The Role of Tourism, Real Exchange Rate and Economic Growth in Singapore: Are there Asymmetric Effects?

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Abstract

This paper examines the relationship between tourism development, real exchange rate and economic growth in Singapore for the period of 2005-2015 by using disaggregated data of eleven major tourist arrival countries, namely China, France, Germany, India, Indonesia, Japan, Malaysia, Philippines, Thailand, United Kingdom and USA. Previous literature focused the effects of exchange rate changes on tourism growth are symmetric. We are evaluating a new course of analysis which is on asymmetry and asymmetry cointegration. We find support for short-run asymmetric effects in majority of the cases and long-run significant asymmetric effects in five of the major tourist arrivals to Singapore.

1. Introduction

As a global tourism has grown rapidly, tourism sector is considered as an important contributor to stimulate economic growth in developing countries. In other words, tourism sector could be considered as an "engine" of economic growth by earning valuable foreign currencies, creating job opportunities and generating additional government revenues (Koch *et al.*, 1998; Oh, 2005; Gunduz and Hatemi-J., 2005; Kim *et al.,* 2006; Proença and Soukiazis, 2008; Lee and Chang, 2008; Chen and Song Zan, 2009; Hye and Khan, 2012; Hampton and Jeyacheya, 2015; Salleh *et al.*, 2015). Particularly, tourism sector in the small island developing states (SIDS) has played a dominant role in their economic growth process (Hampton and Jeyacheya, 2015). According to the World Development Indicators, there are eight countries in which more than one-fourth of national income was generated by the international tourism, namely Maldives, Macao, Palau, Seychelles, Vanuatu, St. Lucia, Bahamas, and Cape Verde (World Bank, 2017). All these countries are the SIDS which heavily relied on international tourism for their income generation.[3] More interestingly, as an alternative form of exports, tourism sector has also seen as a key element to diversify economic structure (Hampton and Jeyacheya, 2015). For example, Singapore's government has implemented an economic diversification strategy to set the manufacturing sector and service sector, including the tourism industry, as the "twin-pillar" of its economic growth (Meng, *et al.*, 2015). Under this strategy, tourism sector in the city-state has successfully attracted more than 15 million foreign tourists and it has generated around US$15 billion which accounted for five percent of the country's GDP (Singapore Tourism Board, 2016). Despite its economic and political important, the tourism-growth nexus was less explored topic.

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[3] The "tourism dependency rate (TDR)" could be used to measure a country's dependency on tourism sector in the economic growth process. The TDR could be calculated as the percentage of the international tourism receipts in the total value of the Gross Domestic Product (GDP). The TDRs in the heavily tourist dependent countries are as follows: Maldives (77.5%), Macao (70.5%), Palau (54.2%), Seychelles (33.5%), Vanuatu (34.2%), St. Lucia (27.7%), Bahamas (27.0%) and Cape Verde (25.1%) in 2015 (World Bank, 2017).

In other words, researchers could not produce consistent findings to prove the positive and beneficial relationship between tourism development and economic growth (Gunduz and Hatemi-J., 2005; Katircioglu, 2009; Chen and Song Zan, 2009; Lean and Tang, 2010; Tang and Tan, 2013; Antonakakis *et al.*, 2015). The summary of major empirical findings on the tourism-growth nexus issaid in Appendix 1.

Appendix I

Table 1: Summary of empirical findings on export-growth nexus

no	Author/Year	Countries	Variables	Data	Methods	Findings
1	Balaguer and Cantavella-Jordá (2002)	Spain	1.real tourism receipts 2.real economic growth 3.real exchange rate	quarterly data 1975Q1-1997Q1 from Bank of Spain	1.ADF test/PP test 2.Johansen test 3.Granger test	1.time series on tourism and economic growth are unit root process. 2.cointegrating relationship between tourism and economic growth 3.unidirectional causality from tourism to economic growth
2	Dritsakis (2004)	Greece	1.real tourism receipts 2.real economic growth 3.real exchange rate	quarterly data 1960Q1-2000Q4 from OECD/IMF/Bank of Greece	1.ADF test/PP test 2.Johansen test 3.Granger test	1.time series on tourism and economic growth are unit root process. 2.cointegrating relationship between tourism and economic growth 3.bidirectional causality between tourism and economic growth
3	Oh (2005)	South Korea	1.real tourism receipts 2.real economic growth	quarterly data 1975Q1-2001Q1 from Korean National Tourism Organization	1.ADF test/PP test 2.EngleGranger test 3.Granger test	1.time series on tourism and economic growth are unit root process. 2.no cointegrating relationship 3.unidirectional causality from economic growth to tourism
4	Gunduz and Hatemi-J (2005)	Turkey	1.tourist arrival 2.real economic growth 3.real exchange rate	annual data 1963-2002 from IMF/State Planning Organization, Turkey	1.KPSS test 2.leveraged bootstrap causality test	1. time series on tourism and economic growth are unit root process at first difference 2. unidirectional causality from economic growth to tourism
5	Kim *et al.* (2006)	Taiwan	1. tourist arrival 2. economic growth	quarterly data 1971Q1-2003Q2 from Taiwan Economic Journal/Taiwan Tourism Bureau	1.ADF test/PP test 2.Johansen test 3.Granger test	1.time series on tourism and economic growth are stationary process at first difference 2.no cointegration 3.bidirectional causality between tourism and economic growth
6	Proença and Soukiazis (2008)	Greece Italy Portugal Spain	1. tourism receipts 2. real per capita income.	annual panel data 1990-2004 from OECD	1.fixed effects model 2.random effect model	1. significant relationship between tourism and economic growth
7	Lee and Chang (2008)	23 OEDD countries 32 non-OECD countries	1. tourist arrival 2. real tourism receipts real economic growth 3. real exchange rate	annual panel data 1990-2002 from World Bank	1.LLC test/IPS test 2.Pedroni test 3. Panel causality test	1.panel data on tourism and economic growth are stationary process at first difference 2.cointegrating relationship between tourism and economic development 3.unidirectional causality from tourism to economic growth in OECD countries 4. bidirectional causality between tourism and economic growth in non-OECD countries
8	Katircioglu (2009)	Turkey	1.tourist arrival 2.real economic growth 3.real exchange rate	annual data 1960-2006 from World Bank/Turkish Institute of Statistics	1.ADF test/PP test 2.bounds test/ Johansen test	1. time series on tourism and economic growth are unit root process at first difference 2. no cointegration
9	Chen and Song Zan (2009)	Taiwan South Korea	1.tourist arrival 2.real economic growth	quarterly data 1975Q1-2007Q1 from Taiwan Economic Journal/Taiwan	1.PP test/KPSS test/Zivot-Andrews test 2.Johansen test	1. time series on tourism and economic growth are stationary process at first difference 2. no cointegration

