DIMENSIONS OF DEBT IN SELECTED ECONOMIES: ANALYSIS ON DETERMINANTS, THRESHOLDS AND EFFECTS ON ECONOMY

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DIMENSIONS OF DEBT IN SELECTED ECONOMIES: ANALYSIS ON DETERMINANTS, THRESHOLDS AND EFFECTS ON ECONOMY

ABSTRACT

This research examines three dimensions of public debt among a group of 12 upper-middle Asian countries, as well as country-specific analysis on China, Indonesia, Malaysia, Thailand and Turkey. An ARDL model was used to analyse the determinants of public debt, while Threshold Regression was applied to estimate the threshold level and understand the impact of breaching the threshold using panel data between 1980 and 2015. Firstly, the determinants of public debt indicate that GDP growth, capital stock, national saving, total trade, and inflation are factors that reduce the level of public debt. However, employment, government consumption, real interest rate and real exchange rate increase public debt levels. Crisis periods are also times when countries are exposed to public debt, but the results show such an effect only among country specific analyses. Secondly, public debt threshold (turning point) was estimated involving 12 upper middle-income economies from Asia. Results show that there is a non-linear relationship between public debt and economic growth in the long-run and this relationship exists in both U-shape and inverted U-shape (Ո). Public debt threshold is estimated at 96.9% for 12 upper middle-income economies. At country specific, the threshold present at 26.1% for China, 37.5% for Indonesia while Malaysia and Thailand at 54.0% and 23.0%, respectively. Nevertheless, such threshold did not exist for Turkey. The inverted U-shape nonlinear relationship found in overall sample as well as China and Malaysia indicating growth rate turn ‘negative' beyond threshold level. In Indonesia and Thailand, the U-shape relationship indicate above threshold level growth rate is higher. The glaring difference

in threshold level between pooled-sample and individual countries shows country specific estimation is much appropriate in setting threshold level. Thirdly, the effects of public debt threshold on macroeconomic variables shows capital stock and national saving are the channels of which negative impact transmitted on growth as public debt exceeds the threshold level. Employment rate, on the other hand, remain positive as public debt exceeding threshold, albeit at a slower pace. Nevertheless, for Indonesia and Thailand, the positive impact on GDP growth though breaching the threshold level is mainly attributed to government consumption.

Keywords: public debt, determinants, threshold

DIMENSI HUTANG DALAM EKONOMI TERPILIH: ANALISIS TERHADAP PENENTU, NILAI AMBANG DAN KESAN TERHADAP EKONOMI

ABSTRAK

Penyelidikan ini mengkaji tiga dimensi hutang awam di kalang 12 negara berpendapatan sederhana tinggi di Asia, serta analisis khusus bagi negara China, Indonesia, Malaysia, Thailand dan Turki. Model *ARDL* digunakan untuk menganalisis penentu hutang awam, sementara keadah *Threshold Regression* pula untuk menganggarkan nilai ambang dan impak kesan melangkaui nilai ambang tersebut menggunakan data panel antara tahun 1980 dan 2015. Pertama, penentu hutang awam menunjukkan bahawa pertumbuhan KDNK , stok modal, tabungan negara, jumlah perdagangan dan kadar inflasi adalah faktor yang mampun mengurangkan hutang awam. Walau bagaimanapun, kadar tenaga kerja, perbelanjaan kerajaan, kadar faedah benar dan kadar pertukaran benar meningkatkan tahap hutang awam. Tempoh krisis juga merupakan faktor di mana negara terdedah kepada peningkatan hutang awam, tetapi kajian menunjukkan kesan seperti itu hanya wujud bagi negara tertentu sahaja. Kedua, nilai ambang hutang awam (titik perubahan) dianggarkan melibatkan 12 ekonomi berpendapatan sederhana tinggi dari Asia. Hasil kajian menunjukkan bahawa terdapat hubungan bukan linear antara hutang awam dan pertumbuhan ekonomi dalam jangka panjang dan hubungan ini wujud dalam bentuk-U dan bentuk-Ո. Nilai ambang hutang awam dianggarkan 96.9% untuk 12 ekonomi berpendapatan sederhana tinggi. Bagi kajian ke atas negara tertentu, nilai ambang dianggarkan pada 26.1% untuk China, 37.5% untuk Indonesia sementara Malaysia dan Thailand masing-masing pada 54.0% dan 23.0%. Walaupun begitu, nilai ambang sedemikian tidak wujud di Turki. Hubungan bukan linear bentuk U-terbalik yang terdapat

pada keseluruhan sampel serta China dan Malaysia menunjukkan kadar pertumbuhan berubah menjadi 'negatif' apabila hutang awam melebihi nilai ambang. Di Indonesia dan Thailand, hubungan bentuk-U menunjukkan kadar pertumbuhan melebihi nilai ambang adalah lebih tinggi. Perbezaan yang ketara dalam tahap nilai ambang antara keseluruhan sampel berbanding bagi setiap negara menunjukkan anggaran spesifik bagi sesebuah negara lebih sesuai dalam menetapkan nilai ambang. Ketiga, kesan nilai ambang hutang awam terhadap pembolehubah makroekonomi menunjukkan bahawa stok modal dan tabungan negara adalah saluran yang memberi kesan negatif terhadap pertumbuhan apabila hutang awam melebihi nilai ambang. Sebaliknya, kadar tenaga kerja tetap positif bagi hutang awam melebihi nilai ambang, tetapi pada kadar yang lebih perlahan. Bagi Indonesia dan Thailand, impak positif terhadap pertumbuhan KDNK melebihi nilai ambang disokong terutamanya oleh perbelanjaan kerajaan.

Kata kunci: hutang awam, penentu, nilai ambang

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"It does not matter how slowly you go as long as you do not stop – Confucius"

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LIST OF SYMBOLS AND ABBREVIATIONS

AD	Aggregate demand
ADF	Augmented Dickey-Fuller test
ARDL	Auto-Regressive Distributed Lag
ASEAN+3	Association of Southeast Asian Nations + China, Japan and S. Korea
C	Consumption
CPF	Central Provident Fund Board
CPI	Consumer price index
ECT	Error correction term
EMDEs	Emerging market and developing economies
EU	European Union
G	Government expenditure
GDP	Gross domestic product
GFC	Global financial crises
GLS	Generalized least squares
GMM	Generalized method of moments
GNI	Gross national income
GNP	Gross national product
HIPCs	Highly indebted poor countries
I	Investment
ILO	International Labour Organization
IMF	International Monetary Fund
MGI	McKinsey Global Institute
mpc	Marginal propensity to consume
OECD	Organisation for Economic Co-operation and Development
OPEC	Organization of the Petroleum Exporting Countries
OLS	Ordinary least squares
p-value	probability
PMG	Pooled Mean Group

PP	Phillips-Perron test
R&R	Reinhart & Rogoff
SGMM	Simulated Generalized Method of Moments
T	Tax
T*	Threshold
TFP	Total factor productivity
UK	United Kingdom
US	United States
USD	US Dollar
VAR	Vector AutoRegression
VECM	Vector Error Correction Model
2SLS	Two-Stage least squares
Y	Output
d_t	Debt
εit	Disturbance
$I(0)$	Stationary series without a trend
$I(1)$	Series with a unit root
$\triangle y_t$	First difference
c_t	Capital stock,
D_t	Crisis period dummy
e_t	Employment rate
g_t	Government consumption
r_t	Real interest rate
rer_t	Real exchange rate
s_t	Gross national saving
tr_t	Total trade
π_t	Inflation

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CHAPTER ONE

Introduction

1.0 Background

Public debt[1] accumulation due to prolonged expansionary fiscal policies has attracted the attention of economists, policymakers and analysts for many years. The impact of these expansionary fiscal stances on economic performance is still a debateable topic in academia, especially on the high debt and economic growth nexus due to the intricate linkages between other macroeconomic aspects. The complexities surrounding public debt raise the doubts on whether debt level exceeding a certain threshold could drag growth. While the idea of precise "debt thresholds"[2] remains unclear, many studies generally conclude that high public debt levels have negative impact on growth (IMF, 2013).

High public debt makes public finances more vulnerable to future shocks, limiting the ability of governments in engaging countercyclical policies, increasing primary surplus to stabilise the debt ratio resulting from an adverse shock to growth (Abbas et. al, 2013). Indeed, there is a risk of snowballing effect from high public debt levels, such as increase in interest rates and economic slowdown. In addition, high indebtedness can be dangerous for various reasons. For example, government debt insolvency may lead to sovereign debt default or high inflation. Moreover, high debt levels negatively correlate with economic

[1] Public debt referring to total Central government debt as a percentage of GDP. Debt is the total stock of government's fixed-term contractual obligations to other outstanding. It includes both domestic and foreign liabilities such as currency and money deposits, securities other than shares, and loans. It is the gross amount of government liabilities minus the equity and financial derivatives held by the government. (World Bank, 2021).

[2] Public debt threshold refers to debt-to-GDP ratio of which, beyond the limit average growth rate become higher or lower.

growth and rising expenditure on debt payments limits productive spending (Gál & Babos, 2014).

The attention on rising public debt became greater in the aftermath of the 2008/09 Global Financial Crisis (GFC)[3], which caused widening government deficits that translated into skyrocketing debt accumulation in both developed and developing nations (Cecchetti et al., 2011). Empirical evidence show that deficits is crucial in reducing the severity and duration of a recession. Nevertheless, the government's capacity to provide such buffers depends on the soundness of its fiscal position prior to the crisis. Hence, this underscores the importance of having a strong fiscal space, accurately evaluating economic cycles and closely monitoring public debt limit (IMF, 2016). The impact of the crisis is expected to haunt many economies in the coming years. The serious consequences triggered by the crisis are still felt to date. As a result, the impact of the crisis will likely to cause substantial paradigm changes in economic policies in dealing with debt, especially as a tool to promote growth.

Prolonged deficits cause a significant upward trend in public debt, raising concerns of the constraints on government borrowing and the long-term consequences. The total global debt level has doubled since the 2008/09 global financial crisis, fuelled by massive government and corporate borrowings (Lund, 2018). Governments are obligated to pump in large sums of funds into financial systems by taking over a hefty debt of the banks and financial institutions in the form of large stimulus packages. This was done to jump-start

[3] The Global Financial Crisis (GFC) refers to the period of paramount stress in global financial markets and banking systems between mid-2007 and early 2009. During the GFC, collapse in the United States (US) housing market was a catalyst for the financial crisis that spread from the US to the rest of the world through linkages in the global financial system (Reserve Bank of Australia, 2020).

and resuscitate demand as well as cushion the impact of the economic crisis (Cecchetti et al., 2011). However, one main question which to date many scholars are still struggling to explain is if these debts have promoted growth as expected and described in the economic theories.

It is widely accepted that government borrowing utilised on productive expenditure and investment affects positively on economic growth (Barro, 1990). Productive expenditure refers to spending on public infrastructure such as building hospitals, schools and roads as well as social services including education and health. Such spending is anticipated to have a substantial influence on the long-term economic development (Glomm & Ravikumar, 1997; Mundle, 1999). In return, productive debt spending will stimulate a constant revenue stream to the government. Therefore, it enables the government to pay back the interest and principal debt amount from revenues generated by these projects' (Aybarç, 2019). The consequences of rising public debt, in particular, its sustainability, have moved to the centre stage of the policy debate. High debt level poses possible sovereign debt downgrades, whereby such a case happened in 2009, with the consequence being that global financial markets were in turmoil after a downgrade of Europe and the United States (US) with growing worries that the debt crisis in the Eurozone was spreading from the periphery to the core (Anand, 2012).

As such, if the Asian region wishes to continue to serve as an engine for global growth, its public debt must be sustainable. Developing Asian countries[4] have generally weathered a number of economic and financial crises reasonably well, particularly in 1985, 1997 and 2009 (ADB, 2009). The 1985/86 economic crisis, which triggered by high real interest rates in the United States (US), better known as the Volcker Shock, led to the collapse in world commodity trade. In 1997, the Asian Financial Crisis (AFC) was propagated through the currency channel, whereby stimulus packages totalling to USD120 billion were introduced, particularly in Thailand, Indonesia and South Korea (IMF, 2000), while Malaysia spent RM2 billion for the purpose (Lim & Goh, 2012). Likewise, a major factor supporting the recovery during the GFC was the timely rollout of appropriate fiscal and monetary stimulus packages. The Governments in the Asian region rolled out an enormous USD700 billion[5] worth of stimulus measures (Heng, 2009). As a result, increasing pressure on public debt management.

The macroeconomic fundamentals of this region appeared sound and robust, having severely reshaped after the 1997 AFC. Although strong fundamentals are able to shield the region from direct contagion of any crisis, nevertheless, Asia's strong export orientation made it highly vulnerable to external shock. Anderson et al. (2011) pointed out that over the years, many countries within the region had diversified their portfolio, reduced external debt level, stepped up debt management capacity and increased the maturity of debt, with these measures helping to maintain debt level to be sustainable.

[4] Afghanistan; Armenia; Azerbaijan; Bangladesh; Bhutan; Brunei; Cambodia; China, Fiji; Georgia; Hong Kong, India; Indonesia; Kazakhstan; Kiribati; South Korea; Kyrgyz; Laos; Maldives; Malaysia; Marshall Islands; Micronesia; Mongolia; Myanmar; Nauru; Nepal; Pakistan; Palau; Papua New Guinea; Philippines; Samoa; Singapore; Solomon Islands; Sri Lanka; Tajikistan; Taipei; Thailand; Timor-Leste; Tonga; Turkmenistan; Tuvalu; Uzbekistan; Vanuatu and Vietnam.

[5] The USD 700 billion of stimulus package in Asia (excluding Japan) accounted for China (USD586 billion, 12% of the GDP); South Korea (USD53 billion, 6.8% of the GDP); Malaysia (USD18 billion, 10% of the GDP); Singapore (USD14 billion, 8% of the GDP) and Indonesia (USD6 billion, 1.3% of the GDP).

However, this relatively sanguine environment does not necessarily translate into an optimistic outlook for the future of the region (Raghbendra & Tu, 2012). With many major economies such as the US, the United Kingdom (UK), Japan and Euro Zone facing huge debt burdens, the external demand from these economies may become weaker, which serves as the main engine of growth for many Asian economies. Furthermore, this region observes low interest rate and maintain an accommodative monetary policy, which has fuelled economic growth for years. Moving from a low interest rate to a higher rate and changing from an accommodative to a restraining monetary stance, would be difficult, particularly if public debt is large. Hence, these are important reasons to investigate the public debt dynamics in the Asia region.

In order to examine the public debt issues, particularly the debt and growth nexus, this research analyses a pooled sample of upper-middle income countries in the Asian region, namely Armenia, Azerbaijan, China, Georgia, Indonesia, Iran, Jordan, Kazakhstan, Lebanon, Malaysia, Thailand and Turkey. These twelve countries have been chosen based on the World Bank's Atlas Method, with gross national income (GNI) per capita (2015 base year) ranging from USD 4,036 to USD 12,475 between 1980 and 2015. Additionally, country-specific analysis was conducted focusing on China, Indonesia, Malaysia, Thailand and Turkey, as these countries have the largest gross domestic product (GDP) within the pooled sample. (A stylised fact on these six selected countries are provided in the next section). There is vast literature currently available on public debt analysis, many of these researches concentrate on developed economies such as the Eurozone, the US and Organisation for Economic Co-operation and Development (OECD) as these economies relatively have high debt level. There are also some researches that replicated threshold analysis emphasising on external debt, especially for heavily indebted poor

countries (HIPCs). As such, analysis on Asia, especially on upper-middle income Asian countries is still limited or unavailable.

