

Fiscal Sustainability in Some ASEAN Countries: Evidence from a Panel Data Analysis

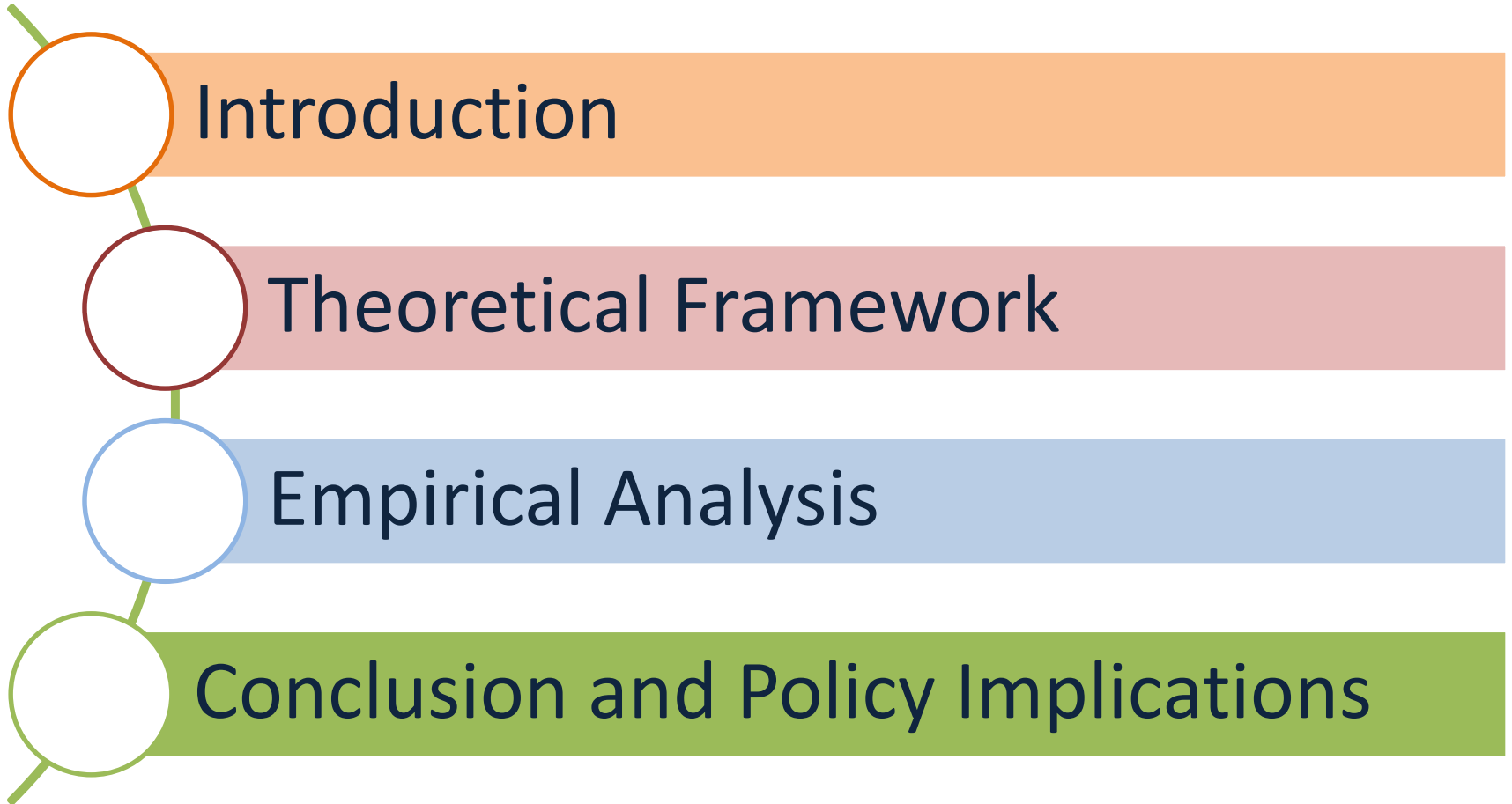
Nguyen Thi Thuy

Visiting Scholar

Policy Research Institute, Ministry of Finance, Japan

December 11, 2018

Outline



Introduction

Motivation

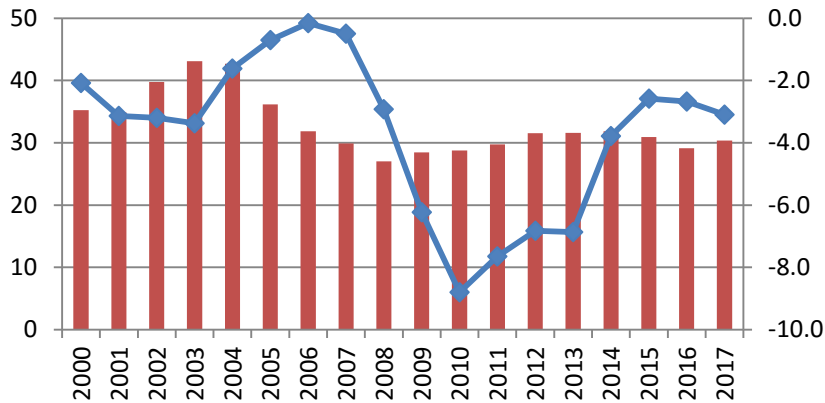
- Maintaining sustainable fiscal policy has been increasingly important in the scope of economists and policymakers.
- There has been substantial growth in the literature related to fiscal sustainability over the past few years, especially after the financial crisis 2007-2008.

ASEAN

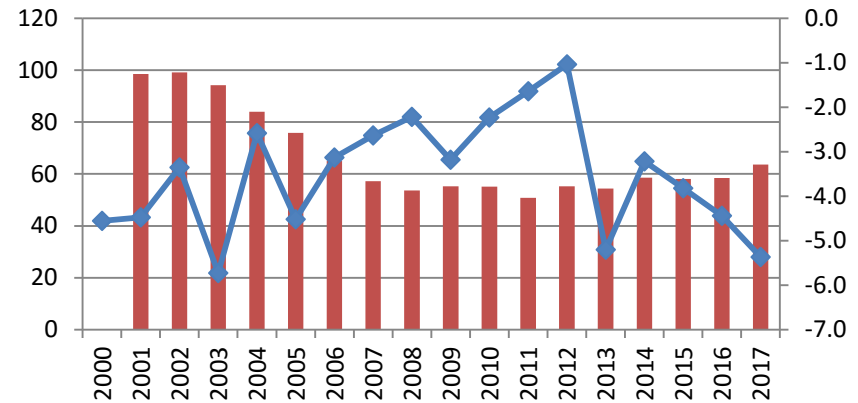
- Managing fiscal sustainability prospects is also among the key macroeconomic management issues in the ASEAN countries.
- A unique characteristic of the ASEAN economies most badly damaged by the Asian financial crisis of 1997-1998 was that fiscal policies and public debt levels had been relatively sound leading up to the crisis.
- High and persistent fiscal deficits in ASEAN countries have been a matter of concern for policymakers and researchers.
- This study **adds to the limited literature on fiscal sustainability in developing countries.**

Budget deficit and Gov. debt for selected countries (% GDP)