				Tourism Bureau/IMF/ Korean National Tourism Bureau	3.EGARCH-M test	3. unidirectional causality from tourism to economic growth in Taiwan bidirectional causality between tourism and economic growth in Korea
10	Lean and Tang (2010)	Malaysia	1.tourist arrival 2.real industrial production	monthly data 1989M1-2009M2 from IMF	1.TodaYamamoto test 2.rolling causality test	1. bidirectional causality from tourism to economic growth
11	Hye and Khan (2012)	Pakistan	1.real tourism receipt 2.real economic growth	annual data 1971-2008 from Federal Bureau of Statistics/ State Bank of Pakistan	1.NP test 2.Bounds test 3. rolling bounds test	1. cointegrating relationship between tourism and economic growth
12	Tang and Tan (2013)	Malaysia	1. tourist arrival 2. real industrial production	monthly data 1995M1-2009M2 from IMF	1.ADF test 2. Bayer-Hanck test 3.rolling causality test	1. unidirectional causality from tourism to economic growth
13	Salleh *et al.* (2015)	3 countries in Middle East	1.real tourist receipts 2.real economic growth	annual panel data 1981-2008 from World Bank/UNCTAD/IMF	1. panel unit root test 2. panel cointegration test	1. cointegrating relationship between tourism development and economic growth
14	Antonakakis *et al.* (2015)	10 countries in Europe	1. tourist arrival 2. industrial production	monthly data 1995M1-2012M12 from Eurostat	1. spillover index approach	1. instable relationship between tourism and economic growth
15	Perles-Ribes *et al.* (2017)	Spain	1.tourist arrival 2.real tourism receipts 3.real economic growth	annual data 1957-2014	1.linear unit root test 2.unit root test with structural break 3.bounds test 4.Toda-Yamamoto causality test	1.time series on tourism and economic growth is stationary process at first difference 2.no cointegration 3.bidirectional causality between tourism and economic growth

The findings in the table showed that researchers could not agree with the causal direction in the relationship between tourism development and economic growth. There is an ongoing debate whether tourism development would cause economic growth, or *vice versa*. Against such background, current paper aims to contribute to existing literature on the tourism-growth nexus by choosing Singapore as the case study[42]. More specifically, there are two major contributions in this study. First, as Appendix I showed, there is little systematically analysis on the relationship between tourism development and economic growth in Singapore. This study aims to fill this important research gap. Secondly and more importantly, the earlier studies do not pay due attention to the asymmetry effects in the tourism-growth nexus. This study incorporates the asymmetry effects in the estimation model. This paper consists of five sections. Following this introductory section, the second section will review briefly major empirical studies on the tourism-growth nexus. The third section would discuss about models and research methods. The fourth section reports empirical findings. The fifth section is conclusion. Data definition and sources are then cited in the Appendix II.

2. Literature Review

Numerous research efforts are devoted to examining the relationship between tourism development and economic growth. However, there were little empirical studies on the topic before the beginning of the 2000s (Papatheodorou, 1999; Balaguer and Cantavella-Jordá, 2002).

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[4]Singapore received about 15 million visitors in 2015 and majority of its tourist are from Asian countries (77%). From 2006-2015, the largest growth in tourist arrivals is from China, Malaysia, and Philippines with a growth of 8.2%, 7.1% and 6.4%, respectively. In 2015, the bulk of tourists spending are on port taxes, local transportation, business, medical, education, sightseeing, entertainment & gaming, and accommodation.

There are several pioneer empirical studies which examine the tourism-growth nexus in the first half of the 2000s (Balaguer and Cantavella-Jordá, 2002; Dritsakis, 2004; Oh, 2005; Gunduz and Hatemi-J, 2005). For example, Balaguer and Cantavella-Jordá (2002) examined the relationship between tourism development and economic growth in Spain for the period of 1975-1997 and they detected a unidirectional causality from tourism development to economic growth in Spain. Dritsakis (2004) analyzed the tourism-growth nexus in Greece for the period of 1960-2000 and claimed that there is bidirectional causality between tourism development and economic growth in Greece. Furthermore, Oh (2005) examined the relationship between tourism development and economic growth in South Korea for the period of 1975-2001 and claimed that there is unidirectional causality from economic growth to tourism development. Gunduz and Hatemi-J (2005) examined the tourism-growth nexus in Turkey for the period of 1963-2002 by using the leveraged bootstrap test and they detected the bidirectional causality from economic growth to tourism development in Turkey. There was an increasing number of empirical analyses on the tourism-growth nexus since the second half of the 2000s.

Researchers used some time-series or panel data techniques, such as the Granger causality test, random effects model, the Pedroni panel cointegration test, the bounds test approach for cointegration analysis and EGARCH-M test (Kim *et al.,* 2006; Proença and Soukiazis, 2008; Lee and Chang, 2008; Katircioglu, 2009; Chen and Song Zan, 2009). For example, Kim *et al.* (2006) examined the relationship between tourism development and economic growth in Taiwan for the period of 1971-2003 by using the Granger causality test. These researchers claimed that there was bidirectional causality between tourism development and economic growth in Taiwan. Proença and Soukiazis (2008) used some panel data methods, such as the fixed effects model and the random effects model, to examine the relationship between tourism development and economic growth in four European countries, namely Greece, Italy, Portugal and Spain, for the period of 1990-2004 and they pointed out that tourism industries in these countries has significantly contributed economic growth in these countries. Similarly, Lee and Chang (2008) analyzed the relationship between tourism development and economic growth in 23 OEDD countries and 32 non-OECD countries for the period of 1990-2012 by using some panel econometric test, such as panel unit root test, panel cointegration test and panel causality test. They pointed out that there was unidirectional causality from tourism development to economic growth in OECD countries and bidirectional causality between tourism development and economic growth in non-OECD countries. Furthermore, Katircioglu (2009) re-examined the tourism-growth nexus in Turkey for the period of 1960-2006 by using the bounds test approach. Researcher claimed that, contrary to findings from Gunduz and Hatemi-J, 2005, there was no cointegrating relationship between tourism development and economic growth in Turkey.