Based on Figure 1.1, the connotation between average public debt and GDP growth rate for upper-middle income of Asian countries indicate that there is a negative relationship between these two variables. Breaking down the public debt and GDP growth on a specific interval reveals that between 1991 and 1996, the public debt averaged at 52.2% of GDP, while the economy grew by 2%. When public debt level is reduced to 47.1%, a higher growth rate was recorded at 6.4% between 1997 and 2008. Nevertheless, between 2009 and 2015, the GDP moderated at 4.1% when the public debt is reduced further to 41.7%, as depicted in Figure 1.2.

Although initially reduction in average public debt level enhanced GDP growth, further reduction in the debt level did not bring much improvement to the economy as the growth rate is becoming smaller. This is contrary to evidence in the literature claiming that lower public debt leads to higher growth rate. Therefore, this raises the question on the necessity to maintain low public debt level since in this case, as public debt level reduces further, growth rate becomes smaller. For that reason, it raises the question does this indicate the presence of any threshold effect in the sample?

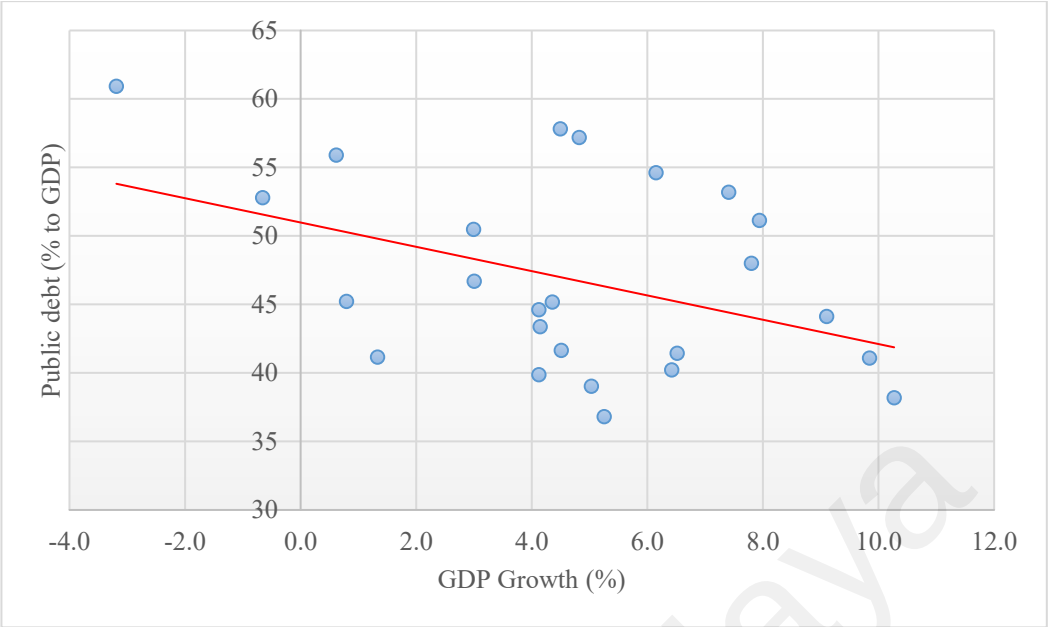


Figure 1.1: Average Public Debt and GDP Growth of Upper-Middle Income Asian Countries

Source: World Bank (2021)

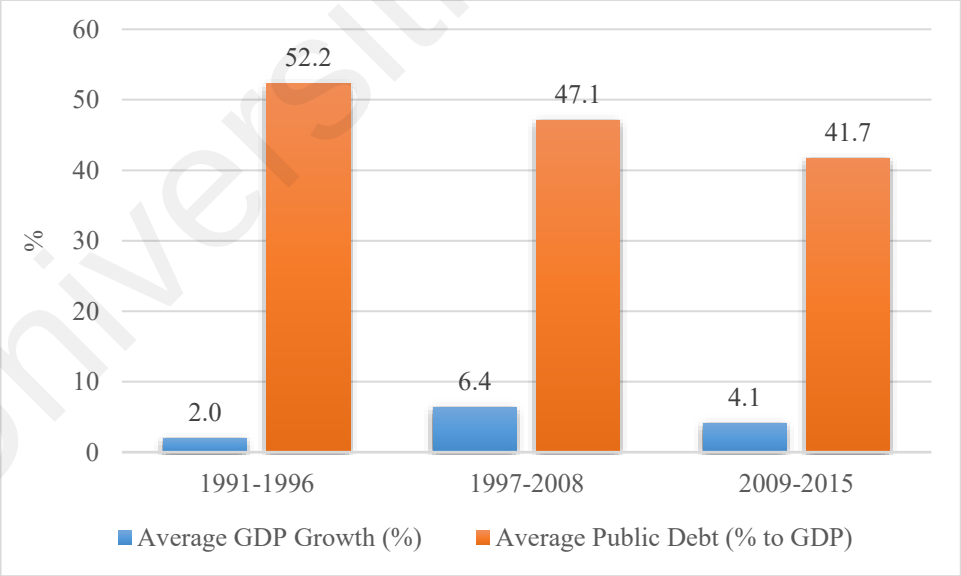


Figure 1.2: Average Public Debt and GDP Growth for Selected Period in Upper-Middle Income Asian Countries

Source: Author's calculation

1.1 Country Specific Stylised Fact

1.1.1 China

China made a remarkable rise from a poor nation to be an economic superpower in approximately four decades. From 1980 to 2015, China's GDP grew on average of 10% annually. China has experienced the fastest economic expansion by any major economy in history, lifting more than 800 million people out of poverty (World Bank, 2021). China's high growth established on resource-intensive manufacturing, trade and low-wage labour, however, these indirectly led to economic, social and environmental imbalances. Hence, reducing these inequalities entails reforms in the economy structure from low-end to higher-end manufacturing and services as well as from investment to consumption.

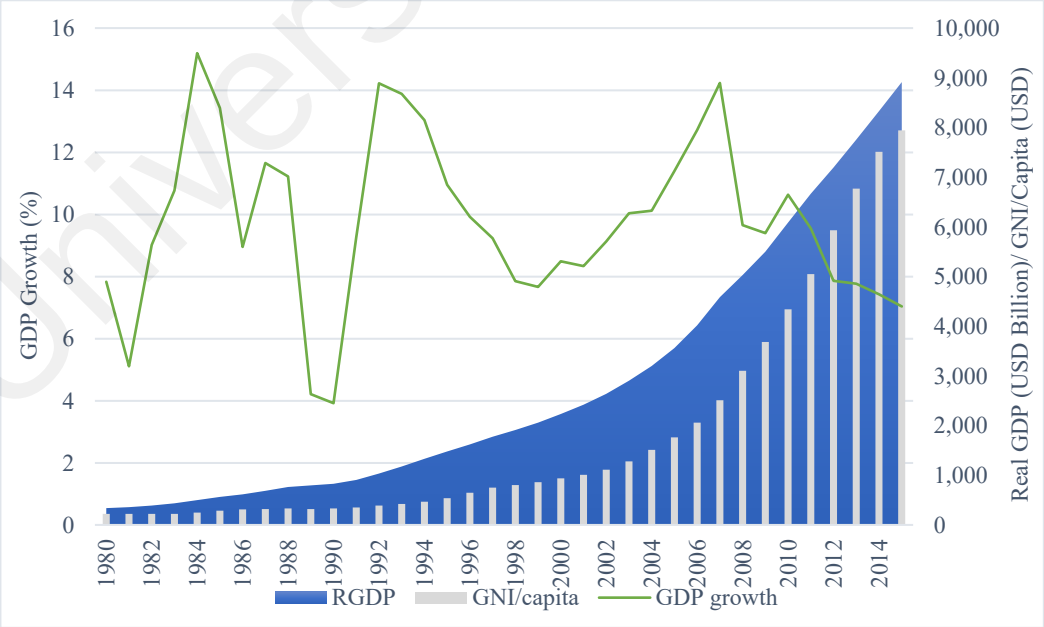


Figure 1.3: China - Real GDP, Real GDP Growth and GNI per Capita Trends

Source: World Bank, 2021

In retrospect, China's continuous economic boom after 1978 had multiple reasons and benefited from a serendipitous mixture of factors and historical eventualities. After establishing the People's Republic in 1949, China started its own industrialisation process in 1950s. China's growth can be divided into two periods of before and after 1978. China's growth between 1952 and 1978 mainly fuelled by capital accumulation, while post -1978 growth was driven by productivity. Since 1979, China has launched numerous economic reforms such as price and ownership incentives for farmers, which enables them to sell crops in free market. The government also established special economic regions aiming at attracting foreign investment, boosting exports and import high technology products (Whyte, 2021).

Table 1.1: China - 5-year Average Public Debt, GDP Growth & GNI/Capita

5-year Average	Public Debt (%)	GDP Growth (%)	GNI/Capita (USD)
1985	-	9.6	226
1990	-	9.9	314
1995	-	10.9	392
2000	21.1	9.1	720
2005	25.1	9.2	1,170
2010	28.4	11.5	2,622
2015	36.6	8.4	6,257

Source: World Bank & Author's calculation

Among other reforms by the Chinese government is decentralise economic policy making in several sectors, especially businesses where provincial and local governments were given economic control of various enterprises. This generally allowed operating and competing on free market principles. Furthermore, coastal regions and cities developed as development zones, which implements free-market reforms, provide tax and trade incentives for foreign investment. Trade liberalisation also another major factor behind China's economic growth, removing trade barriers encouraged greater competition and

encouraged FDI inflows. These gradual economic reforms produced favourable economic outcomes for China over the years (Zhu, 2012).

Economists generally attribute China's significant development on two main factors namely mega-scale capital investment supported by national savings and foreign investment as well as rapid productivity growth. In addition, economic reforms also led to higher efficiency in the economy, which boosted output and increases overall investment. China historically sustained high saving rate about 32% of GDP in 1979. Nevertheless, most of the savings generated by the profits of state-owned enterprises, which capitalised by the government for domestic investment. Economic reforms also resulted in substantial increase in household savings as well as corporate savings. As a result, currently China's saving rate stands about 50% of GDP, highest among major economies.

Although China banks on high saving and investment rate to sustain double-digit economic growth thus far, nevertheless, the public borrowings subject to debate. China's public debt level grown rapidly since 2009 while GDP growth has decelerated from historic double-digits to a more modest level of about 8.5% on average. As a result, China public debt ratio soared 41.1% in 2015. The country's debt problems begin in 2008 with the announcement of stimulus package worth USD586 billion as a response to GFC. Rather than being channelled through the government's budget, it mainly came from bank lending which were mostly state-owned enterprises and local governments (Wong, 2014). Hence, raising question on public debt accounting or calculation methods.

By 2010, the government scaled down on bank lending about a third, nevertheless, shadow banking or nonbank borrowing through other government institutions increased rapidly. In 2012, nonbank's credit accounted for 40% of new credit, more than double, comparing before the crisis. The bank-credit stimulus and shadow-banking boom caused China's total national debt rise to about 200%, higher than most developing countries. China's debt situation has gone through an intriguing development. Before opening up to the world, China practiced "self-reliance" policy with very tight restrictions on external front. Hence, China had almost no external debt. Before the GFC, specifically between 2004 and 2008, public debt and GDP growth harmonised with some fluctuations where growth was stable, similar pace as the debt increase, indicates debt had positive impact on economic activities. However, since 2008, China entered phase of debt explosion and slower growth, coupled with lower returns on investment, causing financial fragility (Li, 2017).

In 2015, China's total debt including both public and private debt stood at around 250% of GDP or USD30 trillion (NBS & BIS, 2017). However, China's external debt was around only 7%, outshined by its record high foreign exchange reserve as well as foreign assets. Additionally, China maintains a relatively wide current account surplus. As such, the debt position is not a problem for China. Nonetheless, the bulk of the debt is corporate debt and this sudden hike comes with certain risks. Non-financial sector by far the largest debtors, especially China's state-owned enterprises. The dangerous trend is the rapid debt accumulation that could cause systemic risks if not addressed swiftly. With debt servicing ratio recording about 20 percent of GDP, debt is expected to drag the economic growth. Although, China uses much of its borrowing on stimulating it economy, the growth rate has slowed down since the crisis. Based on recent development in China's debt level and

growth rate, this raises the doubt on nonlinear public debt and growth relationship and threshold effect.

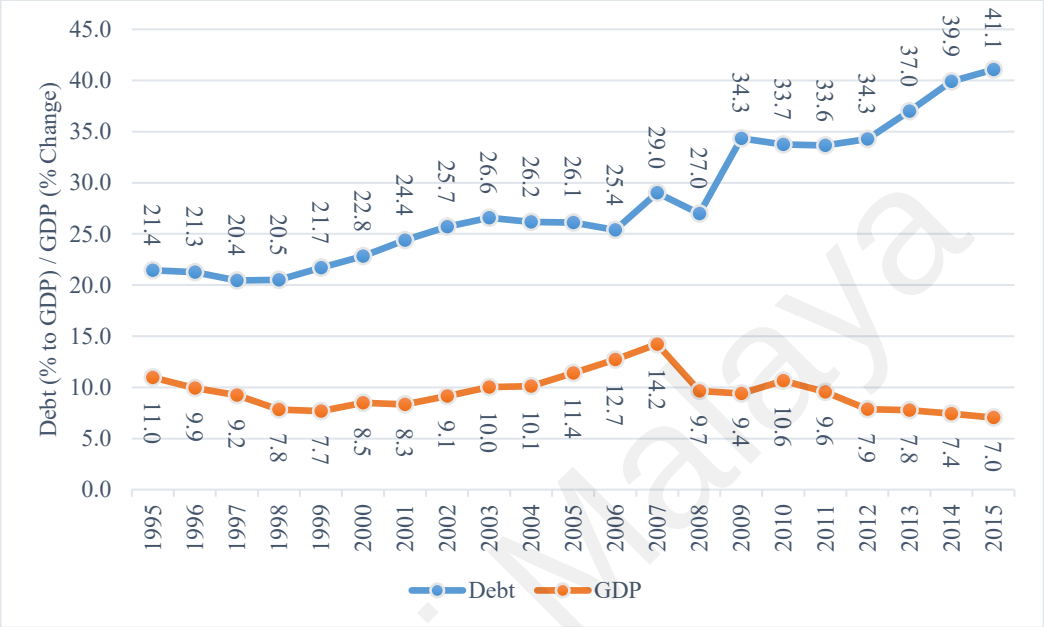


Figure 1.4: China - Public Debt and GDP Growth Trends

Source: World Bank, 2021

1.1.2 Indonesia

The Indonesian economy grown more than five folds within three decades reaching almost USD1 trillion in 2015. Before 1980s, Indonesia's economic growth was heavily relied on petroleum income and it was severely affected by oil price fall between 1982 and 1987, causing government revenue and overall growth become sluggish (Woo et al., 1994). As the global economy faces recession in 1985/86, the country's external sector took the hit in which both agricultural and non-oil export dwindled. Nevertheless, during this period Indonesia implemented several reforms to develop and diversify non-oil sectors, mainly in manufacturing and agriculture. These reforms known as 'economic deregulation', which were implemented through structural adjustment packages.

