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Contribution of International Flow of Capital and Product Services on the GDP of Maldives

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Abstract: The aim of this study is to examine the effect of international flow of capital and product services on GDP in the case of Maldives. Using the annual data from 1980-2007 we found that Product Service of Export and Foreign Direct Investment are the influencing factors of the GDP of Maldives where as Product Service of Import and Remittance are not the driving force of the GDP. So Maldives government should imposed more emphasis on exports and foreign investment depending on tourist sectors with policies to encourage people to exports more and give more relax able condition for foreign investment.

Key words: Cointegration tests, GDP, product service of export, product service of import, FDI and remittance

INTRODUCTION

Gross Domestic Product (GDP) measures the total output of goods and services for final use occurring within the domestic territory of a given country, regardless of the allocation to domestic and foreign claims. Gross domestic product at purchaser values (market prices) is the sum of gross value added by all resident and nonresident producers in the economy plus any taxes and minus any subsidies not included in the value of the products.

The geographical condition and production environment of Maldives determines its dependence on imports. The largest proportion of Gross Domestic Product (GDP) of the Maldives is produced in the tourism sector engaged in exports of services while a sizeable proportion of GDP comes from sectors supporting tourism business such as transportation and communication services. On the other hand more than half of all household consumption comes from imported goods. Foreign trade statistics are important not only by itself due to the large contribution of foreign trade to the national economy but also to measure the various indicators of sectors dependent on foreign trade such as fishery, manufacturing, construction and others. Major categories of import to the Maldives in recent years were processed industrial supplies, processed food and beverages for household consumption, machinery and equipment, parts of machinery and equipment and fuels and lubricants. These categories contributed 64% of total imports in 1998 and 67% in 1999. Apart these goods recently imports of machinery and equipment and textile goods consistently grew up. From the export data by CPC we found that prepared fish has the largest share of 64% of the total exports in 1998 and 53% in 1999 followed by wearing apparel and footwear (24% in 1998 and 39% in 1999). Other significant exported products are fishery products, scrap metals, frozen tuna, dried tuna, canned fish, fresh or chilled reef fish and live reef fish, salted dried fish and fishmeal and fresh and chilled tuna.

The government encourages foreign investment to spur growth, employment and exports. No legal distinctions are made between foreign and domestic companies, foreign companies can own 100% of a domestic company and there are no restrictions or limitations on remitting profits and dividends.

Most of the foreign investment is concentrated in the tourist sectors. Among the major leisure and recreation firms that have a presence are Hilton Resorts, the Four Seasons (Canada), Club Med (France), One and Only Luxury Resorts (South Africa), Holiday Inn, Taj hotels (India), Regent Hotels, Banyan Tree (Singapore) and Sheraton. Shangri La (Hong Kong), Mandarian Oriental (Hong Kong) and the Jumeirah Group (Dubai) will open hotels in 2010. Expatriate labor plays a major role in the economy particularly in the teaching, medical, construction and tourist sectors. In the fourth quarter of 2008, the average number of expatriate workers was 79,058

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which were 16% above the same level of 2007 (Maldives Monetary Authority). Several researchers discussed different factors effect on the GDP for different countries. Dasgupta (2008) examined the long run effect of export, import, FDI inflows to the FDI outflows in case of India. Nahar analyzed the growth trend and changing structural of GDP of Bangladesh. Ahmed and Mortaza (2005) explored the relationship between inflation and GDP of Bangladesh. Jongwanich (2007) examined the impact of workers' remittances on growth and poverty reduction in developing Asia-Pacific countries using panel data over the period 1993-2003 and found that remittances do have a significant impact on poverty reduction through increasing income, smoothing consumption and easing capital constraints of the poor. Kim *et al.* (2003) investigated the effect of imports and exports on total factor productivity in Korea during 1980-2003 and found Granger causality from imports to Total Factor Productivity (TFP) growth but no causality from exports to TFP growth. Rahman (2007) re-examined the effect of export, FDI and remittance to real GDP of Bangladesh, India, Pakistan and Sri Lanka. Katircioglu (2004) established the causal relationship among GDP, agricultural, industry and service in case of North Cyprus. Subramaniam and Reed (2009) estimated an econometric model that incorporates the linkages among agriculture, manufacturing, service and trade sectors using a Vector Error Correction model for Poland and Romania. From the above discussion researchers found that exports, import, FDI and foreign remittance are the main influencing factors of the GDP of any country. So it is always interesting to find out the relationship among these factors. Here we will find out the causal relationship among these variables in case of Maldives.