Chen and Song Zan (2009) used the EGARCH-M test to examine the tourism-growth nexus in Taiwan and South Korea for the period of 1975-2007. They pointed out that, in line with findings from Oh (2005) and Kim *et al.* (2006), there is no cointegrating relationship between tourism development and economic growth in Taiwan and South Korea. On the other hand, researchers also claimed that there is unidirectional causality from tourism development to economic growth in Taiwan and bidirectional causality between tourism development and economic growth in South Korea.

In the 2010s, the empirical study on the tourism-growth nexus remain as a popular research topic among the empirical economics specialists. Researchers used some advanced econometric techniques such as TodaYamamoto causality, the rolling causality test, the rolling cointegration test. Bayer-Hanck cointegration test, the spillover index approach (Lean and Tang, 2010; Hye and Khan, 2012; Tang and Tan, 2013; Salleh *et al.,* 2015; Antonakakis *et al.,* 2015). For example, Lean and Tang (2010) used the rolling causality test to examine stability of the causal relationship between tourism development and economic growth in Malaysia for the period of 1989-2009. Researchers pointed out that there was significant bidirectional causality between tourism development and economic growth and the causal relationship between tourism development and economic growth was stable. Hye and Khan (2012) used the rolling bounds test to examine the stability of long-run relationship between tourism development and economic growth in Pakistan for the period of 1971-2008. They claimed that there is a stable cointegrating relationship between tourism development and economic growth in the country. Tang and Tan (2013) used the Bayer-Hanck test cointegration test to examine the cointegrating relationship between tourism development and economic growth in Malaysia for the period of 1995-2009. They pointed out that there would be a long-run relationship and a stable causal relationship between tourism development and economic growth in Malaysia.

Salleh *et al.* (2015) used the panel data methods to examine the tourism-growth nexus in three countries in the Middle-East, namely Bahrain, Jordan, and Saudi Arabia, for the period of 1981-2008. They pointed out that there was a significant long-run relationship between tourism development and economic growth in these countries. Antonakakis *et al.* (2015) employed the spillover index approach to examine the tourism-growth nexus in ten European countries for the period of 1995-2012 and they pointed out that the relationship between tourism development and economic growth in these European countries are not stable. Perles-Ribes *et al.* (2017) used some advanced methods, such as unit root test with structural break, to examine the relationship between tourism development and economic growth in Spain for the period of 1957-2014. They pointed out that there was bidirectional causality between tourism development and economic growth in the country. However, they added that empirical findings are sensitive to the model specification and data transformation. Harvey, Furuoka and Munir investigates disaggregated data in the case of Malaysia. They used quarterly data 2000(I)-2012(IV) and employed the Autoregressive Distributive Lags (ARDL). Their results show that the countries of interest real income and exchange rate plays significant role in promoting Malaysia's economic growth

3. The models and Methods

Following similar approach to Katircioglu (2011) and Harvey, Furuoka and Munir (2017) our model is specified using the following log linear form as in equation (1):

$$LnIP_{SG,t} = \alpha + \beta lnIP_{j,t} + \lambda LnTou_{j,t} + \eta LnREX_{j,t} + \varepsilon_t \text{ (1)}$$

As specified in equation (1), IP_{SG} measures Singapore's realeconomic growth, IP_jTrading partner i's income, T$ou_j$is the tourist arrivals from country *j*, and REX_j is the real exchange rate. Since an increase in country's *j* income will promote Singapore's economic growth, we expect β to be positive. Similarly, in the case of *λ*, an increase in tourist arrivals will promote growth. In addition, devaluation or depreciation of real exchange rate will promote Singapore's economic growth. As such, we expect *η* to be positive. Equation (1) outlines the variables of long-run relationship among economic growth. To assess the impact in the short-run, we follow a modeling from Pesaran et al. (2001), error-correction model version of autoregressive distributed lag (ARDL), replaced equation (1) with equation (2).

$$\Delta Ln_{SG,t} = \alpha + \sum_{i=1}^{n} \rho_i \Delta LnIP_{SG,t-i} + \sum_{i=0}^{n} \gamma_i \Delta LnIP_{j,t-i} + \sum_{i=0}^{n} \vartheta_i \Delta LnTOU_{j,t-i} + \sum_{i=0}^{n} \phi_i \Delta LnREX_{j,t-i}$$
$$+ \sigma_1 LnIP_{SG,t-1} + \sigma_2 LnIP_{j,t-1} + \sigma_3 LnTOU_{j,t-1} + \sigma_4 LnREX_{j,t-1} + \gamma_t \qquad (2)$$

Our focus will be on REX in which the short-run effects are judged by the estimates ofϕ_j's and the long run effects by the estimate of σ_2 - σ_4 normalized on σ_1.[5]

ARDL
PART A
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLnS$_{PI}$												
ΔLnC$_{PI}$	0.46 (6.54)	0.19 (3.45)										
ΔLn Tou	0.03 (1.10)											
ΔLn REX	-0.50 (3.56)											

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[5] For details of normalization procedure see Bahmani-Oskooee and Tanku (2008).

Panel II: Long Run Estimates

Constant	5.44(9.69)
Ln C_{PI}	0.06(1.03)
Ln Tou	-0.01(0.41)
Ln REX	-0.52(3.99)

Panel III: Diagnostic Statistics

F	ECM_{t-1}	LM	RESET	CUSM	CUSM²	$\bar{R}^2$
10.97	-0.97(6.93)	1.64	2.37	S	S	0.74

NARDL
PART B
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S_{Pi}												
ΔLN C_{PI}	0.44(5.33)	0.20 (3.09)										
ΔLN T_{OU}	0.01(0.45)											
ΔPOS	-1.44(2.07)											
ΔNEG	-1.20(3.57)											

Panel II: Long Run Estimates

Constant	4.15(7.25)
Ln C_{PI}	0.09(0.89)
Ln TOU	0.01(0.44)
POS	-1.46(2.01)
NEG	-1.22(3.88)

Panel III: Diagnostic Statistics

F	ECM_{t-1}	LM	RESET	CUSM	CUSM²	$\bar{R}^2$	WALD – S	WALD – L
9.67	-0.8(6.84)	0.60	2.71	S	S	0.74	2.09[0.15]	0.22[0.64]

To confirm cointegration, Pesaran et al. (2001) recommended applying F-test using their calculated critical F-Values. Furthermore, the main benefit of using Pesaran et al. (2001) model is that there is no pre-testing for unit roots even though these variables are I (1), I (0), or combination of both. Moreover, these are common properties for macro variables. The long run effect of real depreciation from devaluation is estimated indirectly from ϕ_j is negative or not significant followed with σ_4 positive and significant. If the J-curve outcome is not observed, then Bahmani-Oskooee and Fariditavana (2015, 2016) and Bahmani-Oskooee et al. (2016) argue it may be that the exchange rates are symmetric.