Indonesia significantly liberalised trade by simplifying export/import procedures, opening up export sector with greater freedom, providing export credit subsidy and tariffs reductions. Additionally, the rupiah devalued twice during the period as a move to enhance competitiveness. Since then, the Indonesian economy doubled in size (Sherlock, 1998). Nevertheless, rapid exchange rate depreciation in 1997 caused by domino effect among Southeast Asian countries such as Thailand, South Korea and Malaysia affected Indonesia as well. Exchange rate crisis coupled with political turmoil undermine foreign investor confidence in Indonesia, discouraging foreign capital inflow that was essential for restoring the rupiah value and reviving economy. The Indonesian rupiah initially was not affected by other regional currencies collapse and did not cause problems on hefty current account deficit and high foreign debt. The Bank Indonesia took the pre-emptive actions by floating rupiah in the range of 8% to 12%. Still, the rupiah was caught with the 'contagion' effect and fell more than 12%, forcing Bank Indonesia to allow currency to float freely (Rosenberger, 1997).

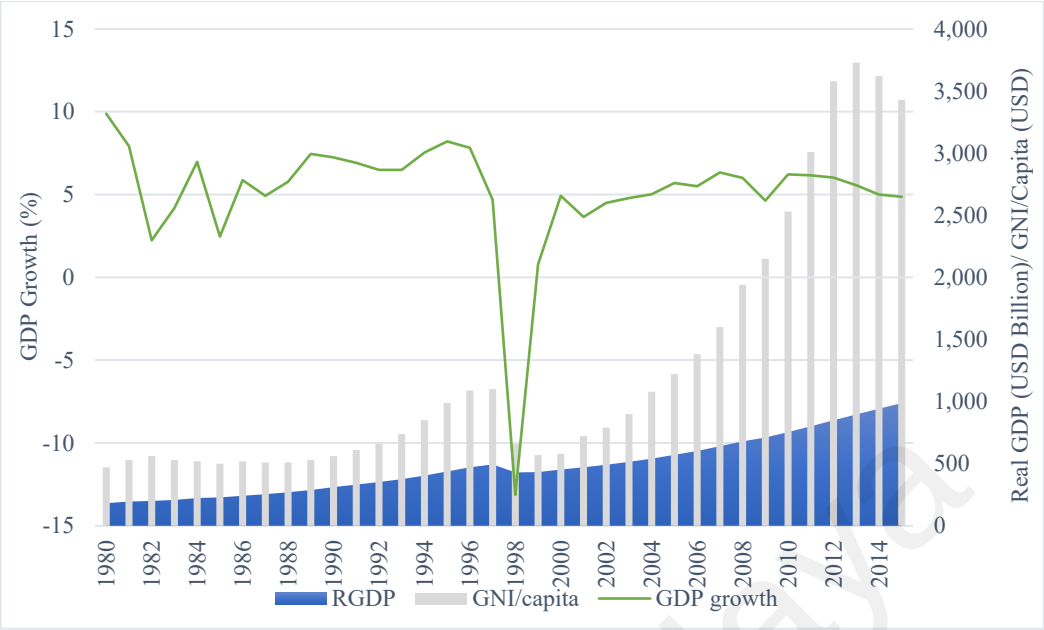


Figure 1.5: Indonesia - Real GDP, Real GDP Growth and GNI per Capita Trends

Source: World Bank, 2021

The rapid depreciation in rupiah exposed fundamental weakness in Indonesian's financial sector. Panic selling of rupiah led private foreign debt hike far higher than before. This made worse with Bank Indonesia unaware of the extent of debt exhibited its poor capacity to oversee and regulate the financial markets. As most of the external debt was short-term, the continuing fall in the rupiah, made debt service more costly and challenging for Indonesia. The impact on Indonesian banks was rapid and disastrous forcing the Government liquidate 16 private domestic banks. Low confidence in the banking sector was catastrophic nearly trigger 'bank run' and rupiah continued to fall beyond predictions accompanied by stock market nosedive (Thee, 2003). The IMF, World Bank as well as Asian Development Bank (ADB) stepped in to implement reforms as a measure to reinstate confidence in the financial sector. This includes numerous conditions intended to streamline the country's financial sector and deregulating economy, reducing

government expenditure, revolutionising trade and industry policy as well as improving transparency in business and government.

Indonesian economy started to improve gradually after the 1998 reforms. Between 2000 and 2006, the economy grew about 5% on average and almost 6% up to 2015. Indonesia is not a debt free country. Public debt played an important role in developing the economy since 1980s. Indonesia's public debt level rose from 45.7% in 1990 to reach the peak of 87.4% in 2000. Since then, the level has reduced tremendously to 26.9% in 2015. The AFC had a big impact on the Indonesia's government debt since it dominated by foreign currency. The debt snowballed due to the depreciation of rupiah. Indonesia conducted fiscal consolidation program since 2001 which helped to reduce the debt level. Currently, the government is diversifying both domestic and external debt structure (Handra & Kurniawan, 2020).

Table 1.2: Indonesia 5-year Average Public Debt, GDP Growth & GNI/Capita

5-year Average	Public Debt (%)	GDP Growth (%)	GNI/Capita (USD)
1985	-	6.2	522
1990	-	5.3	514
1995	40.6	6.9	684
2000	45.5	1.7	882
2005	66.1	4.6	814
2010	33.5	5.6	1,658
2015	24.5	5.6	3,317

Source: World Bank & Author's calculation

The debt diversification from external to domestic currency denominated helps to reduce depreciation currency risk, which leads to uncontrolled debt. In 2003, the Indonesian government officially passed the 2003 State Financial Law that capped the debt-to-GDP ratio below 60% and budget deficit ratio maximum 3% of GDP which follows euro area's

Maastricht Treaty.[6] Nonetheless, the government allows debt or budget deficit to be revised if exceeds the limits in unusual conditions (Pamungkas, 2016). This threshold is to serve as a guide for Indonesia's fiscal sustainability. Based on these developments, it is clear that Indonesia maintains relatively low public debt level currently. However, the 60% threshold set by the government could be an issue as this simply follows Maastricht Treaty and economic structure of these two economies very different and the threshold level serves different purposes. Therefore, Indonesia needs to set a threshold level that suits its economy structure.

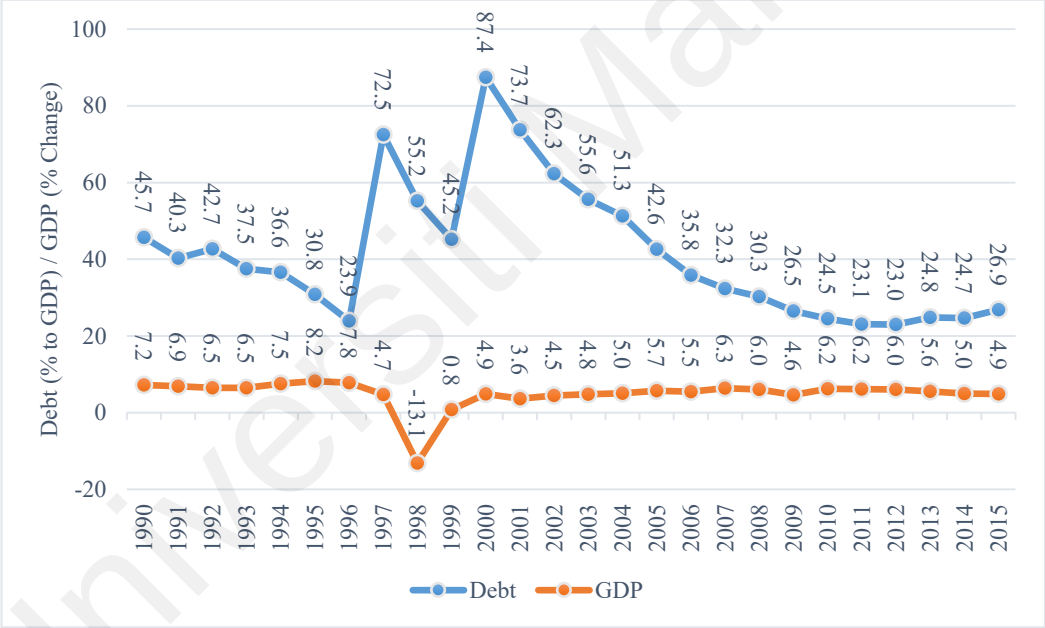


Figure 1.6: Indonesia - Public Debt and GDP Growth Trends

Source: World Bank, 2021

[6] Maastricht Treaty 1992 fiscal rules enshrined in the founding documents of European Monetary Union (EMU). The rule required its members, both existing and prospective, to maintain public debt below 60% and public deficits below 3% of GDP. The purpose of these rules, also referred as the convergence criteria, to ensure price stability is maintained in the euro area even when new member join the currency (ECB, 2020; Ilzetzki, 2021).

1.1.3 Malaysia

The economic structural changes since independence in 1957 has transformed Malaysia into a developing country backed by strong manufacturing and services sectors' performances. Malaysia's economic growth consistently follows global growth pattern indicates it's prone to impact from external sector and risk exposure due to highly-open economic environment despite having solid macroeconomic fundamental (Munoz-Moreno et al., 2016). Oil prices, foreign direct investment (FDI) and exports were identified as among the macroeconomic factors that affects country's performance significantly given the external sector exposure risk (Norasibah et al., 2009). As a result of highly opened economy, the country faces numerous economic crises in 1985, 1998 and 2009. Between 1980 to 1997, the Malaysian economy grew on average of 7.5% but slowed down to 4.5% from 1998 to 2015.

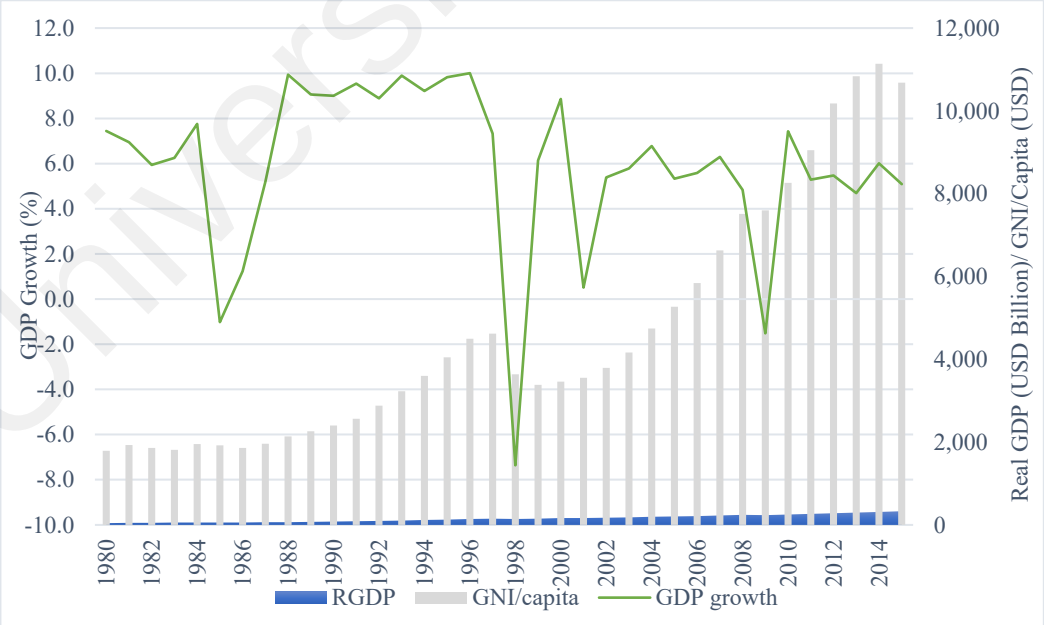


Figure 1.7: Malaysia - Real GDP, Real GDP Growth and GNI per Capita Trends

Source: World Bank, 2021

Malaysia's economic development anchored on several long-term policies namely New Economic Policy, National Development Policy and National Vision Policy. In 1990s, Malaysia became as a Newly Industrialised country where 30 percent of exports comprising manufactured goods. Currently, Malaysia is one of the largest semiconductors and electronic goods exporter. Malaysia visioned to become a high-income nation by 2020 as planned under the National Vision Policy. Although the original policy modified accordingly as time goes on, the vision itself seems challenging to achieve. There are several structural barriers in achieving sustained and inclusive growth, among others middle-income trap – struggling to move from resource-based and cheap-labour economy to a more value-added high-income economy. Nevertheless, Malaysia's per capita income has grown almost 500% from 1980 to 2015 reaching more than USD10,000. The remarkable expansion in per capita income is attributed to well-designed long-term economic policies.

Malaysia's economic growth comes at a cost where since the independent, the country recorded budget surplus only for five years between 1993 and 1997. Moreover, Malaysia is extremely sensitive to global economic shocks due to its highly opened economy and therefore, any shocks on its external front affect both economic growth and public debt level (Hussin & Chee, 2013). Public debt remains a concern of Malaysian government since debt-to-GDP ratio risen 12 percentage points to 54.5% after the GFC, approaching self-imposed ceiling of 55%.[7] Malaysia as among the fast-growing economy in the Southeast Asia region has experienced uphill tasks in managing the swelling debt level. The debt accumulation is unavoidable since it utilised for acquiring capital, cushion

[7] Malaysia has revised upward its public debt ceiling to 60% in 2020.

external economic shocks caused by financial crisis, currency fluctuation and oil price volatility.

Table 1.3: Malaysia 5-year Average Public Debt, GDP Growth & GNI/Capita

5-year Average	Public Debt (%)	GDP Growth (%)	GNI/Capita (USD)
1985	62.2	6.9	1,868
1990	93.9	4.9	2,028
1995	64.1	9.3	2,934
2000	36.4	5.2	4,038
2005	42.1	5.5	3,940
2010	42.7	4.1	6,570
2015	51.9	5.7	10,025

Source: World Bank & Author's calculation

The shift towards more private sector-driven growth contributed to apparent improvement in government's financial position. As fiscal position strengthened in the late 1980s, the government able to reduce its external debt, thus improving the country's debt profile. With the consolidation of government spending, public expenditure share declined to 21% in 1997, from a peak of 44% in 1980s. This move also improved the government's debt position substantially, reduced to 32% of GDP in 1997, from the peak at 103% in 1986. The external debt also declined to 4.6% in 1997. These prudent fiscal policies adopted by the government provide greater flexibility in implementing expansionary measures to support growth during crisis periods (Vijayaledchumy, 2003).