MATERIALS AND METHODS

Stationarity: To determine the non-stationary property of these time series variables both in the levels and first differences, the relevant DF and ADF test have been employed. The DF test is based on the following Eq. l:

$$\Delta Z_t = \delta + (\rho - 1)Z_{t-1} + \lambda T + \varepsilon_{1t} \quad (1)$$

The ADF test is a modification over the DF test and lagged values of the dependent variables are added in estimation of Eq. 1 which is formed as follows:

$$\Delta Z_t = \delta + (\rho - 1)Z_{t-1} + \lambda T + \gamma \Delta Z_{t-1} + \varepsilon_{2t} \quad (2)$$

Since it is widely believed that both DF and ADF test do not consider the cases of heteroscedasticity and non-normality frequently revealed in a raw data of economic time series variables, the PP test for unit root has been used in the empirical analysis. Moreover, it has an advantage over the ADF test when the concerned time series has serial correlation and there is a structural break. Therefore, the PP test provides robust estimates over DF and ADF tests and is based on the following form of equation:

$$\Delta Z_t = \phi + (\rho - 1)Z_{t-1} + \lambda(t - T/2) + \psi \Delta Z_{t-i} + \varepsilon_{3t} \quad (3)$$

The appropriate critical values of time t statistics for the null hypothesis of non-stationarity are given by McKinnon (1991). Further an alternative testing procedure, KPSS test has been performed where the concerned time series variables are assumed to be trend stationary under null hypothesis (Patterson, 2002). The KPSS test starts from the basic local level equation:

$$Z_t = \alpha_{t-1} + \beta + h_t + \xi_t \quad (4)$$

The KPSS test statistics is based on the following Lagrangian Multiplier (LM) statistic:

$$KPSS = \sum_t \left(\sum_{r-1}^{t} \hat{u}_r \right)^2 / T^2 f_0 \quad (5)$$

where, f is an estimator of the residuals spectrum at frequency zero. The appropriate critical values for the LM statistic are given by Kwiatkowski-Phillips-Schmidt-shin. At Eq. 1-3, Δ represent the first difference and ε_{1t}, ε_{2t}, ε_{3t} are the respective stationary random error term.

Cointegration tests: Many micro economic time series may contain a unit root has spurred the development of the theory of non-stationary time series analysis. Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a stationary linear combination exists then the non-stationary time series are said to be cointegrated. The purpose of the cointegration test is to determine whether a group of non-stationary series are cointegrated or not. The maximum likelihood estimation method of Johansen and Juselius (1990) is used to test for cointegration. Gonzalo (1994) provided Monte Carlo evidence that Johansen and Juselius (1990) method performed better than others methods according to different criteria. The VAR model can be present as:

$$x_t = \lambda + \phi_1 x_{t-1} + ... + \phi_k x_{t-k} + \varepsilon_t; \quad t = 1, 2, ..., T \quad (6)$$

The corresponding VECM can be written as:

$$\Delta x_t = \lambda + \Gamma_1 \Delta x_{t-1} + ... + \Gamma_{k-1} \Delta x_{t-k+1} + \Phi E_{t-1} + \varepsilon_t \quad (7)$$

where, E_{t-1} is the lagged level of Error Correction term:

$$X = [LGP \quad LPE \quad LPI \quad LFD \quad LRM],$$
$$\Gamma_i = -1 + \phi_1 + ... + \phi_i, \quad i = 1, 2, ..., k-1, \quad \phi = 1 - \phi_1 - ... \phi_k$$

Where:

Δ = Denotes the first difference operator
λ = The intercept term
ε_t = White noise term

An examination of the ϕ matrix enables us to detect existence of cointegrating relations among the X_t variables. Here $0<\text{rank}(\phi) = r < p$ indicates that there are r cointegrating relations among the element of X_t and there are $p \times r$ matrices α and β such that $\phi = \alpha\beta'$. Here α is a matrix of error correction parameter and β is interpreted as a matrix of cointegrating vectors.