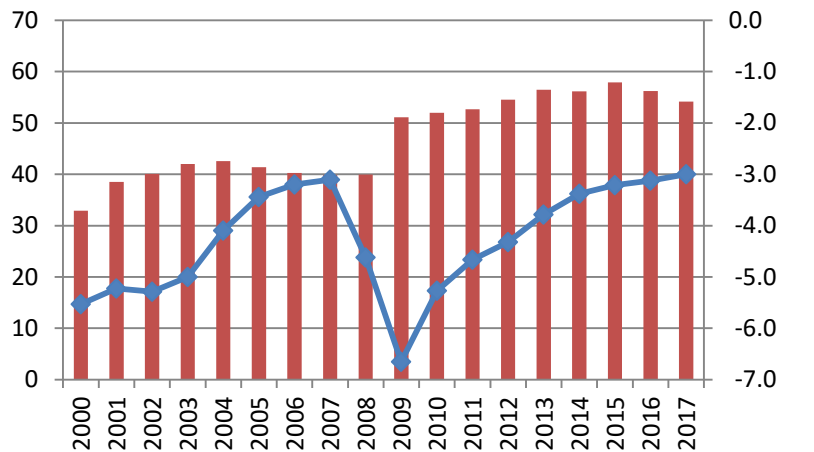
Cambodia



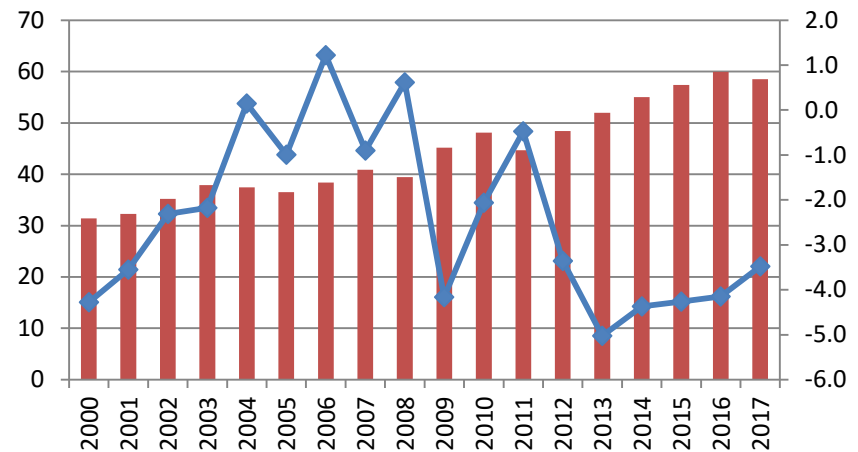
Lao



Malaysia



Vietnam



■ Government debt
◆ Budget deficit

Key objective

To examine the sustainability of fiscal policy in a set of eight ASEAN countries covering the period of 1989-2017 by applying stationarity and cointegration tests. Both the individual and panel approaches in testing sustainability are applied.

Theoretical Framework

The issues of fiscal sustainability

- Blanchard et al. (1990) define a sustainable fiscal policy as a policy such that **the debt-to-GNP ratio eventually converges back towards its initial level** after some excessive variation. In other words, for a fiscal policy to be sustainable, after having accumulated debt in the past, the government must run primary surpluses in the future.
- According to the IMF (2002), debt sustainability is defined as a situation in which a borrower is expected **to be able to continue servicing its debts without an unrealistically large future correction** to the balance of income and expenditure.
- Mendoza and Oviedo (2003) take fiscal sustainability to mean that **the present value of total government spending equals its revenues**.

The issues of fiscal sustainability

- Alvarado et al. (2004) define as fiscally sustainable a situation that satisfies the two following conditions: namely, (i) **a country can satisfy its budget constraint** and (ii) it does **not keep accumulating debt** while knowing that a major future adjustment will be needed in order to service its debt
- Gunter (2003) and Burnside (2003) who define sustainability to mean that a country can **meet its current and future debt service obligations in full without recourse to debt relief, rescheduling or accumulation of arrears.**
- Ko and Morita (2015) define that the government debt is sustainable in so far as **its debt hovers at some level.**

The intertemporal budget constraint

$$G_t + (1 + r_t)B_{t-1} = R_t + B_t$$

where G_t is the primary government

R_t is the government revenues

B_t is the government debt

r_t is the real interest rate

The intertemporal budget constraint

Assuming that the real interest rate is stationary, with mean r and defining

$$G'_t = G_t + (r_t - r)B_{t-1}$$

rewriting the equation for the subsequent periods of $t+1, t+2, t+3...$ and recursively solving that equation leads to the following intertemporal budget constraint:

$$B_t = \sum_{j=1}^{\infty} \frac{R_{t+j} - G'_{t+j}}{(1+r)^j} + \lim_{j \rightarrow \infty} \frac{B_{t+j}}{(1+r)^j}$$

Assessment of fiscal sustainability

Two complementary definitions of fiscal sustainability that set the background for empirical testing can be presented.

i. the value of public current debt must be equal to the sum of future primary surpluses

$$B_t = \sum_{j=1}^{\infty} \frac{1}{(1+r)^j} (R_{t+j} - G'_{t+j})$$

ii. the present value of public debt must approach zero in infinity:

$$\lim_{j \rightarrow \infty} \frac{B_{t+j}}{(1+r)^j} = 0$$

Assessment of fiscal sustainability

The additional definition $GG_t = G_t + r_t B_{t-1}$, the intertemporal budget constraint can also be written as

$$GG_t - R_t = \sum_{j=1}^{\infty} \frac{1}{(1+r)^{j-1}} (\Delta R_{t+j} - \Delta G'_{t+j}) + \lim_{j \rightarrow \infty} \frac{B_{t+j}}{(1+r)^{j+1}}$$

It is assumed that R and G' are stationary variables at the first difference level.