The 1997 AFC originated from Thailand caused by heavy currency speculation leading to slumps in Baht, spreading quickly throughout Southeast Asian countries and severely affect both banking and finance sectors in the region. As for Malaysia, ringgit depreciated from RM2.42 to RM4.88 against the US dollar. The fall in ringgit led to heavy foreign capital flight amplifying further impacts on banking and financial sectors. The IMF

recommended several fiscal and monetary austerity measures to counter the situation. However, Malaysian government refused it and implemented its own measures among which peg the US-Ringgit exchange rate at RM 3.80, foreign capital repatriation only allowed after at least twelve months and subject to substantial levies. Although the measures seems radical and unconventional by international institutions, nonetheless, it managed to stabilised the situation effectively and restoring growth compared to neighbouring countries (Drabble, 2014).

The governments around the world run wide budget deficits particularly during GFC accelerated the government debt growth and debt accumulation reaching critical levels. Malaysia's public debt issue became prominent due to public concern especially after the dramatic increase in public debt from AFC and GFC periods. Public debt level started to increase from lowest level of 31.9% in 1997 to highest point 45.7% in 2004 before improve slightly to 39.8% in 2008. Nevertheless, in 2009, public debt hike to 50.8% and marked at 54.5% in 2015, almost breaching self-imposed debt ceiling of 55%. The huge surge in government debt especially in recent years also attributed to achieving the Vision 2020 targets that envisioned making Malaysia as a developed and high-income nation by year 2020.

The high debt ratio in Malaysia mainly ascribed to the heavy industrial development program embarked in the early 1980s. These development programs in 1980s entirely financed through foreign borrowing. Bulk of foreign borrowing made from the Japanese government project loans and financial institutions loans. In recent days, Malaysia's external borrowing reduced significantly from 9% in 1980 to 2% of GDP in 2015.

Malaysian government focuses on domestic borrowing lately, which stands at 53% of GDP in 2015. As the public debt hike continuously, creditors become concerned about the government's ability to repay and over time, demand higher interest rate to provide a greater return for their increased perceived risk. As interest rates rise, it becomes more costly for the country to refinance its existing debt.

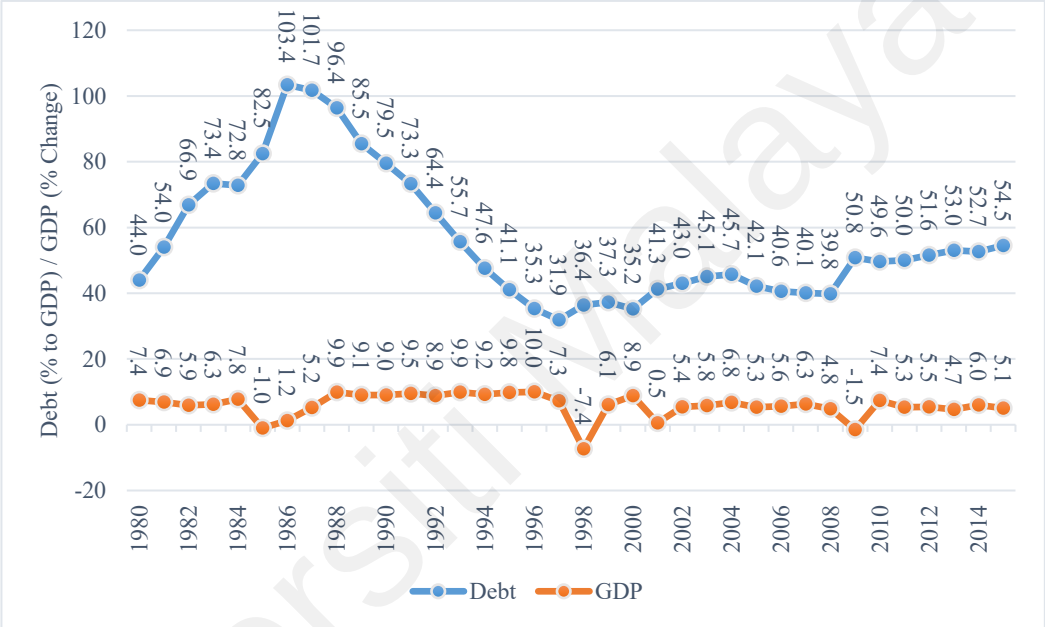


Figure 1.8: Malaysia - Public Debt and GDP Growth Trends

Source: World Bank, 2021

The public debt in Malaysia seems to benefit the economic growth in 1980s and 1990s. Although initially Malaysia recorded an increase in debt level, nevertheless this supported the economic growth. With improving growth rate, Malaysia managed to reduce the public debt level and this in return boost the economy growth further. However, since early 2000, the country's public debt level surging consistently, but this time around the growth rate not able to expand at the rate before AFC and GFC periods. Based on these developments, thus, it raise the question on existence of nonlinear relationship between public debt and growth and the threshold effect.

1.1.4 Thailand

Over the last four decades, Thailand has made notable progress in economic development, moving out from a low-income to become an upper middle-income country. Thailand's transformation is widely cited development success story, with sustained economic growth and remarkable poverty reduction. The Thai economy grew at an average of 7.5% between 1960 and1996, nevertheless, reduced to 5% between 1999 and 2005 following the AFC. The economic expansion had created jobs and elevated millions out of poverty. Thailand has maintained very high growth rates without a single year of negative growth even though with high global interest rates, oil shocks and cyclical fluctuation have caused fall in exports demand. By 1997, the Thai economy has expanded more than 10 times since 1960 (World Bank, 2021). With rapid industrialisation, Thailand has become a major exporter of manufactured goods, with export share growing from 20% in the 1980s to almost 70% in recent years.

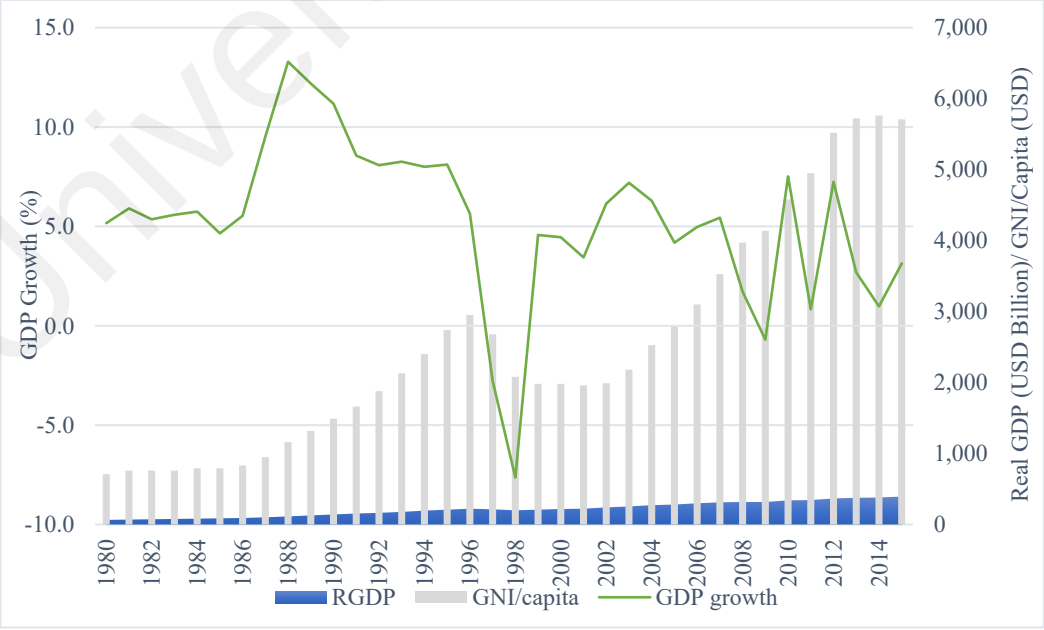


Figure 1.9: Thailand - Real GDP, Real GDP Growth and GNI per Capita Trends

Source: World Bank, 2021

Focusing on five-year economic development plans starting 1960s, Thailand's macroeconomic fundamentals has been relatively stable over the past decades despite frequent changes in government ruling. Thailand like other Asian countries followed a development model focusing on a long-term structural change from agriculture to industrial nation. The import substitution policy emphasised on greater importance for export promotion as the main driver amid rapid manufacturing production and exports expansion. The export growth also came with more favourable exchange rate and investor-friendly industrial policies. With 1977 Investment Promotion Act, investment incentives were reformed in order to suit export-oriented projects. Additionally, special credit facilities for exporters were introduced by the Bank of Thailand. Overall, Thailand has reformed its economic policies to market-oriented supported by flexible exchange rates and accommodative monetary policies (IMF, 2000).

Another factor that supported Thailand's industrialisation structure change is the FDI inflow. Since Japanese yen recorded appreciation in 1985, foreign investors relocated their production plants from Japan to Thailand, resulting in a surge in FDI inflows. This FDI inflow from Japan provided technical foundation for Thai industries, especially in automobile parts and electronic industry. Nevertheless, the move to highly capital-intensive industries such as iron, steel and petrochemical industries predominantly driven by local investment. Bulk of domestic investment was made possible through capital markets liberalisation that led to heavy foreign private borrowings. These reforms facilitated FDI inflow into Thailand. In addition, Thailand, benefitted largely as foreign investors considered Asian region as 'investment heaven'. The government also set up Bangkok International Banking facility to make ease FDI entry and led to about USD50 billion in loans poured into the country between 1993 and 1996. Nevertheless, all these

have increased Thailand's private sector borrowing from 39% to 123% during the period (Hays, 2014).

Thai's economy started facing issues in 1996 due to deceleration in export as result of sluggish global demand for electronic and semiconductor goods. The global demand slowdown hit Thailand, particularly strong due to its structural weaknesses. The economic expansion through FDIs did not produce skilled labours that could compete with other regional economies such as Taiwan and South Korea (OECD, 1999). Coupled with a number of other factors resulted in Thai baht crisis in 1997. The credit boom in 1990s also lead to financial and real estate bubble that made the economy vulnerable to a shift in business sentiment. The shift in sentiment has caused slowdown in exports and as an attempt to defend the exchange rate, the Thai government had raised the interest rate significantly. This has made foreign exchange reserves dwindled causing Thai baht to collapse in mid-1997 together with extensive capital flight, pushed the country into a deep recession. Similar events subsequently took place in other neighbouring countries as a domino effect and later amplified as the AFC making worse for Thailand's economy.

Following the AFC, public debt in Thailand surged substantially during the economic crisis. As a result, the government debt increased significantly between 1997 and 1999. Other elements of public debt also affected considerably during this period and led to widespread concerns about its effect in near-and long-term. The weaknesses of financial and corporate sectors due to several factors such as pre-existing flaws in financial institutions' portfolios; unhedged foreign exchange borrowing which exposed domestic entities to substantial losses from currency depreciation, over dependence on short-term

external debt, risky investments against stock and property prices bubbles (Hawkins & Turner, 2000). These factors led private capital inflows and rapid domestic credit expansion, nevertheless mammoth imbedded government guarantees remained pervasive causing existing rules regulation not robust enough to face challenges of a globalised financial market.

Table 1.4: Thailand 5-year Average Public Debt, GDP Growth & GNI/Capita

5-year Average	Public Debt (%)	GDP Growth (%)	GNI/Capita (USD)
1985	-	5.6	756
1990	-	9.0	1,010
1995	-	8.8	1,912
2000	40.5	1.6	2,486
2005	52.8	5.5	2,128
2010	40.2	3.1	3,506
2015	41.5	3.7	5,373

Source: World Bank & Author's calculation

Before the AFC, Thailand maintained relatively lower public debt level at about 15% and in 1997 but surged to 40.5%, due to the crisis. The public debt level increased further to reach its peak at 57.8% in 2000. Since then, Thailand managed to lower the public debt level to 34.9% in 2008 but rose to 42.4% in 2009 following GFC which continues to hover around 40% until 2015. Post AFC period, Thailand maintained its average growth rate at about 5% but reduced to 3.5% after the GFC. Although Thailand lowered its debt level substantially as result of numerous reforms as recommended by the IMF during AFC. Nevertheless, the growth rate seems to slow down in tandem with reduction in public debt. Therefore, this raises the doubt of maintaining lower public debt level as a precondition to boost economic growth.

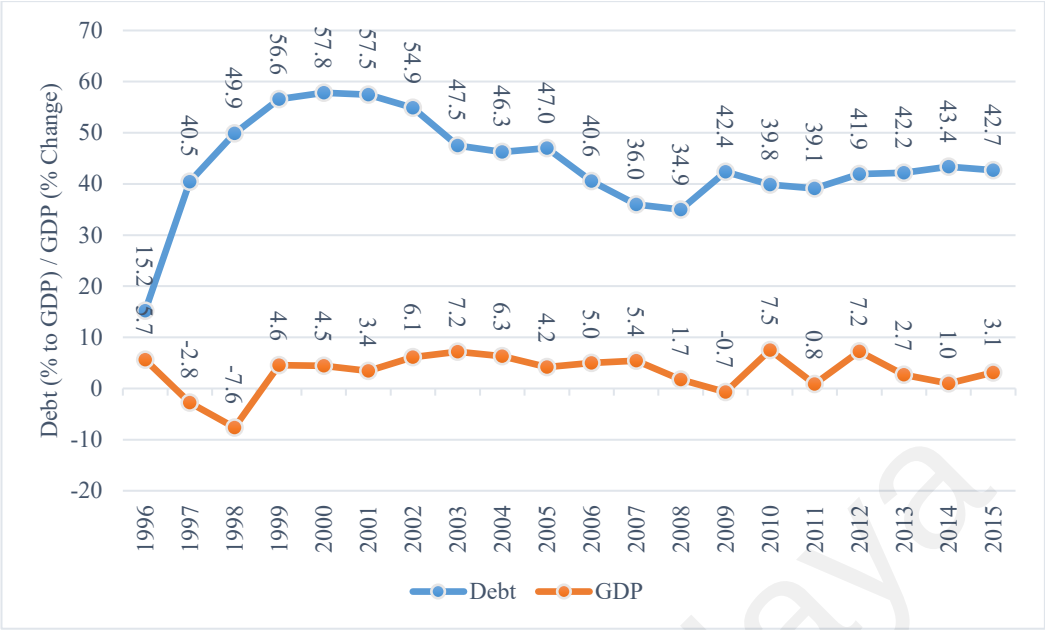


Figure 1.10: Thailand - Public Debt and GDP Growth Trends

Source: World Bank, 2021

1.1.5 Turkey

The founding Father of Turkey, Kamal Ataturk, after launching new constitution of the country acknowledged that to be a sovereign state it needs to be economically independent which only possible through well-functioning monetary system and industrial zones. Nevertheless, Turkey was financially immature and did not successful build a strong economy in early days (Takim & Ensar, 2010). In addition, it also became difficult for the Turkey to do trading or business due to high cross border tariffs and non-tariff barriers. Despite facing difficulties, Turkey put forth five-year economic development plan focusing on reducing import dependency and starts self-produce on agricultural products such as sugar, flour and cotton. As the economy become mature, Turkish government succeeded in establishing State Economic Enterprises and boost domestic demands through public infrastructure improvement. This also led foreign financial inflow and trading expansion through great government stimulus measures (Wagstaff, 1989). Coupled with tax reduction on agricultural sector, public investment expansion, communication and connection development, economic growth in Turkey started to flourish. In the 1980's, Turkey abandoned import substitution strategies and adopted export-oriented industrialisation as an effort to integrate with global economies. Consequently, government intervention in markets replaced by the market mechanism.