Granger causality test: Once researchers have established the long run relationship among GDP, product service of export, product service of import, foreign direct investment and remittance, the next step is to examine the Granger-Causal relationship among these variables. X is said to Granger cause of Y if and only if the forecast of Y is improved by using the past values of X together with the past values of Y (Granger, 1969).

Granger causality distinguishes between unidirectional and bi-directional causality. Unidirectional causality is said to exist from X to Y if X causes Y but Y does not causes X. In order to test for Granger causality, we will estimate a VAR model as follows where all variables are initially considered symmetrically and endogenously:

$$[LX_t] = \alpha + \beta_1 [LX_{t-1}] + \beta_2 [LX_{t-2}] + ... + \beta_n [LX_{t-n}] + [U_t];$$
$$X = [LGP \quad LPE \quad LPI \quad LFD \quad LRM]' \quad (8)$$

Where:

t = The time subscript
n = The number of lags for the VAR
α = The vector of constant
$\beta_1, \beta_2 ... \beta_n$ = All parameter matrices and the variables have their usual meaning

RESULTS AND DISCUSSION

Empirical study: For the empirical study we use the annual data of GDP, Product service of export and product service of import, FDI and Remittance of Maldives for the year 1980-2007. Annual data are collected from the World Economic Indicators and from the website of Strategic Asia. All data are in billion US dollars. Since all the variables are in the U.S. dollars, exchange rate has not been included in this study.

These data are transformed into natural logarithms to account for the expected non-linearities in the relationships and also to achieve stationarity in variance (Chang and Caudill, 2005). After taking log we define the Gross Domestic Product (GDP) as LGP, Foreign Direct Investment (FDI) as LFD, Remittance as LRM, Product Service of Export as LPE and Product Service of Import as LPI. The descriptive statistics for each of these variables are shown in Table 1.

The mean return of the LGP, LPE, LPI, LFD, LRM are -1.332, -1.396, -1.393, -6.051 and -6.250, respectively. The ranges of standard deviation of these series are from 0.388-1.977. Among these variables LRM showed the smallest and LFD showed the highest standard deviation. All of these data indicate that the series LGP, LPE, LPI, LFD and LRM are not normally distributed as their kurtosis is <3. Among these data LGP, LPE and LRM are negatively skewed and LPI and LFD are positively skewed. The graphical representations of these series are shown in Fig. 1.

From this figure we found that the series of Product Service of Export (LPE) showing upwards trend up to 2004 and again showing upwards after 2005. The series of Product service of Import (LPI) showing upwards trends after 1987. The LGP series also showing upwards trends but the series LFD and LRM does not showing clear trend. After graphical representation we have to test the stationarity of these series. For this purpose we used some popular test such as ADF, DF, PP and KPSS test statistics. These tests are done for both with and without

Table 1: Descriptive statistics for Maldives

Series	Mean	Median	Max.	Min.	SD	Skewness	Kurtosis	Jarque-Bera (JB) test (p-value)
LGP	-1.332	-1.259	0.0525	-3.015	0.9360	-0.2530	1.747	2.128 (0.344)
LPE	-1.396	-1.396	-0.3350	-2.733	0.8580	-0.2028	1.501	2.811 (0.245)
LPI	-1.393	-1.401	0.2070	-2.462	0.8421	0.2010	1.832	1.791 (0.408)
LFD	-6.051	-7.257	-1.9800	-9.028	1.9770	0.6670	2.140	2.934 (0.230)
LRM	-6.250	-6.214	-5.8090	-6.907	0.3880	-0.6810	2.338	2.607 (0.261)