They then adopt, and adjusted model proposed by Shin, Yu, and Greenwood-Nimmo (2014) to consider the asymmetry effects on exchange rates. The approach is to isolate the ΔLn REX into negative (Singapore dollar depreciation) and positive (Singapore dollar appreciation) values. As such, there will be two variables generated and define as POS and NEG.

These partial sum processes of positive and negative in ΔLn REX is specified as follows [6] :

$$POS = LnREX_t^+ = \sum_{j=1}^{t} \Delta LnREX_j^+ = \sum_{j=1}^{t} \max(\Delta LnREX_j, 0),$$

$$NEG = LnREX_t^- = \sum_{j=1}^{t} \Delta LnREX_j^- = \sum_{j=1}^{t} \min(\Delta LnREX_j, 0) \qquad (3)$$

As recommended by Shin et al. (2014), Ln REX in equation (2) will be replaced by POS and NEG to as follows:

$$\Delta Ln_{SG,t} = \alpha' + \sum_{i=1}^{n} e_i \Delta LnIP_{SG,t-i} + \sum_{i=0}^{n} f_i \Delta LnIP_{j,t-i} + \sum_{i=0}^{n} g_i \Delta LnTOU_{j,t-i} + \sum_{i=0}^{n} h_i \Delta POS_{j,t-i}$$

$$+ \sum_{i=0}^{n} M_i \Delta NEG_{j,t-i} + \omega_0 LnIP_{SG,t-1} + \omega_1 LnIP_{j,t-1} + \omega_2 LnTOU_{j,t-1} + \omega_3 LnREX_{j,t-1}$$

$$+ \omega_4 LnNEG_{j,t-i} + \gamma_t \qquad (4)$$

The introduction of POS and NEG into Equation (4) generates non-linearity. Shin et.al (2014) set up a similar process developed by Pesaran et al. (2001) to evaluate a non-linear ARDL model. The proposition to asymmetric effect of exchange rate will abide by the following outcome. Based on observation on (4), there is evidence of short-run adjustment asymmetry if ΔPOS and ΔNEG variable shows different lag orders. In addition, short run asymmetric effects will be found from the sign and size of h_k is dissimilar than the size of J_k at each lag k. This is applied using Wald test to conclude if $\sum \hat{h}_k \neq \sum \hat{J}_k$. In the long run, asymmetric is confirm if $-\dfrac{\hat{\omega}_3}{\hat{\omega}_1} \neq -\dfrac{\hat{\omega}_4}{\hat{\omega}_1}$; which needs Wald test as well.

4.The results

As defined, equations (2) and (4) are focused on China mainland, France, Germany, India, Indonesia, Japan, Malaysia, Philippines, South Korea, Thailand, USA, and UK. The empirical analysis will employ monthly data 2005-2015. Following earlier studies from Bahmani-Oskooee and Fariditavana (2015, 2016), and Bahmani-Oskooee et al. (2016), a maximum 12 lags levied and applied Akaike Information Criteria (AIC) to findthe best lags. The results are listed in Table 1-11.

Table 1[7]: Singapore-China Models

Table 2: Singapore-France Models
ARDL
PART A
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLnS_{PI}		-0.59 (3.19)	-0.46 (2.52)	-0.38 (2.22)	-0.38 (2.22)	-0.58 (3.72)	-0.51 (3.51)	-0.33 (2.40)	-0.42 (3.19)	-0.32 (2.56)	-0.16 (1.67)	
ΔLnF_{PI}	0.19 (1.04)	1.29 (4.24)	1.32 (4.89)	1.01 (4.44)	1.03 (4.61)	1.14 (5.21)	1.19 (5.54)	0.98 (4.51)	0.86 (3.91)	0.89 (4.19)	0.74 (3.68)	0.35 (2.04)
ΔLn Tou	-0.06 (0.74)	-0.04 (0.37)	0.11 (1.40)									
ΔLn REX	0.02 (0.16)											

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[6] Other studies applying partial sum approach and non-linear are Bussiere (2016), Pal and Mitra (2016) and Nusair (2016).
[7] Refer to notes at the end of Table 11.

Panel II: Long Run Estimates

Constant	22.58(1.19)
Ln F_{PI}	-3.64(1.16)
Ln Tou	-0.09(0.17)
Ln REX	0.09(0.17)

Panel III: Diagnostic Statistics

F	ECM_{t-1}	LM	RESET	CUSM	CUSM²	$\bar{R}^2$
7.49	-0.27 (1.49)	3.30	1.97	S	US	0.46

NARDL
PART B
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S_{Pi}		-0.12 (1.26)										
ΔLN F_{PI}	0.44 (2.35)	0.70 (2.76)	0.88 (3.56)	0.63 (2.67)	0.74 (3.21)	0.84 (3.87)	0.72 (3.18)	0.85 (3.62)	0.59 (2.52)	0.68 (2.99)	0.82 (3.69)	0.42 (2.36)
ΔLN TOU	0.02 (0.19)	-0.22 (1.50)	-0.03 (0.22)	-0.18 (1.24)	-0.17 (1.15)	-0.14 (1.00)	-0.36 (2.59)	-0.18 (1.48)	-0.18 (1.60)	-0.24 (2.73)		
ΔPOS	2.67 (1.92)											
ΔNEG	-0.04 (0.09)											

Panel II: Long Run Estimates

Constant	1.84(0.74)
Ln F_{PI}	-0.27(0.94)
Ln TOU	0.43(2.11)
POS	0.33(0.75)
NEG	1.84(0.74)

Panel III: Diagnostic Statistics

F	ECM_{t-1}	LM	RESET	CUSM	CUSM²	$\bar{R}^2$	WALD – S	WALD – L
7.62	-0.72(5.76)	1.24	0.76	S	US	0.47	0.63[0.43]	0.44[0.98]

Table 3: Singapore-Germany Models
ARDL
PART A
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLnS_{PI}		-0.79 (3.95)	-0.75 (3.69)	-0.58 (3.05)	-0.73 (4.09)	-0.66 (3.89)	-0.45 (2.86)	-0.56 (3.83)	-0.42 (3.19)	-0.21 (2.07)		
$\Delta Ln\ G_{PI}$	0.32 (2.55)	1.22 (6.03)	1.01 (4.75)	0.78 (3.78)	0.49 (2.33)	0.69 (3.09)	0.59 (2.66)	0.42 (2.06)	0.16 (0.84)	0.19 (1.21)	0.36 (3.11)	
ΔLn Tou	0.02 (0.42)	-0.12 (1.98)										
ΔLn REX	0.15 (0.96)											