Although Turkish economy grew reasonably well, but due to it political instability and military coups, the economic development faced several hick-ups along the way. This also caused currency depreciation, hyperinflation, wage inequality and huge fiscal deficits. Turkish economy witnessed capital movement liberalisation and the Turkish Lira made convertible in the 1990s (Yay, 2001). These significant fundamental changes caused fiscal deficit widened in Turkey. The domestic demand increases significantly,

nonetheless import increased tremendously as well, fiscal deficit recorded at double-digit and resulting in a chaotic situation. Between 1991 and 1994, hefty public borrowings through the Central Bank helped the economy to grow, but also resulted in current account deficits. In addition, interest rates skyrocketed attributed to heavy government's borrowing activities. In order to address these unfavourable conditions, the Turkish government introduced stabilisation programs, however, this not robust enough to cushion the impact. Due to widening budget and current account deficits, in 1994, the Turkish Lira collapsed leading to economic crisis (Altug, Filiztekin & Pamuk, 2008).

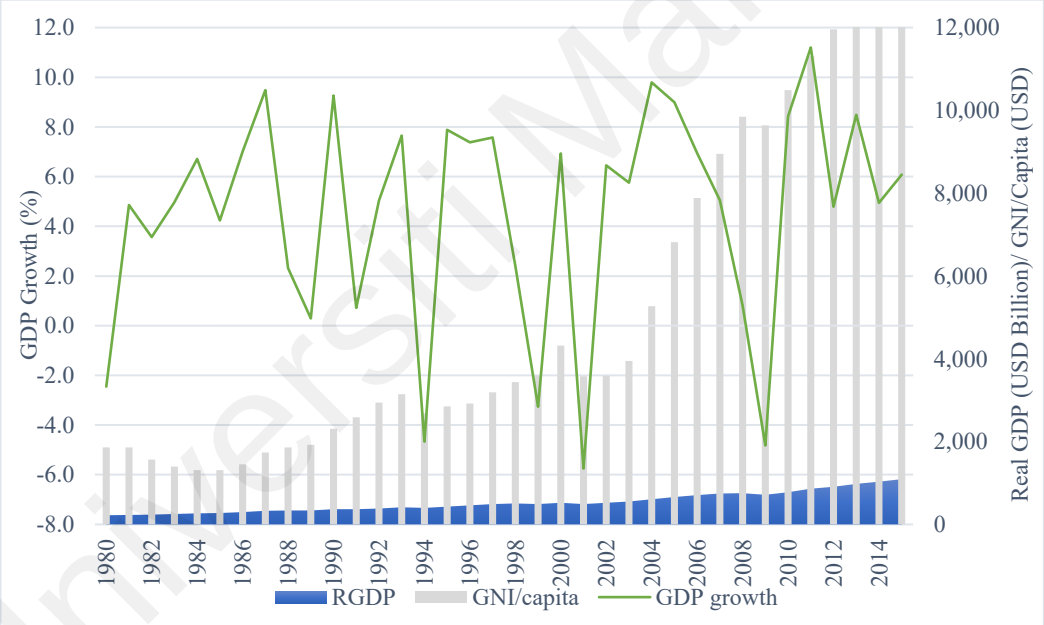


Figure 1.11: Turkey - Real GDP, Real GDP Growth and GNI per Capita Trends

Source: World Bank, 2021

Turkey witnessed four major economic crises between 1994 and 2009. Among the major factors behind these crises were political instability, foreign affairs problems, populist domestic economic policies and a major earthquake in industrial zones. These factors made Turkey's economy growth fluctuating along the way, for example in 1980 recorded -2.4% due to military coup, then fell -4.7% (1994) and -5.8 (2001) caused by currency

crisis as well as -4.8 (2009) by GFC. As Turkey faces massive fiscal deficits and high public debt level, the policies implemented thus far seems longer sustainable as severely affected by several economic crises. Thus, the country's economy fell significantly and recorded hyperinflation. The situation became spiral effect causing budget deficit grew enormously with interest rate peaked at 106% and total outstanding debt amounting to 60% of GDP in 1999 (Eğilmez & Kumcu, 2002).

Table 1.5: Turkey 5-year Average Public Debt, GDP Growth & GNI/Capita

5-year Average	Public Debt (%)	GDP Growth (%)	GNI/Capita (USD)
1985	-	3.5	1,600
1990	-	4.7	1,656
1995	34.8	3.6	2,732
2000	47.3	4.4	3,198
2005	59.0	4.6	4,142
2010	36.6	3.4	8,628
2015	27.7	7.3	11,837

Source: World Bank & Author's calculation

In addition, the 2001 crisis caused by currency depreciation remained as a dark history in Turkish economy. Due to change of 'crawling peg[8]' exchange rate system by the government, the Lira depreciated about 40% against the US dollar and caused interbank interest rate to surge tremendously (Yeşilada, 2002). This has resulted economic dysfunctions as well as social and political instability in Turkey. Because of numerous crises, public debt level in Turkey rose significantly from 30.2% in 1980 to 72.7% in 2001. Nevertheless, following improvement in economic environment and macroeconomic fundamentals, Turkey lowered public debt to 32.3% in 2008. The 2009

[8] The currency adjusted periodically in minimal amounts at a fixed rate or in response to changes in selective macro indicators such inflation differentials vis-à-vis major trading partners, differentials between expected inflation in major trading partners and so forth. The crawl rate can be set to generate inflation-adjusted changes in the exchange rate or set at a preannounced fixed rate and/or below the projected inflation differentials. Maintaining a crawling peg imposes constraints on monetary policy similar to a fixed peg system (IMF, 2003).

GFC had caused Turkish debt to increase slightly to 37.4%. Since then, public debt continued to decline to reach 23% of GDP in 2015.

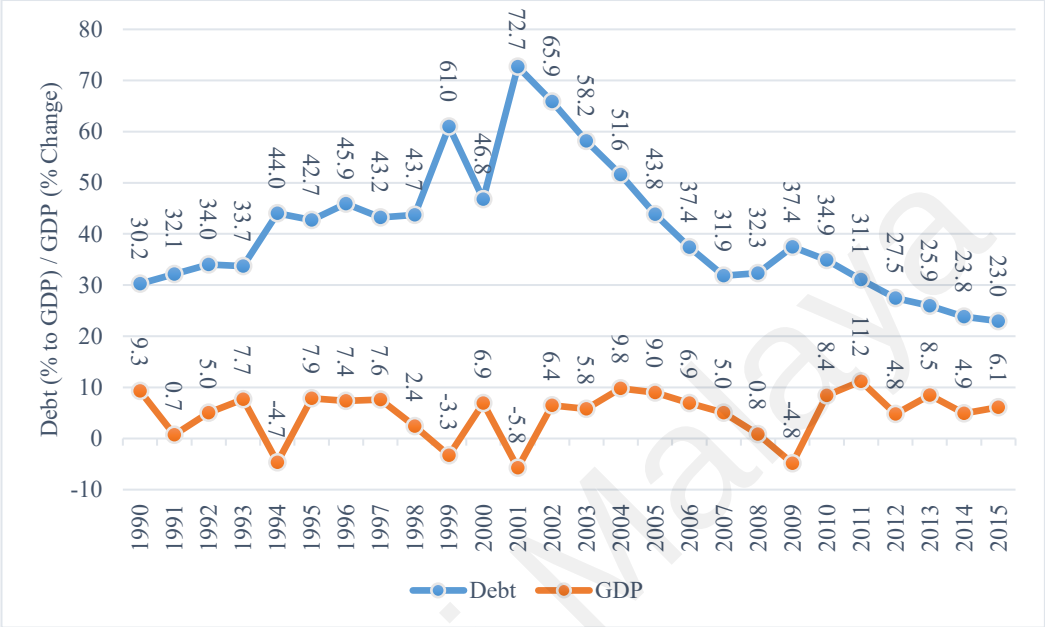


Figure 1.12: Turkey - Public Debt and GDP Growth Trends

Source: World Bank, 2021

Turkey's public debt mainly surged due to numerous economic crises which primarily caused by the Lira depreciation. Additionally, Turkish government's unsustainable economic policies had caused heavy public borrowings, which also indirectly hike the debt level. Turkey's public debt and growth pattern indicate a mixed pattern where there were times when the surge in public debt boost economic growth, however, at the same time lower level did not necessarily support higher growth. This situation perhaps an indication of a non-linear relationship between public debt and growth in Turkey.

1.2 Problem Statement

Based on available data, upper-middle income Asian countries generally maintain low public debt level below 55% of the GDP except for a number of countries. Nevertheless, as Asian economies are highly exposed to external shocks due to economic structure, any shock to economic growth will have harmful consequences on growth and therefore to the public debt to GDP ratio. High public debt may possibly lead to sovereign debt downgrades, which in turn will make government borrowings become more expensive and reduce fiscal space. In addition, tight fiscal space also makes the government unable to implement country cyclical measures during crisis periods. However, thus far, public debt and crisis periods have not been analysed together. On the other hand, government also needs to ensure that the public debt level remains sustainable for a number of reasons. Manageable public debt level is ambiguous and subject to debate, nevertheless, based on recent developments, a threshold may serve as a yardstick to set such a limit. Such threshold estimation to provide guidance in Asia is still lacking. Since Asian economies are exposed to high-level of externalities, the impact of breaching the debt threshold also needs to be analysed together with other macroeconomic indicators.

1.3 Research Objectives

The main objective of this research is to analyse the determinants, threshold and impact of public debt on upper middle-income countries in the Asian region between 1980 and 2015. In detail, there are three objectives of this research, as below:

1. Determine the factors that contribute to public debt and analyse if economic crisis is one of the variables that influences public borrowings;
2. Estimate the public debt threshold for these Asian countries, including country-specific estimation; and
3. Analyse the impact of breaching the public debt on macroeconomic variables.

1.4 Research Questions

1. What are the determinants of public debt in upper-middle income Asian countries? Is economic crisis a significant determinant?
2. What is the public debt threshold for the upper-middle income Asian countries?
3. What is the impact of breaching the public debt threshold on macroeconomic variables?

1.5 Significance of Research

As most of the **debt related researches focused on samples of developed economies, HIPCs, the US or Euro Zone**, hence, **this research focuses on upper-middle income in the Asian region**. This sample selection also **recommended by Abd Rahman, Ismail & Ridzuan (2019), stressing the lack of information on these economies and more attention needed**. Moreover, these countries have a moderate level public debt which is below 50% of GDP. This is one of the contributions of this research as most of the previous empirical researches are concentrated on countries that have high public debt. Results from theoretical and empirical researches indicate public debt is interlinked with numerous macroeconomic variables. Nevertheless, literatures on debt determinants did not consider economic shocks such as crisis or recession in the estimation. As most of the economies embark on stimulus packages to revive the economy during recession, it is imperative to include economic shocks as a variable that could influence public debt. In addition, this research also attempts to estimate public debt threshold for the sample which is unavailable in the past literatures. Besides, most literatures merely focused on estimating threshold level alone. As such, this study provides the source of drag or boost on growth when the debt level increases above the threshold levels.

1.6 Research Structure

Chapter 1 is the overall introduction of the research. It briefly explains the overall public debt and growth position. It also identifies the problem statement and develops the research questions as well research objectives. Chapter 2 covers the literature review and identifies the gaps. Related theories on the theoretical framework and methodology are presented in Chapter 3. There are three parts of the analysis. The first analysis on determinants of debt which is discussed in Chapter 4. The second analysis on threshold estimation is elaborated in Chapter 5, while the impacts of breaching the threshold on macroeconomic variables are explained in Chapter 6. Finally, Chapter 7 is the overall conclusion of the thesis, which also includes policy recommendations, limitations and scope for future research.

CHAPTER TWO

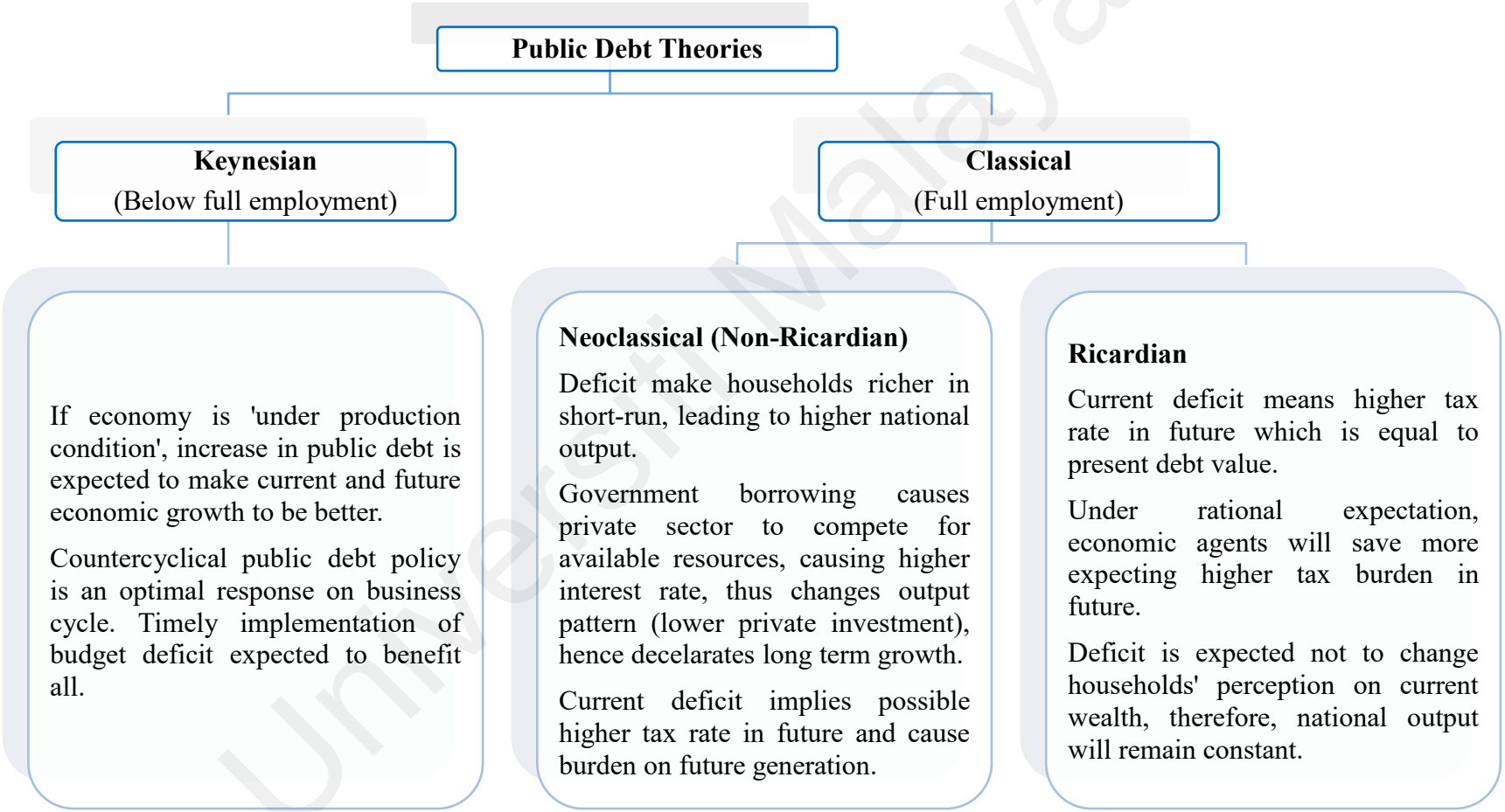
Literature Review

2.0 Introduction

Public debt or public borrowings, is a critical instrument for a government to fund the development of a nation. Debt is used for expenditures that will eventually generate productivity and stimulate the economy. However, when a country has high levels of debt, the government has no incentive to introduce new development policies as the debt repayment outweighs the return. Against this background, there has been substantial attention given to analyse the impact of public debt on economic growth. In this regard, the goal of this chapter is to review the empirical literatures on the relationship between public debt and growth to provide insights in identifying the gaps related to analysis on public debt. The chapter has four parts, namely literatures on public debt theory (2.1); literatures on public determinants (2.2); literatures on threshold (2.3); and literatures on impact of public debt (2.4).