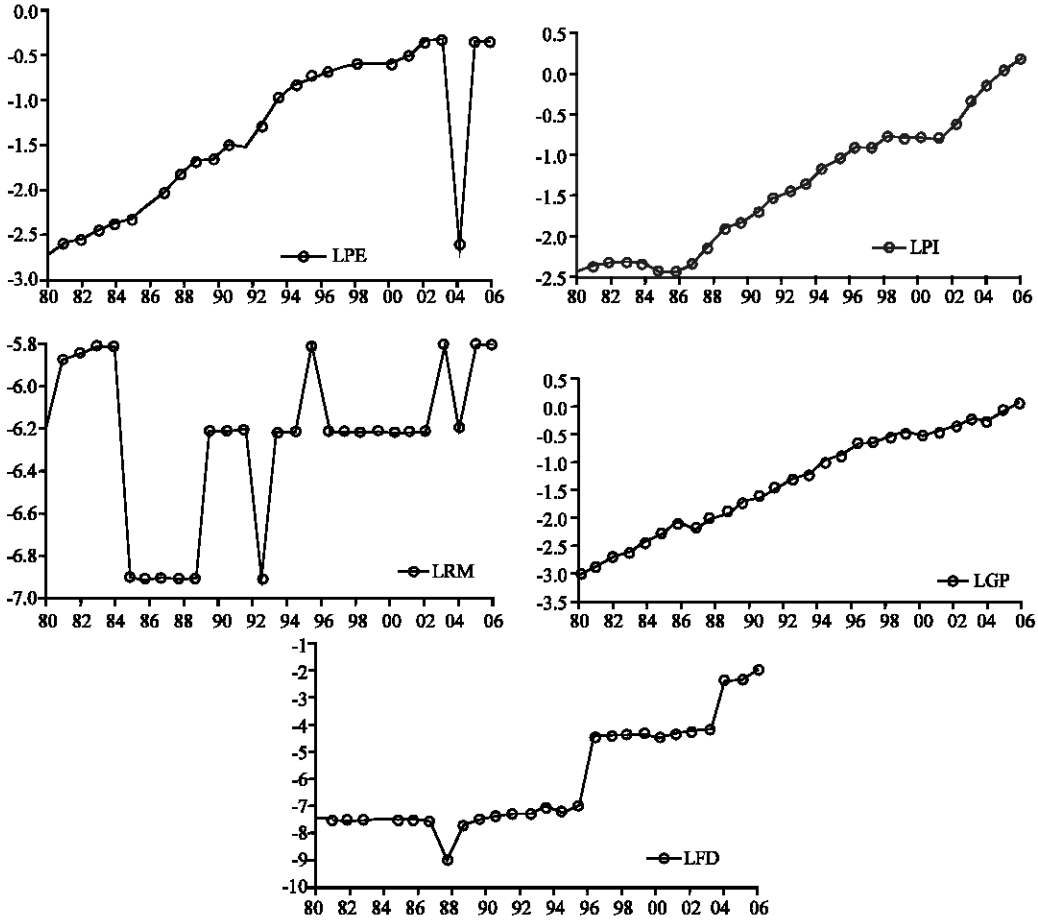

Fig. 1: The graphical representation of these series in case of Maldives

Table 2: Unit roots test for level

	ADF		DF		PP		KPSS	
Variables	Without trend	With trend	Without trend	With trend	Without trend	With trend	Without trend	With trend
LGP	-1.684 (-3.6990)	-1.506 (-4.339)	0.616 (-2.660)	-1.487 (-3.770)	-1.684 (-3.699)	-1.457 (-4.339)	0.670 (0.739)	0.149 (0.216)
LPE	-1.717 (-3.7240)	-1.506 (-4.339)	-0.859 (-2.660)	-4.386 (-3.770)	-1.932 (-3.699)	-4.219 (-4.339)	0.600 (0.739)	0.164 (0.216)
LPI	0.630 (-3.7110)	-3.135 (-4.356)	0.276 (-2.656)	-2.908 (-3.770)	1.168 (-3.699)	-1.919 (-4.339)	0.661 (0.739)	0.091 (0.216)
LFD	0.1554 (-3.699)	-2.046 (-4.339)	0.132 (-2.653)	-2.025 (-3.770)	0.558 (-3.699)	-1.936 (-4.339)	0.600 (0.739)	0.187 (0.216)
LRM	-2.542 (-3.6990)	-2.696 (-4.339)	-2.597 (-2.653)	-2.806 (-3.770)	-2.611 (-3.699)	-2.654 (-4.339)	0.204 (0.739)	0.117 (0.216)

