of the variables, which showed that all the variables are stationary at first difference, indicating that each series is integrated at the same order—I(1). These results are shown in Table 2.

Given that all the variables included in the model are non-stationary and integrated at I(1), cointegration tests allowed the identification of any long-run equilibrium

relationships among the variables. As mentioned previously, Johansen's (1995) cointegration procedure is used to test for cointegration. As for the lag selection, the SIC information criteria is used, and the model that minimises the SIC and eliminates autocorrelation is a model with seven lags.

An unrestricted VAR model with seven lags and five variables (as identified in Equation 13 and including e_t, p_t^f, m_t, y_t as endogenous variables and a set of dummy variables)

Table 3: Johansen Cointegration Test

Null Hypothesis	Eigenvalue	Trace Statistic	5% Critical Value
$H_o: r = 0*$	0.21	122.97	69.82
$H_o: r \leq 1*$	0.18	66.33	47.86
$H_o: r \leq 2$	0.04	19.08	29.80
$H_o: r \leq 3$	0.04	8.90	15.49
$H_o: r \leq 4$	0.00	0.21	3.84
Null Hypothesis	**Eigenvalue**	**Max-Eigen Statistic**	**5% Critical Value**
$H_o: r = 0*$	0.21	56.64	33.88
$H_o: r \leq 1*$	0.18	47.24	27.58
$H_o: r \leq 2$	0.04	10.18	21.13
$H_o: r \leq 3$	0.04	8.68	14.26
$H_o: r \leq 4$	0.00	0.21	3.84

* Denotes rejection of the hypothesis at the 0.05 level. The trace test indicates 2 cointegrating eqn(s) at the 0.05 level. The max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

is estimated to conduct the Johansen cointegration test. The results of the cointegration test are presented in Table 3. Both the trace statistic and maximum eigenvalue strongly rejects the null hypothesis of no cointegration and at least one cointegrating vector, but does not reject the null that the number of cointegrating vectors is two. This means that there are two cointegrating vectors in the variables included in the model.

The existence of two cointegrating vectors is in line with the theoretical foundations of the inflation model that has been specified for the Maldives. The first cointegrating vector can be interpreted as the long-run relationship between the NER, foreign prices and domestic consumer prices. The existence of a long-run relationship between these three variables can be taken as an indication that the absolute version of PPP holds for the Maldives in the long run. This is the equation established in Equation 1, which can also be regarded as an equation of external or imported inflation. The second cointegrating vector is taken as the long-run equilibrium between money supply, real income and domestic consumer prices. This is the money demand relationship given in Equation 3.

Therefore, restrictions were imposed to split the model into two: an external inflation model and a monetary inflation model, which is consistent with economic theory.

The existence of cointegration means that the VECM specified in Equation 14 can be estimated. In terms of diagnostic tests, the VECM is checked for serial autocorrelation and normality. Both the Portmanteau test and LM test showed that residuals are free of serial correlation. However, the normality test of Jarque-Bera failed due to kurtosis in the residuals. Gonzala (1994) and Hubrich (1999) show that the Johansen procedure for VECM is robust under non-normal residuals, and therefore the estimates remain valid.

$$p = -3.19 + 0.95e + 0.74\,p^f \qquad (15)$$
$$(3.19)\ \ (7.81)$$
$$m = 0.92 + 1.05p + 0.74y \qquad (16)$$
$$(3.93)\ \ (13.2)$$

Long-run cointegration relations

The long-run relationships for the two cointegrating relations identified by the VECM give the estimated long-run equations for the external inflation model and monetary inflation model. They are presented in Equations 15 and 16, with their t-statistics in brackets. All the variables are statistically significant.

In Equation 15, it can be seen that both the NEER (e) and foreign prices (p^f) positively influence consumer prices in the Maldives, as expected. Given that the variables are modelled in logs, the coefficients of the variables in the equations can be taken as long-run elasticities. As such, a 1 per cent depreciation (an increase in the coefficient of e is measured as depreciation) leads to an almost equal increase in inflation. This means that the pass-through is extremely high for the Maldives. This is as expected, given that the imports are invoiced in the exporter's currency and, as discussed in the literature review (see Section 3), when there is producer currency pricing, the ERPT is high.

In most small open economies, the ERPT is high—although not as high as this, except for in Jamaica, for which the estimated coefficient was 0.98 (McFarlane, 2002). In the case of Fiji, the pass-through coefficient was estimated at 0.45 for the period 1982–1986 and 0.37 for the period 1987–1991(Jayaraman & Choong, 2011b). As mentioned in the literature review, the pass-through coefficient was somewhat lower in Mauritius (0.23) mainly due to administered prices (Imam & Minoiu, 2005).