In order for the equation to hold, its left-hand side will also have to be stationary. If GG and R are integrated of order 1, these two variables should be cointegrated with cointegration vector $(1, -1)$ for the left-hand side of the equation to be stationary.

Assessment of fiscal sustainability

The sustainability of the intertemporal government budget constraint can be measured by the cointegration regression between government revenue and expenditure as **per** the following equation:

$$R_t = a + bGG_t + u_t$$

Assessment of fiscal sustainability

- **Hakkio and Rush (1991)** point out that if there is cointegration between government revenue and expenditure with $0 < b \leq 1$, then the condition that prevents a Ponzi game situation is satisfied. In this mode, the value of b is defined as the degree of sustainability. If $0 < b < 1$, we have 'weak' sustainability, meanwhile $b = 1$ presents 'strong' sustainability or sustainability in the strict sense.
- **Quintos (1995)** states that $0 < b \leq 1$ would be a necessary and sufficient condition for the fiscal sustainability, and the presence of a cointegration relationship between R_t and GG_t is also a sufficient condition for fiscal sustainability.

Literature review

- The empirical literature has followed two different approaches to test fiscal sustainability: (i) **testing stationarity** of the various fiscal variables and (ii) employing **cointegration techniques** and explores the existence of a long-run equilibrium relationship between government revenue and expenditure.
- Recent literature deals with the cross-sectional analysis of fiscal sustainability by applying panel data methods that have a number of advantages.
- Very few studies on fiscal sustainability apply panel stationarity and cointegration tests for developing Asian countries.

Literature review

Author and date	Country - Period	Data Frequency	Methods	Sustainability
Panel Data Studies				
Lau and Baharumshah (2005)	10 Asian countries (1970-2003)	Annual	Panel stationarity	Yes when applying commonly used panel unit root techniques
Adedeji and Thornton (2010)	5 Asia Countries (India, Pakistan, the Philippines, Sri Lanka and Thailand) 1974-2001	Annual	Panel cointegration	Yes (weak sustainability)
Syed et al. (2014)	10 Asian countries (1990-2010)	Annual	Panel cointegration	Yes for SAARC countries and No for IMT-GT countries
Sharstri, Giri and Mohapatra (2017)	05 major South Asian countries (1985-2014)	Annual	Panel cointegration	Yes (weak sustainability)

Empirical Analysis

Stylised Facts and Data Overview

- The sustainability of fiscal policy is evaluated for a sample of **eight ASEAN countries**, namely Cambodia, Indonesia, Lao, Malaysia, Myanmar, Philippines, Thailand and Vietnam.
- The research uses **annual data** drawn from the International Monetary Fund's World Economic Outlook Database. It is conducted using annual series covering the period **1989-2017** for each of the variables.
- The variables of **government debt, revenue and expenditure** are measured in terms of their ratio to nominal GDP.

Testing for individual stationarity

ADF Tests of Government Debt for Individual Countries

Deterministic	Intercept		Intercept and trend	
	t-stat	Prob.	t-stat	Prob.
Cambodia	-2.070037	0.2575	-2.806384	0.211
Indonesia	-2.292388	0.1856	-2.370906	0.3757
Lao	-2.427962	0.1501	-0.069009	0.9901
Malaysia	-2.802939*	0.0711	-3.989171**	0.0216
Myanmar	-2.335193	0.1745	-1.019114	0.9136
Philippines	-0.965896	0.7476	-1.898383	0.6228
Thailand	-4.132302***	0.0047	-5.943868***	0.0005
Vietnam	0.754756	0.989	-2.569192	0.296

Note: MacKinnon values for rejection of hypothesis of a unit root at 1% level (***), 5% level (**), and 10% level (*).