Table 3: Unit roots test for first difference

	ADF		DF		PP		KPSS	
Variables	Without trend	With trend	Without trend	With trend	Without trend	With trend	Without trend	With trend
LGP	-5.256 (-3.711)	-5.605 (-4.356)	-5.109 (-2.656)	-5.826 (-3.770)	-5.253 (-3.711)	-5.605 (-4.356)	0.315 (0.739)	0.055 (0.216)
LPE	-5.790 (-3.724)	-6.338 (-4.374)	-5.845 (-2.660)	-6.219 (-3.770)	-21.101 (-3.711)	-23.178 (-4.356)	0.500 (0.739)	0.500 (0.216)
LPI	-2.560 (-3.711)	-2.869 (-4.356)	-2.709 (-2.656)	-2.976 (-3.770)	-2.587 (-3.711)	-2.914 (-4.356)	0.251 (0.739)	0.077 (0.216)
LFD	-5.648 (-3.711)	-5.967 (-4.356)	-5.732 (-2.656)	-6.213 (-3.770)	-5.678 (-3.711)	-6.993 (-4.356)	0.282 (0.739)	0.187 (0.216)
LRM	-6.559 (-3.711)	-6.596 (-4.356)	-6.148 (-2.656)	-6.579 (-3.770)	-6.559 (-3.711)	-6.668 (-4.356)	0.056 (0.739)	0.044 (0.216)

trend. The estimation results for Unit roots test statistics for level and first difference are shown in land at Table 2 and 3, respectively. From Table 2, we found that we cannot reject the null hypothesis of nonstationary which indicates that all of these variables are non stationary both at 1% and also 5% significance level for both trend and without trend. So we found all of these variables are non stationary for their level. But after taking all of these variables for first difference we found that we can reject null hypothesis which indicates that all of these variables are stationary at 5% significance level (Table 3). Now we applied Ordinary least square estimation to check either

Table 4: Ordinary least square estimation results

Explanatory variables	$\hat{\beta}_i$	$\hat{\sigma}_{\hat{\beta}_i}$	t-statistic	Sig. t
Constant	-1.907925	0.507308	-3.760883	0.0010
LPE	0.249251	0.062603	3.981477	0.0006
LPI	0.920027	0.120627	7.627051	0.0000
LFD	0.007089	0.039317	0.180313	0.8585
LRM	-0.359797	0.082608	-4.355462	0.0002
R^2	0.977	-	-	-
Log likelihood	1 5.884	-	-	-
D-W test statistic	1.210	-	-	-
F-statistics	251.83 (0.000)	-	-	-

Table 5: Johansen test for co-integration

		Maximum eigen value test				
		Without trend		With trend		
Null hypothesis	Alternative hypothesis	Test statistics	Critical value	Test statistics	Critical value	Conclusion
r = 0	r = 1	35.02249	33.87687	26.04759	37.16359	One co-integration
r≤1	r = 2	24.27750	27.58434	25.68718	30.81507	equation
Trace test						
r = 0	r = 1	91.44409	69.81889	83.44756	79.34145	One co-integration
r≤1	r = 2	46.42160	47.85613	51.39997	55.24578	equation

Table 6: VAR Granger causality tests

Dependent variables	Excluded	χ^2statistics	df	p-value
LGP	LPE	4.817322	2	0.0899
	LPI	1.451280	2	0.4840
	LFD	10.64067	2	0.0049
	LRM	1.191069	2	0.5513
	All values	15.81110	8	0.0452
LPE	LGP	0.375490	2	0.8288
	LPI	5.806174	2	0.0549
	LFD	4.922221	2	0.0853
	LRM	0.786869	2	0.6747
	All values	18.71959	8	0.0164
LPI	LGP	0.223229	2	0.8944
	LPE	0.669839	2	0.7154
	LFD	1.393091	2	0.4983
	LRM	1.423269	2	0.4908
	All values	8.696205	8	0.3686
LFD	LGP	2.259138	2	0.3232
	LPE	1.145429	2	0.5640
	LPI	0.915350	2	0.6328
	LRM	0.560627	2	0.7555
	All values	15.58268	8	0.0488
LRM	LGP	13.64466	2	0.0011
	LPE	5.268711	2	0.0718
	LPI	15.72753	2	0.0004
	LFD	0.760311	2	0.6838
	All values	20.94843	8	0.0073