Given the high import content of the consumption basket, domestic prices are responsive to changes in foreign prices, as indicative of the large coefficient for the foreign prices in Equation 15. Similar results were obtained for other small island economies as discussed in Section 2.2. As regards the money demand equation given in Equation 16, this is normalised for domestic prices, p , which would give Equation 17:

$$p = 0.95m - 0.71y$$

(17)

$$(8.57) \; (-7.54\,)$$

As expected, money growth (m) increases domestic prices (p), while higher income (y) reduces prices. The responsiveness of prices to an increase in money supply is high for the Maldives, with the long-run money supply elasticity of prices at 0.95 per cent. This means that almost 95 per cent of an increase in money supply will be translated to higher inflation. In most studies on small island economies, monetary aggregates were either not included as a determinant of inflation or found to be insignificant in explaining inflation.

The importance of money supply in determining inflation in the Maldives is explainable from the developments in domestic credit in recent years. Since the year 2000, credit to the private sector has grown exponentially in the Maldives, while borrowings by the government from the banking system (see Figure 8 in Section 4.3) also grew rapidly, fuelling the money growth in the economy. Most of this translates to higher demand for goods and this is a typical case of the old adage 'too much money chasing after too little goods.' Given that this higher demand for goods is actually higher demand for imported goods, in an open economy such as the Maldives, the increased demand could easily be met by higher imports. However, there are several supply-side bottlenecks and capacity constraints, such as limited port and storage facilities, in the economy, as discussed earlier. In addition, the expansion in credit leads to 'foreign exchange bottlenecks', as posited by the structuralist view of inflation, and as discussed in Sections 2 and 5.2.

In contrast to the finding of Coppin (1993) for Barbados that tourism growth has an inflationary impact in tourism-dependent economies, the estimated equation for the Maldives shows that growth in tourism (which is used as a proxy for real income) has a dampening effect on inflation. One of the main reasons for this may be that higher tourism inflows mean higher foreign exchange inflows, which eases foreign currency demand in the importing sector. Given the fixed exchange rate, when foreign exchange

inflows are low, importers face difficulties and delays in obtaining the foreign currency required for import payments. As a result, prices of imported goods in the domestic market increase. Therefore, rather than higher real output easing supply constraints, in the Maldives, this eases the foreign exchange market and import prices in the country.

The short-run dynamics of the inflation model are discussed below using IRF and variance decomposition analysis.

Short-run dynamics

The impulse response function shows the time path of the CPI to shocks from all the other four variables in the model. From the IRF, short-term elasticities, or in the case of exchange rate, ERPT can be calculated. The formula is given in Equation 18.

$$PT_{t,t+i} = \frac{p_{t,t+i}}{e_{t,t+i}} \tag{18}$$

where PT is the pass-through and p_{t+i} is the cumulative change in price indices and e_{t+i} is the cumulative change in NER between the months t and $t+i$ (Leigh & Rossi, 2002).

Figure 11: Variance Decomposition of Inflation
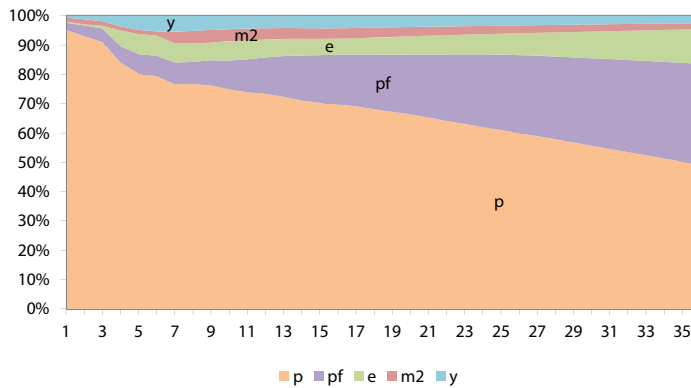
The Cholesky decomposition method was used for the IRFs and the variables were ordered as follows:

$$p^f \rightarrow e \rightarrow y \rightarrow m \rightarrow p$$

Other orderings were tried, but they did not change the results. Therefore, the above ordering was used. The inflation elasticities to the shocks to exchange rate, foreign prices and money supply on a two-year horizon (24 months) are shown in Table 4.

Table 4: Inflation Elasticities to Shocks

Months	e	p^f	m
1	0.00	0.00	0.00
3	0.03	-0.28	-0.04
6	0.66	-0.30	-0.02
9	0.86	-0.10	-0.01
12	0.82	0.13	-0.15
15	0.96	0.33	-0.26
18	0.99	0.59	-0.40

The results in Table 4 show that the ERPT in the first 3 months is very small, but then gains ground over the next three months to reach a high of 66 per cent. The ERPT is almost complete after 18 months. As discussed earlier, this is a very high level of pass-through. As regards the impulse response of inflation to shocks to foreign prices, the initial impact is negative in the first year. However, the domestic inflation starts to pick-up and within 18 months, approximately 60 per cent of the changes in foreign prices are passed on to domestic prices. By the end of the second year, the pass-through to domestic inflation is complete.