Testing for individual stationarity

ADF tests for First Differences of Gov. Debt for Individual Countries

Deterministic	Intercept		Intercept and trend	
	t-stat	Prob.	t-stat	Prob.
Cambodia	-3.107579*	0.0422	-3.023599	0.1504
Indonesia	-1.399198	0.5497	-4.273392**	0.0214
Lao	-0.900056	0.7565	-3.789246**	0.0476
Malaysia	-2.811682*	0.0704	-2.98946	0.1538
Myanmar	-4.466258***	0.0035	-5.173999***	0.0037
Philippines	-3.959587***	0.0063	-3.870347**	0.0307
Thailand	-5.812275***	0.0001	-5.007021***	0.0037
Vietnam	-4.399768***	0.0044	-4.533252***	0.0139

Note: MacKinnon values for rejection of hypothesis of a unit root at 1% level (*), 5% level (**), and 10% level (*).**

Panel stationarity tests

- A number of panel unit root tests advocated by
 - Levin, Lin and Chu (2002) (LLC)
 - Im, Pesaran and Shin (2003) (IPS)
 - Breitung (2000),
 - Maddala and Wu (1999) (ADF Fisher)
 - Choi (2001) (PP Fisher)
- To test the stationarity of the government debt, revenue and expenditure.

Panel Unit Root Test Result of the Fiscal Variables

	Level			First level difference		
	Public debt	Revenue	Expenditure	Public debt	Revenue	Expenditure
Intercept						
LLC	-1.62952** (0.0516)	0.51035 (0.6951)	-0.93293 (0.1754)	-3.22932*** (0.0006)	-1.21695 (0.1118)	-4.88557*** (0.0000)
IPS	-0.67103 (0.2511)	0.32519 (0.6275)	-1.21735 (0.1117)	-4.37279*** (0.0000)	-3.91902*** (0.0000)	-5.99765*** (0.0000)
MW-ADF- Fisher Chi- square	20.0159 (0.2195)	12.3304 (0.7209)	22.3212 (0.1331)	50.8125*** (0.0000)	45.0221*** (0.0001)	66.3477*** (0.0000)
Choi-PP- Fisher Chi square	47.0222*** (0.0001)	21.3305 (0.1662)	32.7895*** (0.0079)	87.2074*** (0.0000)	121.538*** (0.0000)	164.287*** (0.0000)

Note: *, **, * indicates rejection of the null hypothesis of a unit root at 10%, 5% and 1%, levels of significance. The p -values are in parenthesis.**

Panel Unit Root Test Result of the Fiscal Variables (const.)

	Level			First level difference		
	Public debt	Revenue	Expenditure	Public debt	Revenue	Expenditure
Intercept and Trend						
LLC	-2.00334** (0.0226)	0.62742 (0.7348)	-0.47479 (0.3175)	-2.54335*** (0.0055)	1.26634 (0.8973)	-3.67637*** (0.0001)
IPS	-0.48801 (0.3128)	0.17227 (0.5684)	-0.20073 (0.4205)	-3.79641*** (0.0001)	-1.90820** (0.0282)	-4.50181*** (0.0000)
MW-ADF-Fisher Chi square	18.1544 (0.3149)	13.3713 (0.6454)	15.2123 (0.5091)	42.3458*** (0.0004)	28.0336** (0.0313)	49.8148*** (0.0000)
Choi-PP-Fisher Chi square	46.5081*** (0.0001)	17.2856 (0.3674)	24.9326* (0.0710)	85.5765*** (0.0000)	97.7951*** (0.0000)	159.881*** (0.0000)
Breitung t -stat	1.17676 (0.8804)	-0.53740 (0.2955)	-0.65223 (0.2571)	-2.28164** (0.0113)	-2.88352*** (0.0020)	-4.25704*** (0.0000)

Panel stationarity test results

- The debt series were **difference-stationary**, which indicates that fiscal policy in the ASEAN countries was **weakly sustainable**.
- The government revenue and expenditure-to-GDP ratios have been found to be integrated of order 1 or $I(1)$.