Panel II: Long Run Estimates

Constant	89.45(0.22)
Ln G_{PI}	-17.26(0.21)
Ln Tou	-0.21(0.11)
Ln REX	3.68(0.26)

Panel III: Diagnostic Statistics

F	ECM_{t-1}	LM	RESET	CUSM	CUSM²	$\bar{R}^2$
5.29	-0.04(0.22)	0.33	4.13	S	US	0.49

NARDL
PART B
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
$\Delta Ln\ S_{Pi}$		-0.08 (0.47)	-0.02 (0.15)	0.18 (1.89)								
$\Delta LN\ G_{PI}$	0.48 (3.91)	0.59 (3.95)	0.52 (3.19)	0.43 (2.45)	0.18 (0.95)	0.45 (2.10)	0.41 (1.91)	0.36 (1.82)	-0.01 (0.03)	0.14 (0.99)	0.42 (0.72)	
ΔLN TOU	0.04 (0.72)	-0.16 (2.49)										
ΔPOS	0.82 (2.36)											
ΔNEG	0.38 (0.83)											

Panel II: Long Run Estimates

Constant	3.74(2.76)
Ln G_{PI}	0.02(0.10)
Ln TOU	0.05(0.54)
POS	1.17(3.15)
NEG	0.54(0.86)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$	WALD – S	WALD – L
4.96	-0.70(4.08)	0.01	2.75	S	US	0.81	5.28[0.02]	3.83[0.05]

Table 4: Singapore-India Models
ARDL
PART A
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S$_{PI}$		-0.28 (1.29)	-0.15 (0.75)	-0.11 (0.57)	-0.14 (0.84)	-0.20 (1.29)	-0.22 (1.50)	-0.37 (2.85)	-0.17 (1.74)			
ΔLn IN$_{PI}$	-0.27 (1.06)	-0.34 (1.04)	0.39 (1.23)	-0.58 (1.81)	-0.73 (2.38)	-0.59 (1.81)						
ΔLn Tou	0.23 (2.53)	0.52 (2.57)	0.49 (2..62)	0.40 (2.28)	0.45 (2.79)	0.34 (2.20)	0.34 (2.20)					
ΔLn REX	-0.29 (0.75)	-0.13 (0.36)	-0.67 (1.73)	-0.67 (1.73)	0.95 (2.46)	-0.02 (0.04)	-0.04 (0.10)	0.58 (1.49)	-0.43 (1.12)	-1.09 (2.80)		

Panel II: Long Run Estimates

Constant	-0.19(4.06)
Ln IN$_{PI}$	1.71(4.01)
Ln Tou	-0.42(0.85)
Ln REX	0.33(1.23)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$
5.68	-0.59 (2.72)	1.64	0.02	S	S	0.58

NARDL
PART B#
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S$_{Pi}$		-0.26 (2.66)	-0.25 (2.99)									
ΔLN IN$_{PI}$	0.51 (3.90)											
ΔLN TOU	0.09 (2.66)											
ΔPOS	-0.09 (0.32)											
ΔNEG	-0.22 (0.66)											

Panel II: Long Run Estimates

Constant	-2.21(1.41)
Ln IN$_{PI}$	1.04(3.67)
Ln TOU	0.19(2.56)
POS	-0.18(0.32)
NEG	-0.45(0.67)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$	WALD – S	WALD – L
3.42	-0.49(5.05)	1.34	3.49	S	US	0.35	1.24[0.27]	0.82[0.37]

Table 5: Singapore-Indonesia Models
ARDL
PART A #
Panel I: Short Run Estimates

Lags											
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLnS$_{PI}$											
ΔLnID$_{PI}$	-0.39(3.19)										
ΔLn Tou	0.19(4.53)	-0.22(3.41)	-0.26(4.56)	-0.17(3.53)							
ΔLn REX	-0.14(1.26)										

Panel II: Long Run Estimates

Constant	-1.96(1.35)
Ln ID$_{PI}$	0.04(0.29)
Ln Tou	0.67(10.03)
Ln REX	-0.21(1.27)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$
14.09	-0.66 (7.37)	11.41	3.23	S	US	0.35

NARDL
PART B
Panel I: Short Run Estimates

Lags											
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S$_{Pi}$											
ΔLN ID$_{PI}$	0.34(3.76)										
ΔLN TOU	0.16(4.02)	-0.15(2.43)	-0.17(3.16)	-0.10(2.57)							
ΔPOS	0.97(1.09)										
ΔNEG	-1.72(5.24)										

Panel II: Long Run Estimates

Constant	-1.72(2.61)
Ln ID$_{PI}$	0.38(3.74)
Ln TOU	0.35(5.28)
POS	-0.83(3.09)
NEG	-1.93(5.51)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$	WALD – S	WALD – L
17.91	0.89 (10.26)	16.15	2.29	S	US	0.33	0.31[0.58]	32.34[0.00]

Table 6: Singapore-Japan Models
ARDL
PART A
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S$_{PI}$		-0.78 (5.36)	-0.68(4.22)	-0.69 (4.26)	-0.69 (4.42)	-0.61 (4.04)	-0.49 (3.43)	-0.58 (4.41)	-0.39 (3.03)	-0.30 (2.54)	-0.10 (1.87)	
ΔLn J$_{PI}$	0.41 (2.27)	0.76 (3.72)	0.84 (4.28)	0.48 (2.44)	0.67 (3.54)	0.59 (2.98)	0.27 (1.43)	0.65 (3.52)	0.39 (2.14)	0.53 (2.87)	0.54 (2.72)	0.24 (1.31)
ΔLn Tou	0.11 (1.48)	0.30 (2.65)	0.16 (1.50)	0.17 (1.75)	0.21 (2.08)	0.12 (1.24)	0.06 (0.67)	0.16 (2.01)	0.09 (1.28)	0.15 (1.82)	0.25 (3.46)	
ΔLn REX	-0.34 (1.11)											

Panel II: Long Run Estimates

Constant	31.85(1.29)
Ln J$_{PI}$	-4.28(1.37)
Ln Tou	-1.14(0.85)
Ln REX	1.24(1.17)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$
7.78	-0.14 (1.39)	1.11	1.34	S	US	0.52