2.1 Literatures of Public Debt Theory

2.1.1 Overview on Debt-Related Theories



Keynes establishes the theory in 1930s during Great Depression arguing that the economy is neither self-adjusting nor remains at full employment (Cameron & Larry, 2003). In other words, the economy perform either below or above its potential growth. During the Great Depression, unemployment rise steeply because of many businesses failed and the economy was operating below its potential (Mishkin, 2004). Keynesians believe the economy is unstable because aggregate demand instability, stemming from sluggish private investment affecting overall output and employment level (Phelps, 1990). Therefore, Keynes believed during bad times or crisis periods, fiscal and monetary policies required to revive the economy in the short-run (Goodwin, 2008). By applying appropriate fiscal policies, Keynesians believe it will offset undesirable changes in aggregate demand that causing economic downturn.

According to Keynesian, expansionary fiscal policy will cause higher debt level but at the same time stimulates economic growth, particularly through the mechanism of expenditure multiplier. However, this positive outcome is most likely in the short-run. This Keynesian theory dominated the industrial post-war, arguing that government spending stabilises or cushions economic downturn. In the course of recovery from a recession, in particular, private demand is poor, therefore, government expenditure is expected to reduce the negative impact and boost aggregate demand, thus, sustaining full employment.

Nevertheless, there are much debates on Keynesian's ideas as governments continued borrowing to invest beyond or outside of crises or recession periods. Keynesian's idea often quoted in justifying fiscal policy to sustain a high public or semi-public investment.

Public investment is believed to encourage consumption through an increase in overall national output, hence, rising the income level. Upsurge in consumption will lead to higher national income. Keynes argue that greater savings from the society could be utilised to finance public investment. A permanent increase in public investment would compensate fluctuations in private investment, thus, will maintain the economy in a "quasi-boom" state. According to Keynes, the government is expected to take a greater role in investment as the need for such act became a necessity. His idea of "socialising investment" could be enhanced through support from state or government-backed financial institutions, which will help to kick-start public projects. However, Keynesian did not consider private sector as possible investors in such move as it is a doubt that private investors willing to pool their money with the government to take on public infrastructure projects (Yueh, 2019).

On such set up, the criticisms on Keynes's argument is that these policies would cause continues budget deficits. This is the reason for governments in the past been unwilling to take on borrow to invest. Government's fear of borrowing on bond issuance will make way for investors to demand for higher coupon rate to lend money. This in return will increase the borrowing costs for government and in the long term could jeopardise economic growth prospects. The outcome on Keynes's theory in current situation is far from settled. In such set up, other school of taught argues that his counter-cyclical policies are likely to fail since their effects is much anticipated, either immediately or later. Among the critiques is Barro (1979), who argues that expected future tax hike to repay government borrowing will be incorporated by investors when deciding on interest rates for holding government bonds. Hence, this exercise will cause interest rates to increase in the future, thus, making government borrowing more costly and budget deficit pricier.

Critiques of Keynesians traced all the way back to 19th-century by Ricardo. Under Ricardian equivalence (1772–1823), rational people will expect that government borrowings will have to be repaid in the future and therefore predict higher taxes, thus, public is anticipated to save more and do not increase current consumption, therefore will not boost economic growth. Nevertheless, the apparent need to boost investment and economic growth during downturn has shifted the public debate closer on what Keynes advocated even during normal period. There is also a growing need to separate capital from operational spending in government accounting system. This is to ensure that government investment does not count the same as daily public spending. Given the argument over low investment, low borrowing costs and concerns over growth, Keynes's views on public investment could have a greater impact on the structure of an economy than the arguments about government deficit spending.

Theory of optimal government debt was built upon the Ricardian equivalence proposition (Barro 1974). This proposition argues that government debt or government borrowing is irrelevant and has no impact on boosting real economic activity because private sector can undo government's decision. For example, if the government decided to reduce tax rate and widens budget deficit today, the private sector anticipates a higher tax rate in the future as government has an obligation to repay the debt. Therefore, the private sector makes use of the current lower tax rate and save through purchasing of government bonds to cover higher future tax burden. Hence, Ricardian argues that government's decision to borrow has no effect on consumption, labour and capital investment choices.

Ricardian equivalence entails three strong conditions that practically not possible. First, it assumes that increasing tax revenue requires no deadweight loss, which means the revenue raising does not directly distort consumption, labour or capital investment decisions by economic agents. Second, households and firms assumed to be financially unrestrained, able to borrow and lend freely with same terms and conditions as the government. Finally, households and firms fully aware about the future taxes. Since it is practically impossible to hold these conditions, therefore, Ricardian believe government borrowings does not support growth (Seater, 1993).

The tax-smoothing is the most commonly used theory of optimal government debt. If lump sum taxes ruled out, in which, raising tax collection distorts economic decisions while borrowing through government bonds does not, then public debt allows the government to smoothen out the deadweight loss from higher tax revenue (Bhandari, Evans, Golosov & Sargent, 2017). However, the rationality of such argument plays out inversely if the fiscal needs are unanticipated versus anticipated. The tax-smoothing argument suggests that a government facing economic downturn or shock, temporary public spending should respond optimally through government borrowing. The reason being, financing these borrowing through immediate revenue raising by increasing tax rate would be more costly and harmful on the economy in short-term. As such, it would be better to issue debt to spread the borrowing cost to future, when fiscal needs are much lower. Tax smoothing has important policy implications, since it is possible to expect that tax adjustments or excess burdens of tax rise more than proportionally with tax rates, government can reduce the distortions by maintaining tax rates relatively smooth or minimal changes rather than increase or reduce it from one period to another.

Table 2.1: Keynesian and Classical Theory Comparison

Features	Keynesian	Classical
Duration	Short-run	Long-run
Wages and Prices	Rigid	Flexible
Employment	Unemployment/ Under employ	Full employment
Output	Demand side (Demand creates supply)	Supply side (Say's Law – Supply creates demand)
Government intervention	Government's intervention necessary to stabilise economy during crisis	No government intervention
Policy	Fiscal and monetary policies as stabilisation tool	Based on market mechanism
Demand curve	Downward sloping straight line	Downward sloping
Supply curve	Upward sloping	Vertical

Source: Chaudhry, Faridi & Gul (2014) & Author's compilation

2.2 Literature on Public Debt Determinants

There are three aspects or gaps of which this research attempts to provide explanations. Firstly, the factors influencing or affecting debt level in a country. Many researches are available in this aspect highlighting factors contributing to public debt level in a country. Among others, gross domestic product (GDP), capital stock, national saving, employment, total trade, government consumption, real interest rate, real exchange rate and inflation. However, there is a gap where impact of crisis period as one of the factors affecting public debt level is analysed thus far. Secondly, numerous researches estimated public debt threshold level currently, nevertheless, these threshold estimations mainly focuses on high debt or advanced economies. Such estimation for upper-middle income Asian economies is unavailable, creating a gap in the literature. Thirdly, threshold estimations in the literature did not provide source of drag on economy beyond the estimated threshold level and there is a gap in this regard. Analysing the literatures indicates public debt is more often have two way causalities in which debt can affect macroeconomic variables and vice versa. Compilation of previous studies analysed in literature review attached in Appendix 1.

2.2.1 One-way Causality

According to Bildirici & Ersin (2007), the inflationary process fed on snowballing domestic debt costs in Brazil, Mexico, Turkey, Japan, Belgium, Canada, Greece, Portugal and Spain. Thus, this led to an increase in public debt level among countries with high inflation. Additionally, these countries had to borrow at a higher interest rate with lower maturity period. The VECM outcome illustrate those countries with relatively low inflation but high domestic debt is able to borrow with low costs, emphasising the influence of inflation on public debt.

Analysis by Sinha et al (2011) on 19 high-income and 12 middle-income countries revealed that GDP growth rate is the most important determinant of public debt. Additionally, government expenditure, education expenditure and current account balance also affect the debt level in these countries. Foreign direct investment (FDI) and inflation rate only significant for middle-income countries while in high-income it does not have any impact on public debt. Education expenditure has stronger influence on debt, particularly in high-income countries while insignificant in middle-income countries. The outcome of the panel regression indicated that population do not influence the debt level in both high-and middle-income countries.

Bittencourt (2012) found that economic growth has the ability of reducing public debt within the region of nine Latin American countries. The results also highlighted significant role of higher economic growth in keeping debt at manageable limit. However, the findings from principal component and dynamic panel data estimation showed that

other independent variables (trade openness, money supply, inflation, population and Gini coefficient) did not provide a clear-cut relationship on debt.

Calderón & Fuentes (2013) found a negative and robust effect of public debt and growth exist, however, structural factors such as strong institutions, high quality domestic policies and outward-oriented policies fairly ease the impact in countries in regions of Latin America, Caribbean, South America and Central America. The outcome from regression analysis also suggest financial market development and GDP per capita could either ameliorate or aggravate the negative effect of public debt and growth.

Sufficient evidences available to conclude a negative relationship between public debt and growth across countries among 118 developing, emerging and advanced economies, based on outcome of ECM and CMG modelling by Eberhardt & Presbitero (2015). Evidence available to conclude co-integrating relationships between public debt, income, capital and Total Factor Productivity (TFP), which is able to reduce the level of public debt. Granger causality and generalised method of moments (GMM) analysis by Vighneswara (2015) on GDP, FDI, government expenditure, inflation and population found to have negative impact on public debt. Conversely, the estimation results from 252 countries shows capital formation, consumption expenditure and trade openness have positive influence on debt. As increase in non-performing loans, military expenditures and imports cause public debt to surge accordingly.

GDP growth and bank liquid reserves has the ability to reduce public debt level in 12 Europeans countries based on evidence from corrected standard errors model according argues Gargouri & Ksantini (2016).The government is able to eliminate unemployment by employing debt-financed fiscal stimulus, nevertheless, this leads to public debt level to increase. On the other hand, inflation and investment is able to reduce public debt in Tunisia as indicated the ordinary least squares (OLS) analysis by Belguith & Omrane (2017). Another research by Bittencourt (2018) on a sample of nine South American countries indicated that young democracies are associated with larger government debt. The reason behind high public debt in these countries mainly due to rundown or non-existent of public infrastructure, high inequality as well as mixed political ideological stances causing high public borrowing cost become expensive.

The fixed-effect estimator and two-stage least squares (2SLS) analysis shows there is no evidence to conclude that countries with relatively matured democracies, the government debt able to lower reduce public level either. Public debt increases in 51 African countries due to high foreign borrowing, fiscal deficit, trade openness, military expenditure, interest rate, exchange rates, debt-service, domestic credit. Government instability, political regime and socio-economic crises are among the main and robust influences of public debt in these countries according to Nagou, Bayale & Kouassi (2021).

2.2.2 Two-way Causality

The effects of public external debts on gross national product (GNP) are small and of an opposite sign in 18 Latin American, 10 Asia-Pacific and 8 Sub-Saharan African countries (Levy & Chowdhury, 1993). The 3SLS findings support those external debts in developing countries are not a primary cause of economic slowdown. An increase in the GNP raises public external debts substantially, nonetheless, investment and capital expands as well. The expansion in investment and capital boost economic growth which helps to lower public debt level.

Continued debt accumulation is expected to cause long-term interest rates hike in the United States (US), Germany and Italy stated (Paesani et al., 2006). Results of multivariate econometric model analysis found crowding out effect, particularly in Germany due to massive fiscal expansion exercised by the government. Hence, this reduces private investment and drag growth rate. As a result, public debt level increase due to slower growth. Kwon, Lavern & Wayne (2006) noted that an increase in public debt expected to cause inflationary pressure in highly indebted countries based on sample of 71 advanced and developing economies. The panel VAR estimation revealed that inflationary impact is strong, particularly in developing countries and less effect in major advanced economies. The results also suggest the risk of a debt-inflation trap is significant for highly indebted countries. High public debt pushes up inflation thus interest rate, in return causing debt level to increase further. The findings also emphasise on the importance of institutional and structural factors for fiscal policy and inflation stability.

The interest rate goes up substantially without a consistency between fiscal and monetary policies, especially when inflation target becoming real treats on external debt. Large private sector dissaving coupled with substantial widening of current account deficit could trigger exchange rate depreciation in Turkey as highlighted by Budina & Wijnbergen (2007) based assessment of stochastic simulations. These conditions could lead to foreign capital flight stemming from loss in investors' confidence, thus, currency depreciates further increase the burden on external debt, threatening fiscal sustainability.

An inverse relationship between public debt and growth was found in both advanced and emerging economies by Kumar & Woo (2010). High debt has an adverse effect on growth due to slowdown in productivity and falling investment as well as sluggish capital stock, based on Pooled OLS, BE and FE estimators. In addition, high debt increases long-term interest rates, future distortionary taxation and inflation, as well as causes greater macroeconomic uncertainty and volatility. Hence, these issues are likely to be exacerbated, with further adverse consequences of public debt level.

In the United Kingdom (UK), the US, Germany and Italy, government borrowings have a small positive impact on GDP but mixed effect on housing and stock prices causing overall price level to surge, hence, increasing government borrowing cost. Applying B-SVAR estimation, Afonso & Sousa (2011) argue that government's borrowing leads to 'crowding-out' effect in these countries as the overall price level and interest rate rises.

Pirtea et al (2013) revealed that debt-to-GDP ratio increasing more than real GDP growth rate since the global financial crisis in Romania. Real interest rate is the significant determinant behind the snowballing public debt level in the country. The OLS estimation also denoted that effectiveness of monetary policy as an automatic stabiliser has little success in addressing cyclical unemployment since the crisis that affects the interest rate and public borrowing cost. The research also highlighted that it is critical to sustain growth that helps in ease interest rate to manage public debt level. In the case of Greece, a significant negative correlation exists between government debt and gross national income (GNI) as well as FDI. On the contrary, a positive relationship was found between government debt with national expenditure and inflation as indicated by the VECM analysis. Mah & Petersen (2013) argues that as the government expenditure expands, inflation surge further and escalates public debt level.