Panel cointegration tests

- To test for existence of a long-run cointegration between government revenue and expenditure in the panel using Pedroni (1999 and 2004) and Kao (1999)

The hypothesized cointegrating equation:

$$R_{it} = a_i + b_i GG_{it} + u_{it}$$

(for $i = 1, 2, \dots, N$ and $t = 1, 2, \dots, T$)

Where a allows the cointegrating regression to include country-specific fixed effects

b is the long run coefficient

Panel cointegration tests using Pedroni (1999, 2004)

	Panel Statistic		Group Statistic
	Statistic	Weighted Statistic	Statistic
Deterministic Specification: Individual Intercept			
V-statistic	0.631852	0.672257	
Rho-statistic	-1.473633*	-1.420397*	-0.345906
PP-statistic	-2.034499**	-1.868591**	-1.526736*
ADF-statistic	-0.461455	-0.296649	0.123717
Deterministic Specification: Constant & Trend			
V-statistic	0.003391	-0.165520	
Rho-statistic	-0.586272	-0.768135	0.390816
PP-statistic	-2.110140**	-2.255461**	-1.990003**
ADF-statistic	-0.309480	-0.582810	-0.343685
Deterministic Specification: No Constant & Trend			
V-statistic	1.604687*	1.004218	
Rho-statistic	-3.778273***	-4.283910***	-1.510270*
PP-statistic	-3.483134***	-3.796752***	-3.451615***
ADF-statistic	-2.642071***	-3.211381***	-2.301851**

Panel cointegration tests using Kao (1999)

Kao (1999) Residual Cointegration Test

Ho: No cointegration

	t-Statistic
ADF	-2.707225*** (0.0034)

Estimation of cointegrating relationship

- The null hypothesis of no cointegration between the series is rejected, the coefficient of the long-run relation between government revenue and expenditure can be estimated.
- Strong coefficient b is unity. Weak solvency occurs when b is less than unity.
- Fully Modified Ordinary Least Square (FMOLS) and Dynamic Ordinary Least Squares (DOLS) are implemented.

Estimation of the cointegrating coefficient

Estimation Method	FMOLS		DOLS	
	Pooled	Grouped	Pooled	Grouped
Long-run coefficient	0.89716	0.883913	0.893314	0.88272
t-statistic	77.0236*** (0.0000)	95.73238*** (0.0000)	74.7861*** (0.0000)	86.20750*** (0.0000)
No. of observations	178	178	162	162
R-squared adjusted	0.780352	0.777873	0.845744	0.841067
b = 0	77.02360*** (0.0000)	95.73238*** (0.0000)	74.78610*** (0.0000)	86.20750*** (0.0000)
b = 1	-8.829104*** (0.0000)	-12.57282*** (0.0000)	-8.931473*** (0.0000)	-11.45376*** (0.0000)

Note: ***, ** and * indicate 1%, 5% and 10% level of significance respectively. The *p*-values are in parenthesis.

Estimation of cointegrating relationship

- The existence of a long-run cointegrating relationship between government revenue and expenditure that is statistically significant
- The average of the estimated slopes is 0.889, meaning that, on average, a 1% change in government expenditure leads to a 0.889 % change in government revenues for the considered group of eight ASEAN countries.
- Further Wald tests on the model reject both the null hypothesis of $b = 0$ and $b = 1$ at the conventional significant levels.
- The empirical tests show that two non-stationary variables, government revenue and expenditure, are cointegrated and fiscal policy can be judged **sustainable only in the weak form.**

Conclusion and Policy Implications

Conclusion

- This paper has closely **assessed the fiscal sustainability of public finance for eight ASEAN countries** including Cambodia, Indonesia, Lao, Malaysia, Myanmar, Philippines, Thailand and Vietnam by exploiting the data from 1989 to 2017.
- The econometric methods employed in the paper include both **time series and panel data techniques**.
- The evidences provide broad support for **a weakly sustainable fiscal policy** in line with the recent literature.

Policy Implications

1. Weak fiscal sustainability in the aforementioned countries reflects that government expenditures are systematically higher than government revenues.
2. ASEAN countries need to improve public debt management.
3. Regional policymakers should continue to give high priority to improving or adopting fiscal rules.
4. A need to rebuild fiscal space to deal with contingent liability shocks remains, arising from the worsening demographics in future.

Thank you for your attention

Q&A session