NARDL
PART B
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S$_{Pi}$		-0.63 (2.46)	-0.43 (1.72)	-0.33 (1.46)	-0.36 (1.69)	-0.42 (2.18)	-0.41 (2.45)	-0.55 (3.61)	-0.33 (2.38)	-0.16 (1.59)		
ΔLN J$_{PI}$	0.34 (1.64)	0.45 (1.24)	0.69 (2.23)	0.29 (1.04)	0.44 (1.85)	0.32 (1.36)	0.07 (0.30)	0.57 (2.83)	0.39 (1.80)	0.53 (2.39)	0.53 (2.51)	0.22 (1.16)
ΔLN TOU	0.13 (1.61)	0.31 (2.63)	0.18 (1.71)	0.24 (2.45)	0.29 (2.79)	0.22 (2.03)	0.11 (0.96)	0.19 (2.28)	0.14 (1.68)	0.16 (1.87)	0.23 (2.89)	
ΔPOS	-1.19 (0.94)	-2.00 (1.59)	-2.24 (1.83)	-0.46 (0.38)	2.91 (2.51)	1.56 (1.38)						
ΔNEG	-0.69 (0.50)	1.47 (1.04)	2.82 (2.03)	1.22 (0.85)	-2.57 (1.77)							

Panel II: Long Run Estimates

Constant	13.53(1.10)
Ln J$_{PI}$	-1.15(0.58)
Ln TOU	-0.34(0.82)
POS	1.08(0.81)
NEG	0.29(0.12)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$	WALD – S	WALD – L
6.25	-0.33(1.44)	1.03	1.95	S	US	0.55	0.32[0.57]	0.23[0.63]

Table 7: Singapore-Malaysia Models

ARDL

PART A

Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S$_{PI}$												
ΔLn MY$_{PI}$	0.63 (4.71)											
ΔLn Tou	0.19 (3.43)	-0.52 (4.89)	-0.61 (5.69)	-0.58 (5.17)	-0.37 (3.32)	-0.26 (2.53)	-0.09 (0.99)	0.12 (1.36)	0.18 (2.27)	0.29 (4.01)	0.26 (3.77)	0.18 (2.75)
ΔLn REX	0.65 (1.87)	0.89 (2.19)	0.83 (2,11)	1.11 (2.88)	1.32 (3.43)							

Panel II: Long Run Estimates

Constant	-5.23(4.84)
Ln MY$_{PI}$	0.61(4.82)
Ln Tou	0.65(7.58)
Ln REX	-0.43(1.90)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$
27.06	-1.04 (11.38)	17.80	1.42	S	US	0.51

NARDL

PART B

Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S$_{Pi}$												
ΔLN MY$_{PI}$	0.54 (2.65)	0.003 (0.01)	0.36 (1.43)	0.78 (3.16)	0.42 (2.01)							
ΔLN TOU	0.12 (1.77)	-0.55 (5.08)	-0.62 (5.54)	-0.60 (5.39)	-0.37 (3.30)	-0.21 (2.09)	-0.08 (0.77)	0.09 (1.01)	0.15 (1.71)	0.25 (3.07)	0.19 (2.41)	0.11 (1.57)
ΔPOS	1.89 (1.89)	2.07 (1.87)	1.02 (0.95)	3.73 (3.56)	4.24 (3.78)							
ΔNEG	-2.32 (0.86)	3.26 (1.29)	5.98 (2.35)									

Panel II: Long Run Estimates

Constant	-3.75(2.62)
Ln MY$_{PI}$	0.34(1.91)
Ln TOU	0.59(6.79)
POS	-1.03(1.76)
NEG	-1.61(1.79)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$	WALD – S	WALD – L
21.98	-1.03(10.21)	12.92	0.46	S	US	0.58	2.12[0.14]	0.005[0.44]

Table 8: Singapore-Philippines Models
ARDL
PART A
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S$_{PI}$		0.37 (3.67)	-0.27 (3.22)									
ΔLn P$_{PI}$	0.27 (2.22)	0.28 (1.94)	0.07 (0.50)	0.33 (2.47)	0.45 (3.38)	0.17 (1.29)	-0.02 (.20)	0.09 (0.79)	0.002 (0.02)	0.26 (2.48)	0.29 (2.65)	0.22 (1.96)
ΔLn Tou	0.25 (4.28)											
ΔLn REX	-0.14 (0.29)	-1.41 (2.72)	-0.05 (0.09)	-1.28 (2.50)								

Panel II: Long Run Estimates

Constant	-0.12(0.09)
Ln P$_{PI}$	0.14(0.64)
Ln Tou	0.61(6.05)
Ln REX	-0.70(1.69)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$
8.50	-0.55 (4.95)	1.83	3.33	S	S	0.84

NARDL
PART B
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S$_{Pi}$		-0.37 (3.79)	-0.32 (3.91)									
ΔLN P$_{PI}$	0.13(1.56)											
ΔLN TOU	0.16(3.89)											
ΔPOS	-0.96(1.74)											
ΔNEG	-1.70(2.38)											

Panel II: Long Run Estimates

Constant	-0.53(0.46)
Ln P_{PI}	0.28(1.63)
Ln TOU	0.34(3.44)
POS	-1.97(1.58)
NEG	-3.49(2.26)

Panel III: Diagnostic Statistics

F	ECM_{t-1}	LM	RESET	CUSM	CUSM²	$\bar{R}^2$	WALD – S	WALD – L
3.09	-0.08(1.41)	4.93	0.07	S	US	0.38	2.96[0.08]	2.53[0.11]

Table 9: Singapore-Thailand Models

ARDL
PART A
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S_{PI}	-0.19 (2.00)											
ΔLn T_{PI}	0.30 (1.31)											
ΔLn Tou	0.25 (4.89)	-0.14 (1.18)	-0.16 (1.52)	-0.07 (0.76)	-0.03 (0.43)	-0.01 (0.11)	-0.11 (1.31)	-0.12 (1.76)	0.01 (0.19)	0.65 (0.01)	-0.14 (2.97)	
ΔLn REX	-0.25 (0.91)											

Panel II: Long Run Estimates

Constant	-3.75(3.31)
Ln T_{PI}	0.56(1.29)
Ln Tou	0.69(3.49)
Ln REX	-0.47(0.09)