The results from Method of Moments estimation specify that GDP and real interest rates are strongly associated with inflation, therefore co-movements in these variables can cause a significant reduction in the debt level in the US. Hilscher, Raviv & Reis (2014) further explain that inflation by itself is unlikely to lower fiscal burden significantly. Nevertheless, changes in GDP and real interest rate has the ability to reduce public debt although this will lead to inflationary process.

The European sovereign debt crisis attested public debt issues could affect negatively on economic growth due to higher interest rates, fear of unsustainable public debt and tight fiscal consolidation actions (Bilan & Ihnatov, 2015). The outcome of quadratic model estimation emphasise that developed countries need to pay attention on high public debts

as it always have two-sided story. Although public indebtedness is expected to promote economic growth, mainly when public debt is used for financing public investment expenditure, the debt level is very high and it can negatively affect economic growth. Public external debt has significant negative impact on growth in South Asia, East Asia and Middle East based on results from panel regression. Mahwish, Pirzada, Shazia & Muhammad (2015) explain that public external debt is deemed as an obligation and ultimate burden on economy, the level always considered on imposing conditions such as interest rate, maturity period or debt service charges, thus, increases liability for the government. The panel regression reveals external debt might support economic growth but costly external debt servicing may drag the growth and leading to higher debt level.

Real interest rate, budget deficit and trade openness are found to increase public debt based on VECM estimation in OECD countries (Battaglini & Coate, 2015). Lack of domestic resources for debt financing also cause an increase in external borrowing. These factors led to a decline in investment, high unemployment and rise in the inflation rate, slowing down economy growth and surge public debt level further. Panel VAR and Granger causality estimation by Ogawa, Sterken & Tokutsu (2016) on 31 European Union (EU) and Organisation for Economic Co-operation and Development (OECD) countries pointed out that economic growth of countries with high-debt have direct negative impact due to rise in the long-term real interest rate, which in turn, shrinks interest-sensitive demand and leads to a further increase in the public debt. Furthermore, rapid build-up in public debt might start to affect economic growth adversely if the financial market perceives the public debt level is ‘unsustainable’. Hence, the long-term real interest rate responds more sensitively depending on the rate of public debt hike. These factors negatively affect growth rate and public debt tend to surge.

The long-run impact of exchange rate depreciation on external debt is significant and positive, indicating that the public debt level will rise (Palić, Banić & Matić, 2018). There is a possible negative effect of depreciation on economy stemming from increasing external debt, consequently reducing the wealth of all sectors holding foreign debt in Croatia. Additionally, the Johansen co-integration analysis indicates that exchange rate depreciation is not recommended as the instrument for increasing export competitiveness due to high external debt. Therefore, currency depreciation in Croatia makes the external debt swells further and export to decrease, hence, causing the overall public debt to surge.

A significant long-run relationship between public debt and government expenditure, real GDP, inflation, real interest rates exist in South African economy. Applying an ARDL model, Mothibi & Mncayi (2019) noted that government expenditure is the key driver of public debt and surge in the level has a harmful impact on economic growth as well as inflation. Slower growth and higher inflation in return cause public debt level in South Africa to swell more. The researcher underscores the importance of productive, moderate interest rates and reducing non-productive expenditure to improve public debt level. Hashem & Fahmy (2019) indicated that in Egypt public debt and macroeconomic variables such as government expenditures, exchange rates and interest rates are positively correlated while inflation and government revenues having negative correlation. The SVAR estimation specifies an increase in economic growth and is expected to cause a higher level of inflation. Nevertheless, this erodes real value of debt, hence reduces debt to GDP ratio. An increase in government revenues as economy expand shrinks debt level as well.

Evidence from literatures illustrate that public debt in a country is influenced by many factors. Among the prominent factors are GDP growth, investment, inflation, national saving, capital stock and government expenditure. It is very clear that these factors are interlinked with one to another and mostly have two-way causality. Therefore, any changes in one of these determinants could impact both public debt and growth directly or indirectly.

2.3 Literatures on Threshold

Many governments around the world set threshold levels or self-imposed debt ceiling level. This is done as way to observe fiscal discipline and to keep the debt level from mounting without limit. Among the countries that impose such limits are Malaysia (Federal government debt - 60% of the GDP), Thailand (Public debt - 60% of the GDP), the US (USD 27 trillion – suspended until after the 2020 presidential election), European Union (60% of the GDP) and Indonesia (budget deficit below 3% annually). Nevertheless, such public debt limit and the impact on economic growth is much debated as government tends to breach and revises the threshold upwards (Aslam and Jaafar, 2020). On the other hand, it is unclear if governments conduct sufficient and proper empirical analysis before imposing such debt ceilings. This is a significant aspect to consider because empirical literature on growth and debt lay strong evidence to indicate the existence of negative correlation between high public debt and economic growth. On that account, it is crucial to ensure that the imposed debt ceiling is not too high or too low which could possibly hinder potential growth of the country.

Currently, there are many empirical literatures estimating, many different thresholds, differentiated by economic development level and geographical categorisation. Threshold level between **15%~30%** is obtained by Cordella et al. (2005) for countries with good policies and institutions among developing countries as well as heavily indebted poor countries (HIPCs). The level reduces further to **0%~20%** for estimation without HIPCs. Cordella's research utilised OLS regression and system of GMM methods. By utilising panel regression method, research on 20 advanced economies by Baglan and Yoldas (2013) found that the threshold level is at **20%**. On the other hand, Clements et al. (2003),

discovered threshold level between **20%~25%** for a sample of 55 low-income countries using GMM estimation.

A study by Égert (2015) tested sample from Reinhart and Rogoff's (2010) dataset and found the threshold level in the range of 20%~60% through threshold regression. Nasa (2009) used two different estimators, namely quadratic modelling (**24%~46%**) and threshold regression (**45%**) obtained two different threshold levels. These estimators were applied on 56 low and medium income heavily indebted countries. Meanwhile, research by Lee et al. (2017) examined Reinhart and Rogoff's dataset as well and obtained threshold level at 30% using median regression modelling. An examination on South African economy by Baaziz et al. (2015) used smooth transition regression obtained threshold level at **31%**.

Research by Pattillo et al. (2002) employed a dynamic panel data modelling to analyse 93 developing countries and found threshold level between **35%~40%**. Government domestic debt threshold level for Malaysia was estimated at **37%** by (Kueh, Liew & Yong, 2017). The researchers employed threshold regression to analyse the Malaysian case for 1980-2015 period. An analysis on 15 developing countries by Nhu et al. (2016) found a threshold level at **39%** through GMM estimation method. The threshold level changes for spilt samples, **30%~60%** for developing countries and **80%** for the advanced economies. In the EU, an analysis using Autoregressive Distributed Lag (ARDL) approach by Gómez-Puig and Sosvilla-Rivero (2017) noted existence of threshold level at **40%** for central countries and **50%** in peripheral countries.

Mencinger et al. (2015) analysed 31 OECD member states and five non-OECD EU member countries utilising GMM estimation. The study found a threshold level of around **45%** for emerging economies and **90%~94%** for developed economies. Mupunga and Roux (2015) used a combination of bivariate quadratic equation and threshold regression obtained threshold level **45%~50%** for Zimbabwe. Similarly, Munir et al. (2016) investigated optimal level of external debt and economic growth in Malaysia over the period 1970-2013 using the co-integration test. The threshold level found for public debt ranged from **50%~60%**. Craigwell et al. (2012) studied the Caribbean economy using the threshold least square regression model and found threshold level to be between **55%~56%**.

Using the vector auto-regression (VAR) method, Andrés et al. (2017) found the threshold level for Spain to be at **60%** for the period of 1970-2007. Another study on developing and advanced countries by Chudik et al. (2015) using ARDL found threshold level to be between **60%~80%**. By utilising the panel unit root, panel co-integration and panel Granger causality test techniques, Chang & Chiang (2009) analysed 15 OECD countries and obtained a threshold level of **66%**. Similarly, Elmeskov & Sutherland (2012) noted a threshold at **66%** for a narrow sample of OECD countries. Ahlborn and Schweickert (2015) used the dataset of 111 OECD and developing countries divided into clusters (Liberal, Continental and Nordic), with results showing the threshold level differing across the clusters **60%** for Nordic countries and **75%** Continental countries. However, for Liberal countries, such a **threshold level does not exist**.

Research on the Nigerian economy by Omotosho et al. (2016) found threshold level at **73%** by employing two-stage least squares the generalized least squares (GLS) and (2SLS) methods. A threshold level of **77%** for public debt for both advanced and emerging countries obtained by Hansen (1996, 2000) and Caner et al. (2010) using the threshold regression method. The researchers found much lower threshold of **64%** when the estimations were conducted for developing economies separately.

A study on a sample of 18 OECD countries by Cecchetti (2011) through panel data regressions with fixed effects showed a debt threshold of **85%**. Using histograms summarising evidence from 44 developed and developing economies, Reinhart and Rogoff (2010) obtained a threshold level of **90%**. This relationship becomes predominantly robust when government debt level approaches **100%** (Kumar & Woo, 2010). The study employed various methods such as pooled OLS, robust regression, between estimators, fixed effects panel regression and system GMM dynamic panel regression. Research on the euro area by Baum et al. (2013) found a threshold level at **95%** through dynamic threshold panel method. Likewise, Bilan and Ihnatov (2015) obtained a threshold level of **94%** for 33 European countries using generalized model.

In the case of Greece, Pengkas (2018) estimated the threshold level for the country at **109.4%**. Pengkas applied threshold regression on the Greek economy covering the period of 1970 to 2016. Minea and Parent (2012) used data set from Reinhart and Rogoff (2010) and employed panel smooth threshold regression estimated threshold at **115%**. Meanwhile, research by Lechtenberg (2017) found threshold level for individual

countries such as Italy (**47%**), the US (**63%**), France (**80%**), Greece (**103%**) and the UK (**156%**). The research applied threshold regression for estimation purpose.

Evidently, public debt threshold level can differ depending on sample selection and estimation methods. Additionally, most of these researches used samples of developed/advanced economies in the estimation process. Such estimation for Asian countries is limited. Therefore, this research intends to conduct both pooled and country specific estimation on selected countries to identify any difference in threshold level in Asia.

2.4 Literatures on Impact of Public Debt

Numerous economic and financial crises in the past have been among the main reasons behind steadily increasing debt levels in both developed and developing countries. The impact of snowballing public debt level on economic growth have been debated and researched by many scholars. Analysis impact of public debt on economy always attracts the attention of many researchers due to its complexity and interlinkages. Public debt management is seen as a tough job for policymakers and often subject to criticism (IMF, 2001). To reduce impediments on economic development, public debt management needs to be done properly so that it earmarked for productive projects that will contribute to economic growth and development. Many countries focusing on achieving higher growth and use this as a strategy to reduce or contain the debt ratio from increasing further (Manzer, 2020). Such move by governments agreed by scholars that sustainable fiscal policy is achievable through higher economic growth. The reason being higher economic growth will bring sufficient revenue to service government borrowings. Besides, governments also adopt strict fiscal rules or austerity plans as suggested by many international financial institutions such as the World Bank and International Monetary Fund (IMF).

It always remains a debate among the researchers that too much debt may dampen economic growth (Maghyereh & Omet, 2003; Berensmann, 2004; Pattillo et al., 2011). The arguments mainly surround the debt overhang hypothesis whereby it postulates excessive debt and discourages investment, hence precluding economic growth by higher tax burden to service the borrowings (Krugman, 1988). Public borrowing is seen as a

crucial policy instrument for governments to cushion economic fall during crisis periods, but the risk stemming from high debt and continued deficit in both industrial and emerging economies important to be aware of (Huang and Xie, 2008). Public debt is expected to increase investment, particularly for public infrastructure projects, which in turn boosts the aggregate supply indirectly. On the contrary, the crowding-out effect of public borrowing often put forward in many researches. It is argued that government borrowing increases interests in the credit market, forcing private sector out and therefore negatively influencing future investments (Karazijiene, 2015; Coupet & McWilliams, 2017). This phenomenon explains the crowding-out effect, suggesting that government's borrowing causes crowding-out of private investment and leads to a fall in private investment and capital formation (Lwanga & Mawejje, 2014).

Debate on public debt is mostly centred on long-term interest rates and the impact on macroeconomic variables (Laubach, 2009). Higher interest payment on the borrowings might adversely affect growth as government spends bulk of the revenue on debt servicing as well as possible higher future tax (Rangarajan & Srivastava, 2005). The impact of public debt often discussed together with inflation whereby increasing debt is strongly associated with high inflation which tend to devalue the currency (Kwon et al., 2006). However, high inflation rate could turn positive in nature, especially for domestic public borrowing, where inflation reduces the public debt burden (Sawchuk, 2020). The impact of public debt on exchange rate is prevalent, especially for countries with high-level external debt. Servicing external debt requires demand for foreign currency, which tends to affect the exchange rate of the country. On the contrary, an increase in public debt causes a trade deficit, causing a real depreciation and therefore, increase in consumption (Monacelli & Perotti, 2010; Ravn et al., 2012). Nonetheless, the most imperative benefits

of public debt, particularly external borrowing, are access to a larger investor base, less crowding-out of domestic financial markets, lower yields on foreign exchange issuance, longer maturity periods as well as the possibility of official foreign exchange reserves surge (Baksay et al., 2012).

Although in long-run many researches concludes negative impact of public debt, nevertheless, in short-run debt, expansionary fiscal policy potentially is able to increase aggregate demand and output, income as well as employment, particularly when the economy is in the liquidity trap[9] (Ewaida, 2017). The argument is that in the short-run, growth is demand-driven and fiscal policy is efficient in stimulating economic growth. In such case, moderate public debt coupled with enhancement in monetary policy, strengthened institutions, improved private savings, deepened financial intermediation as well as smoothed distortionary taxation have a positive impact on overall economy (Gómez-Puig and Sosvilla-Rivero, 2018). Additionally, effective use of public debt can expand economic growth and achieve macroeconomic goals. Development projects financed through public debt helps a country to build its productive capacity and improve economic conditions (Cohen, 1993).

[9] A situation where expansionary monetary policy (increase in money supply) does not reduce the interest rate and income, hence, ineffective to stimulate growth during economic slowdown.

2.5 Conclusion

Various literatures provide deeper understanding on public debt and macroeconomic relationship. Macroeconomic variable such as GDP, capital stock and saving are found to be negatively correlated with public debt. On the contrary, employment and government consumption tend to increase in tandem with rise in public debt. On the other hand, total trade, inflation and real exchange rate are expected to have both positive and negative relationship depending on the circumstances. One aspect lacking in literatures is the inclusion of crisis periods in influencing the public debt level. Thus, this research aims at addressing this gap. Literatures also indicate sufficient evidence to conclude a nonlinear relationship between public debt and growth, in which with the public debt exceeding certain level of threshold could drag down the economic growth. Nevertheless, such estimation involving Asian countries is still limited. Besides, these threshold estimations did not elaborate the impact on other macroeconomic variables. Therefore, this research will estimate the threshold level for upper-middle income Asian countries and the impact of exceeding the threshold level on other macroeconomic variables.