The lag in transmitting foreign price changes to domestic prices may reflect the price stickiness in the economy, as businesses are reluctant to change prices in the short run due to costs such as menu costs. However, why domestic inflation becomes negative in the first year following a shock to foreign prices is not clear. Shocks to money supply seem to bring a negative impact in the short run, which is counterintuitive. This may be due to the availability of credit, facilitating the production of short-term demand in goods and services, especially in facilitating import payments.

As regards the variance decomposition analysis, this shows the relative importance of the four explanatory variables in the model in explaining shocks to inflation. This is achieved by decomposing the error-forecast variance of inflation into components explained by each of the variables. Figure 11 shows the decomposition of inflation in this respect. It is clear that the shocks to inflation are largely explained as shocks to

itself. Initially, about 95 per cent of variation is explained by its own shocks. This could be indicative of the existence of inflation inertia. Shocks to foreign prices explain about 12 per cent of variation in inflation by the end of the first year, and the exchange rate explains about 6 per cent over the same period.

The short-run analysis of inflation shows that changes in NER pass on to domestic prices very quickly, while shocks to inflation itself explain the variance in inflation, followed by shocks to foreign prices. Moreover, it is evident from the variance decomposition analysis, as seen in Figure 11, that external theories of inflation are dominant in explaining the inflation process in the Maldives.

6. Conclusion

This paper examined the inflation process in the Maldives, using 21 years of monthly data from 1990–2010. The high and volatile inflation of the 1990s subsided in the following decade, until, in the post-tsunami period, inflation once again rose to double-digit level. However, these levels remained lower than the high levels of the 1990s. A review of the theoretical and empirical literature on inflation in small developing island economies, such as the Maldives, indicated the importance of three theories of inflation (external theory, monetary theory and wage theory) in explaining the dynamics of inflation.

Given the lack of data on wages in the Maldives and the relatively free and open labour market (due to the easy access to a cheap and abundant labour force of expatriates from neighbouring countries), the contribution of wage inflation is not expected to be large. Therefore, this paper examined the importance of external and monetary determinants of inflation in explaining inflation in the Maldives. Special emphasis was placed on examining the role of the exchange rate in the inflation process, and more specifically, on determining the degree and the speed of ERPT to domestic consumer prices.

Since the time-series data used in modelling inflation were non-stationary, cointegration analysis together with VECM was used. The short-run dynamics were analysed using IRF and variance decomposition. The absolute version of PPP seems to hold in the long run for the Maldives, as a long-run relationship was found between nominal exchange rates and domestic and foreign prices, using cointegration analysis. According to the long-run inflation function based on the external theory of inflation, both nominal exchange rates and foreign prices influence domestic inflation in the Maldives significantly. The

speed of ERPT, determined with the application of IRF, indicates that pass-through is complete in 18 months. Thus, the ERPT can be seen as very high, which is similar to the results obtained for other small island economies.

Given the high content of imports in the consumption basket (both directly as consumption goods, and indirectly as inputs to goods and services) and the inability to influence prices in the importing countries, domestic prices are highly responsive to changes in foreign prices, but suggest some price stickiness in the short run. According to the variance decomposition analysis, shocks to inflation are explained mostly by its own past values, suggesting inflation inertia. Shocks to foreign prices are the second most important source of the variation in domestic prices, followed by the nominal exchange rates.

The estimated long-run relationship based on the monetary theory of inflation showed that an increase in money supply is inflationary, possibly due to structural bottlenecks. As for the real income, proxied by tourist bed nights, this showed that an increase in real income reduces inflation in the long run. This may be due to the easing of foreign exchange markets, owing to higher exchange rate inflows from the increase in tourism activities.

The analysis in this paper suggests that exchange rate and foreign prices have the most influence on the inflation dynamics in the Maldives. The high and fast ERPT suggests that changes to nominal exchange rates will be transmitted almost completely to the domestic prices over a short period. As discussed in the literature review, price-taking, small and open economies, with low trade barriers, high dependence on imports and fixed exchange regimes have a relatively higher and more rapid ERPT. As the Maldives possess these characteristics, the ERPT estimated for the country in this paper supports the findings in the literature.

However, as most of the features of the economy leading to the high ERPT are inherent, except for the exchange rate regime, little can be done to lower the ERPT in the Maldives. The importance attached to the stability of inflation in small developing countries like the Maldives and the volatility associated with flexible exchange rate regimes, therefore lends more weight to the use of a fixed exchange rate regime in the country. Moreover, the empirical results obtained from the inflation analysis also shows that the real

depreciation resulting from a nominal depreciation will be unwound in a short-time which will also reduce the advanatges of a flexible exchange rate regime. The analysis in this paper also showed that there is a positive relationship between monetary expansion and inflation in the Maldives. Therefore, policy makers in the Maldives have to be mindful of the inflationary pressures emanating from monetary growth, especially from monetisation of budget deficits, as the other determinants of inflation in the Maldives are exogenous.

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