these variables have significant effect of Maldives's GDP or not. The OLS estimation results are shown in Table 4. From this table we found that product service for Export (LPE) and product service of Import (LPI) have significant positive effect on GDP where as LFD has insignificant positive effect and LRM has negative effect on the GDP of Maldives. After checking the effect of these variables on the GDP of Maldives we use Johansen's procedure of multivariate cointegration which requires the existence of sufficient number of time lags. For this purpose we look into the standard criteria of lag length and found it to be one by using Akaike Information criteria. Critical values are taken from Osterwald-Lenum (1992). Both maximum eigen value test and Trace tests are conducted. The estimated results are shown in Table 5.

From this table we found that at the Maximum Eigen value test for with and without trend, estimated test statistics is not less than the critical value for r = 0. This means that the hypothesis of no cointegration is rejected. To find the number of cointegrating vectors we see that for r≤1, the estimated test statistics less than the critical vale which means that there is only one cointegrating vector. The cointegrating vector is as follows:

$$[\text{LGP} \quad \text{LPE} \quad \text{LPI} \quad \text{LFD} \quad \text{LRM}] =$$
$$[0.395 \quad -0.498 \quad -0.029 \quad 4.054 \quad -2.294]$$

Similar results are obtained from Trace test for both with and without trend. The existence of the cointegrating equations prompts us to confirm the long run equilibrium relation among the LGP, LPE, LPI, LFD and LRM. In order to examine the causal relationship among these variables we use VAR Granger Causality/Block Exogeneity Wald Tests. Under this system, an endogenous variable can be treated as exogenous. We used the χ^2 (Wald) statistics to test the joint significance of each of the other lagged endogenous variables in each equation of the model and also for joint significance of all other lagged endogenous variables in each equation of the model. The estimated results are shown in Table 6. From Table 6 we found that for LGP series the χ^2 test statistics in case of LPE and LFD are 4.817 and 10.640 with Degrees of Freedom (DF) 2, indicate the hypothesis that lagged coefficients of LPE and LFD in the regression equation of LGP are equal to zero.