Panel III: Diagnostic Statistics

F	ECM_{t-1}	LM	RESET	CUSM	CUSM²	$\bar{R}^2$
5.59	-0.53 (4.54)	0.09	3.01	S	US	0.45

NARDL
PART B
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S_{Pi}	-0.14(1.17)	-0.05 (0.45)	0.21(2.45)									
ΔLN T_{PI}	0.24(0.80)											
ΔLN TOU	0.15(3.69)											
ΔPOS	-0.12(0.45)											
ΔNEG	-0.58(1.60)											

Panel II: Long Run Estimates

Constant	0.51(0.27)
Ln T$_{PI}$	0.35(0.81)
Ln TOU	0.22(3.26)
POS	-0.17(0.45)
NEG	-0.82(1.74)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$	WALD – S	WALD – L
4.69	0.70(5.58)	4.57	3.44S	S	US	0.45	0.04[0.84]	3.16[0.08]

Table 10: Singapore-United Kingdom Models

ARDL
PART A
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S$_{PI}$		-0.57 (5.91)	-0.46 (4.18)	-0.41 (3.57)	-0.56 (4.81)	-0.57 (5.07)	-0.36 (3.37)	-0.47 (4.47)	-0.41 (4.15)	-0.15 (1.81)		
ΔLn UK$_{PI}$	0.68 (3.72)	2.31 (5.55)	2.71 (6.48)	2.46 (6.11)	2.33 (6.26)	2.52 (6.68)	2.38 (6.37)	1.64 (5.40)	0.57 (2.63)			
ΔLn Tou	0.01 (0.18)											
ΔLn REX	0.36 (1.16)	-0.40 (1.22)	0.30 (0.91)	-0.65 (1.99)	-0.33 (1.00)	0.88 (2.65)						

Panel II: Long Run Estimates

Constant	21.03(2.89)
Ln UK$_{PI}$	01.71(1.30)
Ln Tou	-0.77(3.99)
Ln REX	0.29(0.75)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$
11.32	-0.38 (4.68)	3.09	0.11	S	US	0.58

NARDL
PART B
Panel I: Short Run Estimates

Lags												
	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S$_{Pi}$		-0.08 (0.49)	0.02 (0.13)	0.09 (0.72)	0.11 (0.91)	-0.15 (1.72)						
ΔLN UK$_{PI}$	0.58 (2.09)	0.22 (0.43)	1.13 (2.42)	1.58 (3.61)	1.39 (3.09)	1.56 (3.39)	1.30 (2.77)	0.56 (1.23)	-0.57 (1.40)	-0.66 (2.46)		
ΔLN TOU	0.16 (1.49)	-0.69 (3.05)	-0.51 (2.73)	-0.44 (2.57)	-0.32 (2.05)	-0.48 (3.32)	-0.21 (1.97)	-0.27 (2.77)				
ΔPOS	-0.69 (0.58)	-1.83 (1.47)	-0.06 (0.04)	-3.76 (3.11)	-3.94 (3.25)							
ΔNEG	2.83 (1.87)	-0.48 (0.31)	0.19 (0.13)	-0.48 (0.32)	2.43 (1.65)	3.90 (2.83)						

**Panel II: Long
Run Estimates**

Constant	-8.30(1.80)
Ln UK$_{PI}$	1.29(2.67)
Ln TOU	0.63(1.61)
POS	2.19(4.94)
NEG	1.39(2.57)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$	WALD – S	WALD – L
7.66	-0.88(4.60)	1.98	0.08	S	S	0.61	5.96[0.01]	13.26[0.00]

Table 11: Singapore-United States Models

**ARDL
PART A
PanelI: Short Run
Estimates**

LAGS

	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S$_{PI}$												
ΔLnUS$_{PI}$	-0.08 (0.13)	0.37 (0.66)	0.12 (0.21)	2.56 (4.03)	1.97 (3.52)	-1.18 (2.17)						
ΔLn Tou	0.43 (5.66)											
ΔLn REX	0.03 (0.14)											

Panel II: Long Run Estimates

Constant	-5.07(3.06)
Ln US$_{PI}$	0.08(0.19)
Ln Tou	0.87(5.18)
Ln REX	0.06(0.14)

**Panel III:
Diagnostic
Statistics**

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$
6.64	-0.49(7.07)	7.63	1.61	S	US	0.32

**NARDL
PART B
PanelI: Short   Run
Estimates**

LAGS

	0	1	2	3	4	5	6	7	8	9	10	11
ΔLn S$_{Pi}$												
ΔLN US$_{PI}$	0.16 (0.29)	1.97 (3.42)	1.23 (2.12)	1.30 (2.13)	1.38 (2.52)	0.45 (0.76)	0.49 (0.88)	0.01 (0.02)	-0.17 (0.32)	2.00 (3.82)		
ΔLN TOU	0.17 (2.12)											
ΔPOS	0.49 (1.37)											
ΔNEG	-0.52 (1.56)											

Panel II: Long Run Estimates

Constant	2.63(2.29)
Ln US$_{PI}$	-0.11(0.59)
Ln TOU	0.21(2.01)
POS	0.61(1.36)
NEG	-0.66(1.64)

Panel III: Diagnostic Statistics

F	ECM$_{t-1}$	LM	RESET	CUSM	CUSM²	$\bar{R}^2$	WALD – S	WALD – L
18.29	-0.79(9.24)	3.42	9.04	S	US	0.37	1.76[0.18]	71.72[0.00]

Notes
   a. PH-Philippines; Aus.- Australia; CHN-China; HKG-Hong Kong; INDO-Indonesia; JPN-Japan; KRA-South Korea; MY-Malaysia; SG-Singapore; U.S.- United States of America
   b. ^, * indicate significance at the 10% and 5% levels respectively.
   c. Numbers inside the parentheses next to coefficient estimates are absolute value of t-ratios.
   d. The upper bound critical value of the F-test for cointegration when there are three exogenous variables is 3.77 (4.35) at the 10% (5%) level of significance. These come from Pesaran *et al.* (2001, Table CI, Case III, p. 300).
   e. The critical value for significance of ECM$_{t-1}$ is -3.47 (-3.82) at the 10% (5%) level when k =3. The comparable figures when k = 4 are -3.67 and -4.03 at 10%(5%), respectively. These come from Banerjee *et al.* (1998, Table 1).
   f. LM is the Lagrange Multiplier statistic to test for autocorrelation. It is distributed as χ^2 with 12 degrees of freedom. The critical value is 18.55(21.03) at the 10% (5%) level.
   g. RESET is Ramsey's test for misspecification. It is distributed as χ^2 with one degree of freedom. The critical value is 3.84 at the 5% level and 2.70 at the 10% level. .
   h. Symbol, #, shows that dummy is significant during 1997 Asian financial crisis.
   i. Wald test are distributed as χ^2 with 1 degree of freedom i.e. critical value is 2.70(3.84) at 10% (5%) significant.

For linear results, the short-run estimates are reported in Part A: Panel I, the long-run estimates are reported in Panel II while Diagnostic statistics are reported in Panel C. Similarly, the non-linear results are detailed in Part B. A dummy variable is incorporated to account for the Global Financial crisis 2008[8]. Based on linear ARDL, all the countries have at least one significant coefficient and in most cases have both positive and negative coefficients at different lags. Moreover, *F*-test is conducted at the best lags (results are shown in Part A, Panel III) showing that all models supported cointegration. The significant of F statistic is further reinforced by an alternative test for cointegration. Under the alternative test, we use normalized long-run estimates and long-run specification (1) and generate the error term, called ECM. We then replace the linear combination of lagged level variables in (2) by ECM$_{t-1}$ and estimate this new specification after imposing the same optimum lags from panel A. A significantly negative coefficient obtained for *ECM$_{t-1}$* not only support cointegration but confirmed convergence toward long run equilibrium as well.

Focusing on real exchange rate, in the short run, depreciation of Singapore dollar improves Singapore's income with China, India, Malaysia, Philippines and U.K. Similarly, in the case of trading partners' income promote Singapore's growth except for Thailand. Moreover, in the case of tourist receipts, all countries are important in supporting growth except for China, France, and U.K. Do these short-run effects lead to long run effects? Focusing on Part A, panel II, there is no evidence depreciation of Singapore dollar promotes growth. Evidence shows, however, countries such as China, Malaysia and Philippines appreciation of dollar further attract growth. This may be due to the fact its geographic proximity of these nations as potential economic trading opportunity. Tourist receipts do play a role in the long run especially in the case of Indonesia, Malaysia, Philippines, Thailand, and USA.

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[8] Both model specifications show the linear and non-linear ARDL model countries affected from Global financial crises are Indonesia and Japan.

Indonesia, Malaysia Philippines, and Thailand are members of ASEAN which allows member nations to visit its member visa free for 2 weeks[9] promote growth especially for Singapore. Without the non-linear approach, our analysis will end here. Emphasizing on non-linear approach, for short run results refer to Part B, in most cases the nonlinear model ARDL either ΔPOS or ΔNEG carry at least one significant lagged coefficient estimate. Evidence of short-run adjustment asymmetry observed in the case of Japan, Malaysia, and UK since ΔPOS and ΔNEG variable shows different lag orders. Furthermore, to show short run asymmetry, Shin et al. (2014) encourage applying Wald-S statistics to verify whether the sum of short run estimates for ΔPOS are different from short run estimates for ΔNEG. Wald-S test reveals that U.K. is significant in the short run. Does this last into long run? Report from Walt test reveals UK is significant showing it last into long run. In addition to UK, Germany, Indonesia, Thailand, and USA are significant as well. The short-run effects last into the long run significant effects that are supported by both F test or by ECM_{t-1} upholding cointegration. As for the long-run effects of income variables, both Indonesia and UK support a significant coefficient in the nonlinear model than it does in the linear model. Similarly, in case of tourist receipts, India tourist's receipts play a significant role as well on the long run. As for diagnostics test, they indicate that residuals are autocorrelation free in all models and all models are correctly specified. In addition, coefficients seem to be stable in most instances.

5. Conclusion and Summary

There have been extensive of studies trying to explain the relationship between tourism and economic growth. Brida et al. (2014) concludes in general tourism-led growth hypothesis promote the economic growth. Our paper empirically investigates the validity of the tourism-led growth hypothesis in the case of Singapore by using the linear and non-linear approach of ARDL. In both models, the real exchange rate in short-run proof to be significant in most cases. In the case of linear model, it reveals that long run models do not affect Singapore economic growth. On the other hand, when we employed asymmetry analysis and utilized a nonlinear specification the U.K., Germany, Indonesia, Thailand, and U.S.A. do affect Singapore's economic growth. In addition, these results implied that with these partners long-run effects of Singapore dollar appreciation are different than dollar depreciation. Nevertheless, the findings are partners' specific. Some notable policy implications can be drawn from the current study's empirical findings. Thus, it was found that depreciation of Singapore dollar has significantly improved the country's income from trade with its several major trade partners in the short-run. However, these short-run benefits from the currency depreciation could not be directly translated into a long-run growth. This outcome could be due to Singapore's policy of adopting a managed float exchange rate regime. This may indicate that a managed float exchange rate regime is able to bring about some short-run benefits to the country. But this policy does not seem to result in the country's sustainable economic growth in the long-run. The question remains: if Singapore policymakers decide to abandon the composite exchange rate anchor system and eventually move the country toward a free float exchange rate regime, would a depreciation of Singapore dollar bring long-run benefits to the economy? At this stage, only simulation studies can satisfactorily deal with this hypothetical problem. More extensive research needs to be done in future to find answers to this interesting and pertinent question. Using actual economic data, should there be a policy change in Singapore's exchange rate regime, would allow drawing empirically-based conclusions.

Appendix II

Definition and Sources

Monthly data over the period 2005-2015 are used to carry out the empirical analysis. These data are from the following sources:

a. International Financial statistics (IFS)
b. Bank of Thailand
c. Annual Tourism Statistics, Singapore Tourism Board, https://www.stb.gov.sg/statistics-andmarket-insights/Pages/statistics-Annual-Tourism-Statistics.aspx
d. Eurostat,http://ec.europa.eu/eurostat

Due to unavailability of data on some variables, China mainland is 2011 January to 2015 December.

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[9]http://asean.org/

Variables

IP_{SG} = Measure of Singapore's income. It is proxied by Industrial Production Index. Data come from source a.

IP_i = Trading partner i's income. This is also proxied by Industrial Production Index. Data come from source a, b.

REX_i = The real bilateral exchange rate of the Singapore dollar against the currency of partner i. It is defined as $REX_i = (P_{SG}. NEX_i/ P_i)$ where NEX_i is the nominal exchange rate defined as number of units of partner i's currency per Singapore dollar, P_{SG} is the price level in Singapore. (measured by CPI) and P_i is the price level in country i (also measured by CPI). Thus, a decline in REX reflects a real depreciation of the Singapore dollar. All nominal exchange rates and price levels data come from source.

TOU_i = Tourist arrivals from country *i*. Data source from c.

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