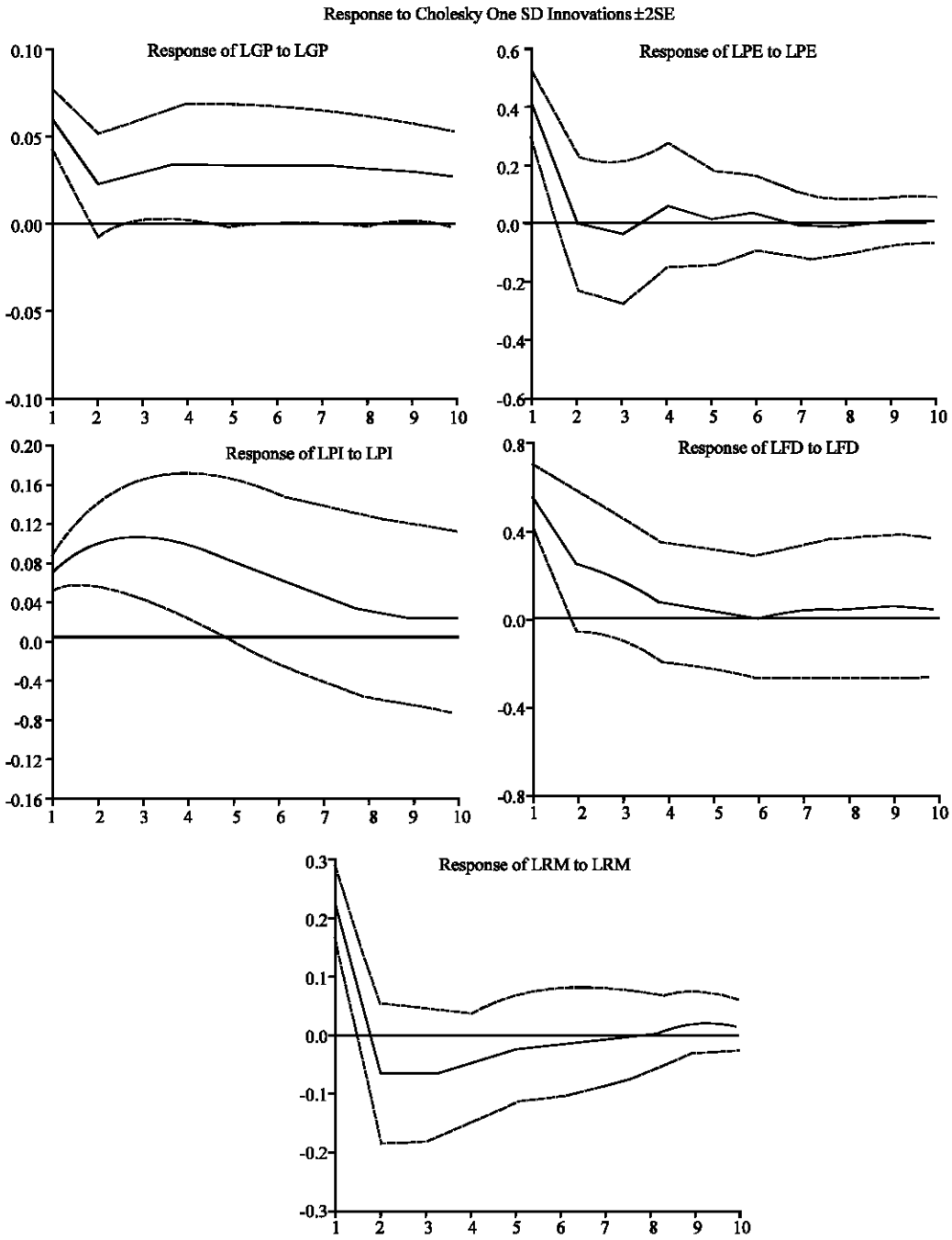

Fig. 2: Impulse response analysis for Maldives

Thus LPE and LFD are granger to LGP and also all the variables are granger to LGP at 0.045 significance level. Similarly the lagged co- efficient of LPI and LFD as well as block of all coefficient in the regression equation of LPE are equal to zero. Thus LPI and LFD are granger to LPE at 0.054 and 0.085 level of significance and all values are also granger cause to LPE and the other variables LGP and LRM do not influence LPE. For the LPI series none of the variables are granger cause to LPI. And for LFD series we found that all variable are granger cause to LFD together but they are not individually granger cause to LFD. Finally for the LRM series we found that the series LGP, LPE, LPI are granger cause to LRM and all values together granger to LRM and LFD does not influence

LRM. So we found only unidirectional causality of LPE, LFD to LGP and LPI, LFD to LPE and also LGP, LPE, LPI to LRM. Finally we also present the evidences from the impulse response analysis on the convergent and divergent influence of the Product service of Export, Product service of Import, FDI and remittance from their one time shock by ±2 standard deviation on GDP. These graphical representations are shown in Fig. 2.

CONCLUSION

In this study we examined the effect of international flow of capital and product services on GDP in the case of Maldives for the year 1980-2007. From theempirical study we found the existence of the long run equilibrium relationship among the GDP, Product Service of Export, Product Service of Import, Foreign Direct Investment and remittance.

To search for the nature of the relationship among these variables, we have implemented the Granger Causlity/Block Exogeneity Wald tests and we found the unidirectional causality from LPE and LFD to the LGP which indicates the Product Service of Export and Foreign Direct Investment are driving force to the GDP of Maldives where as product service of import and remittance are not influencing factors of the GDP of Maldives. So Maldives government should imposed more emphasis on exports and foreign investment depending on tourist sectors with policies to encourage people to exports and give more relax able condition for foreign investment.

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