CHAPTER THREE

Theoretical Framework & Methodology

3.1 The Keynesian and New-Keynesian Theory

3.1.1 Keynesian Theory

The Keynesian theory modifies the open or lose assumptions of the classical theory. Among the key feature of Keynesian is specifically emphasise on the government response during economic downturn in which is essential and crucial to keep the economy in equilibrium. Such intervention by government through public borrowing known as supplement actions to allow the market correct the failures. Keynes argues public borrowing should not be blamed for its detrimental effects because such borrowing smoothens economic function.

Depending on the size of borrowing which contributes to government debts, it cannot be liable that government borrowings negatively affecting national wealth in total. Nevertheless, government's involvement in value adding activities such as public infrastructures that promotes economic growth and development. Besides, government also has a moral obligation in the economy, which need to maintain stability and equilibrium, as such, this makes government borrowing more meaningful as the funds being utilised to correct the economic imbalances and boost the growth.

Keynesian also argues that every single dollar the government borrows and not withdrawn to other usages is considered on an idle mode. As such, the interest rate will not surge up as oppose to Ricardian equivalence[10] (Krugman, 2011). Consequently, Keynesian theory emphasise the importance of public borrowing, which is crucial in formulating demand-side fiscal policies during economic downturn to ensure growth stability (Hansen, 1959; Hicks, 1937).

The Keynesian theory tested during 1929-1933 global economic crises. During the crisis, demand-side fiscal policies introduced in which public borrowing used for the funding and these policies helps to reduce unemployment as well as accelerates the economic growth. In particular, these policies aimed at expansionary public spending and included tax reduction as well as tax exemptions. As a result, the overall demand and production were stimulated, increasing employment and economy rebounded. This seen as the success of Keynesian theory and holds the claim that government borrowing could be used as tool to manoeuvre the economy in the 1960s (Spantig, 2013).

Hence, the government runs a budget deficit when the revenue collection is insufficient it will exercise borrowing which this later translate as debts. Nevertheless, in such exercise, inflationary pressure is unavoidable, yet this public borrowing which mainly from unused saving or revenue from certain social sectors, will allow government to bring fund into economic flow and create demand (IMF, 2014). In this notation, Keynesians argue that public debt in crucial, especially during economic downturn and the borrowing

[10] Ricardian equivalence says that government spending financed through current taxes or future taxes will have equivalent effects on the overall economy. This means that attempts to stimulate an economy by increasing debt-financed government spending is ineffective because investors and consumers understand that eventually future taxes will be raised to pay the debt. The theory argues that people will save based on their expectation of increased future taxes in order to pay off the debt, and that this will offset the increase in aggregate demand from the increased government spending (Abel, 1991).

can used as instrument to strike a balance employment and price stability thus maintain equilibrium in the economy (IMF, 2014).

Keynesian economists pointed out that a surge in public debt, which induced by fiscal policy, will increase the level of national income. Keynesian economists often argue that private sector decisions sometimes cause inefficient macroeconomic outcomes, which require active policy responses by the government, in particular, monetary policy actions by the central bank and fiscal policy actions, in order to stabilise output over the business cycle.

Even though Keynesian attributes public debt to positive aspect of it, the use of such borrowing is strictly limited. **Keynes only promotes budget deficits during recession or stagnation in the economy, such practice should not become permanent.** Along this line, Beveridge (1942) further enhanced Keynesian's theory by admitting government borrowing should be only during economic crisis or downturn and therefore fund expansionary public spending. **Once economy started to register a positive growth or rebound from downturn, government budget should no longer be in deficit or borrowings should not be continued to maintain economic equilibrium** (Filip, 2010). At this point public borrowing by the government must end when the economy reaches full employment (Duverger, 1975).

In a typical closed economy, the Aggregate Demand (AD) comprises of consumption (*C*), investments (*I*) and government expenditures (*G*). In addition, the government collect taxes (*T*); therefore, the basic identity formed as in Equation 2.1, assuming the equilibrium is equivalent to the actual output *Y*:

$$Y = C(Y - T) + I + G \qquad \text{(Eq. 3.1)}$$

Hence, from Equation 3.1, the effect of an increase in government spending is different from the mechanisms as described above. The preliminary expected outcome of an increase in *G* is the exact same amount increase in *Y*. Nevertheless, an increase in *Y* generates *C* in the economy. The increase in *C* leads to an increase in income, in turn, leading to a rise in consumption. This circle repeats infinitely, which means the multiplier effect of government spending can be measure (Mankiw, 2015). Therefore, mathematically, the multiplier calculated by adding all the effects that repeated to infinity.

$$1/(1 - mpc) \qquad \text{(Eq. 3.2)}$$

Equation 3.2 is the multiplier for government expenditures. The term *mpc* is the marginal propensity to consume or the slope of *C* curve. The *C* in the expression that explains *Y*. As such, if *G* increases with 1, the impact is calculated as in Equation 3.3:

$$\partial Y/\partial G = 1 + mpc/(1 - mpc) \qquad \text{(Eq. 3.3)}$$

Hence, equation 3.3 reflection of what been explained before. There are two parts in the equations. The first part shows the early impact of an increase in *G*, namely 1. The second part illustrates the infinitely repetition impact on *C*, which influences *Y*. When expression 3.3 rewritten, it becomes equation 3.2. The same is for the multiplier of taxes. By estimating an increase in *T* does to the value of *Y* the multiplier for taxes is found to be:

$$-mpc/(1-mpc) \qquad \text{(Eq. 3.4)}$$

Combining equation 3.2 and 3.4 explains the effect of government debt on economic growth. In this case, the neoclassical predicts neutrality or even a negative effect as oppose to the Keynesian, predicts a positive effect. Keynesian expect increase in government expenditures will always be higher than an increase in future taxes, thus, the effect is positive.

3.1.2 New Keynesian Theory

The 'New Keynesian' theory established mainly focusing on addressing fiscal consolidation process amid high public debt and whether it is sustainable or not. The feature of this school is finding a balance between Keynesian and neoclassical non-Ricardian features by repackaging it in new form to the traditional problem of the balancing between negative and positive effects of the fiscal restriction through the interest rate. However, the introduction of the interest rate is not due to excess absorption of loanable funds (a flow concept), but to increasing sovereign risk (a stock concept). As rightly summarised by Buti and Pench (2012), the key factors can be summarised in a formula fiscal multiplier in the following form:

$$[1 - \text{confidence}] / [1 + (\text{monetary policy}) + (\text{competitiveness}) - (\text{financial constraints})] \quad \text{(Eq. 3.5)}$$

Confidence aspect has two components in which, financial investors believe that the fiscal restriction reduces the future default probability and demand a lower risk premium. The domestic private sector utilise the lower interest rate and expects lower path of future taxes, hence both encourage expenditure. Therefore, higher the confidence makes the fiscal consolidation multiplier smaller.

Among other factors that shrink the multiplier relate to the side Keynesian aspects mentioned above are: (i) the monetary policy stance (an accommodative stance leads to lower interest rate and boost aggregate demand); (ii) competitiveness gains refers to real exchange rate depreciation (real depreciation helps to sustain the external portion of

aggregate demand); and (iii) financial constraints refers to another classic New Keynesian aspect, inhibit Ricardian neutrality and amplify the effect of the fiscal restriction on aggregate demand.

The effect of government spending, to a certain extent is the same as neoclassical framework used for analysis. Upon this foundation, it is therefore the sticky prices assumption is introduced. There are several features in Figure 3.1, which builds this framework. Aggregate demand and aggregate supply make up an equilibrium, which is the real GDP and price level. In long run, aggregate supply is assumed to be constant, which is replicating the section concerning neoclassical view. Aggregate demand related to average price level; therefore, the curve negatively correlated or has an inverse relationship.

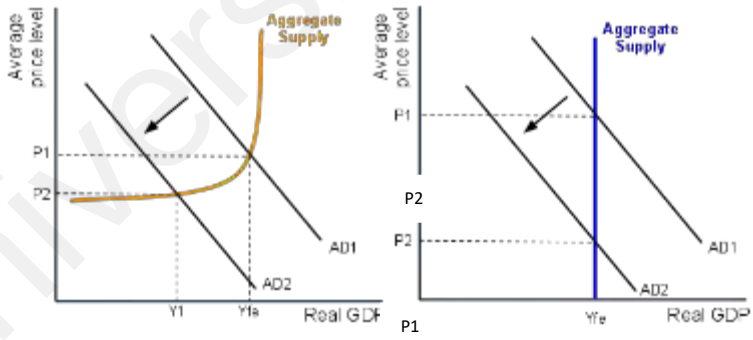


Figure 3.1: The new Keynesian AS-AD curve (left) & The Neoclassical AS-AD curve (right)

Another main assumption of the new Keynesian the assumption of real rigidities. As an example, given a single firm when demand falls, the firm has only a little motivation to reduce its price; therefore, it is likely the firm will keep its price constant. Furthermore, imperfect information and market externalities causes the 'sticky' price effect, in which,

price does not change immediately when demand falls or it will not change at all (Romer, 1993). This sticky price assumption determines the shape of the aggregate supply curve. In Figure 3.1 the difference is obvious between both neoclassical and new Keynesian aggregate supply curve. As such, when an economy run below its optimal output and prices are sticky, an increase in aggregate demand will lead to a higher output level. In such a case, government debt can have a positive relationship on growth, because output increase in the long-run.

3.2 Public Debt and Growth Nexus

3.2.1 Linear Relationship

The explanation of public debt accumulation and economic growth relationship is complex and economic theory alone does not provide clear-cut guidance. The prime argument for a negative relationship between the two often centred on "crowding out" of private investment arising from government borrowing activities. Another possible explanation is the confidence effects; an upward trend debt trajectory beyond certain levels could create anxiety among investors who worry about the country's debt sustainability and servicing ability. Realising this risk, investors would only be willing to hold government securities only at higher borrowing cost. This in turn, pushes up interest rate. Hence, lower demand and investment due to high interest rates can have a negative impact on economic growth in the long-run.

Furthermore, high interest rate also make government borrowing become more expensive and poses an additional pressure on fiscal balances. In an extreme case, a crisis may possibly triggered with negative consequences for economic growth depending on the currency denomination of the public debt. While it is theoretically possible for governments to inflate the domestic debt away through financial repression, however this is not possible on external debt. In the latter case, a public debt crisis could also trigger currency and/or banking crises, which can have more detrimental consequences on economic growth. High and swelling public debt might also put pressure on ability of government to reach on economic cycles. These arguments provide some support for the

negative relationship between growth and debt trajectory in conjunction with a skyrocketing level of debt.

The explanations so far abstract from the composition of additional government spending that leads to a rise in public debt. Such additional government expenditure could be invested in productive public investment (such as infrastructure, education or health) and could be growth enhancing. Nevertheless, the net effect of public debt accumulation on economic growth cannot be established theoretically, hence, requires an in depth analysis of the empirical relationship between debt accumulation and growth (Chudik, Mohaddes, Pesaran & Raissi, 2018).

The assumption of this research is that government expenditure in goods and services is fixed and the impact government's decision to temporarily cut taxes and finance its expenditures by issuing government debt. According to the "conventional public debt view" (Elmendorf and Mankiw, 1999), in short-run, the output assumed to be demand-driven and deficits (higher public debts) have a progressive consequence on disposable income, aggregate demand and overall economic growth. This positive short-run impact of budget deficits is possibly to be greater when the output is far from potential growth. Nevertheless, the situations are different in the long-run (Elmendorf and Mankiw, 1999). Another assumption is that Ricardian Equivalence does not hold and that public debt can affect real variables.

Based on this assumption, the reduction in public savings brought about by a higher budget deficit will not be fully compensated by a surge in private savings. Hence, national savings will decrease and resulting in lower total foreign and domestic investment. Lower domestic investment will have a negative consequence on economic growth, as it will lead to a lower capital stock, higher interest rates, fall in labour productivity and wages. Lower foreign investment on the other hand, will have a negative influence on foreign capital income and leading to lower the country's future gross national product (GNP). These negative effects of rise in public debt on future growth can be amplified by the introduction of distortionary taxes.

3.2.2 Nonlinear Relationship

A large number of empirical researches established that the relationship between debt and growth is nonlinear in nature and this is based on the presence of a threshold above which public debt starts having a negative impact on economic growth. The nonlinear relationship and the public debt threshold illustrated in Figure 3.2. The dotted T* line is the public debt threshold limit or the 'turning point'. To the left T* is the lower limit which indicates as public debt rise, growth rate increase as well. On the right T* in the upper limit which shows as public debt rise further beyond threshold level, the growth become 'negative' or slower. This relationship can exist in both inverted-U shape and U-shape.

While non-linearities and threshold effects may possibly arise from the presence of debt overhang (Krugman, 1988; Sachs, 1989), nevertheless, there is a doubt whether debt overhang argument could be generally applied to all economies in which the theory based on external debt and not all economies borrow heavily from external source.

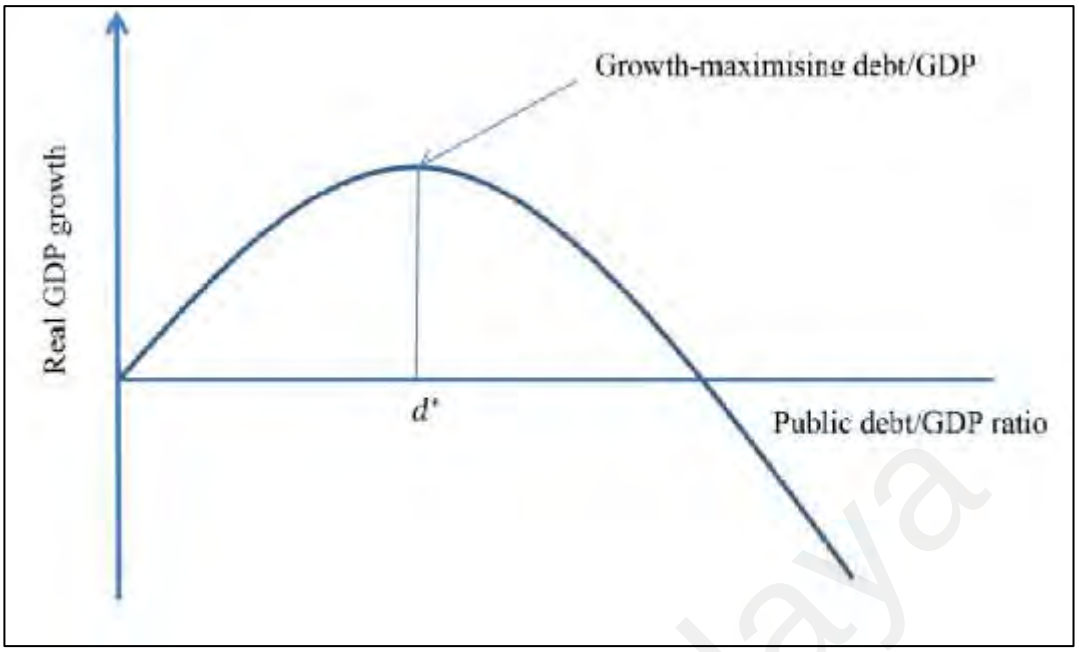


Figure 3.2: Nonlinear Relationship between Public Debt and GDP Growth

Source: Mupunga & Roux (2015)

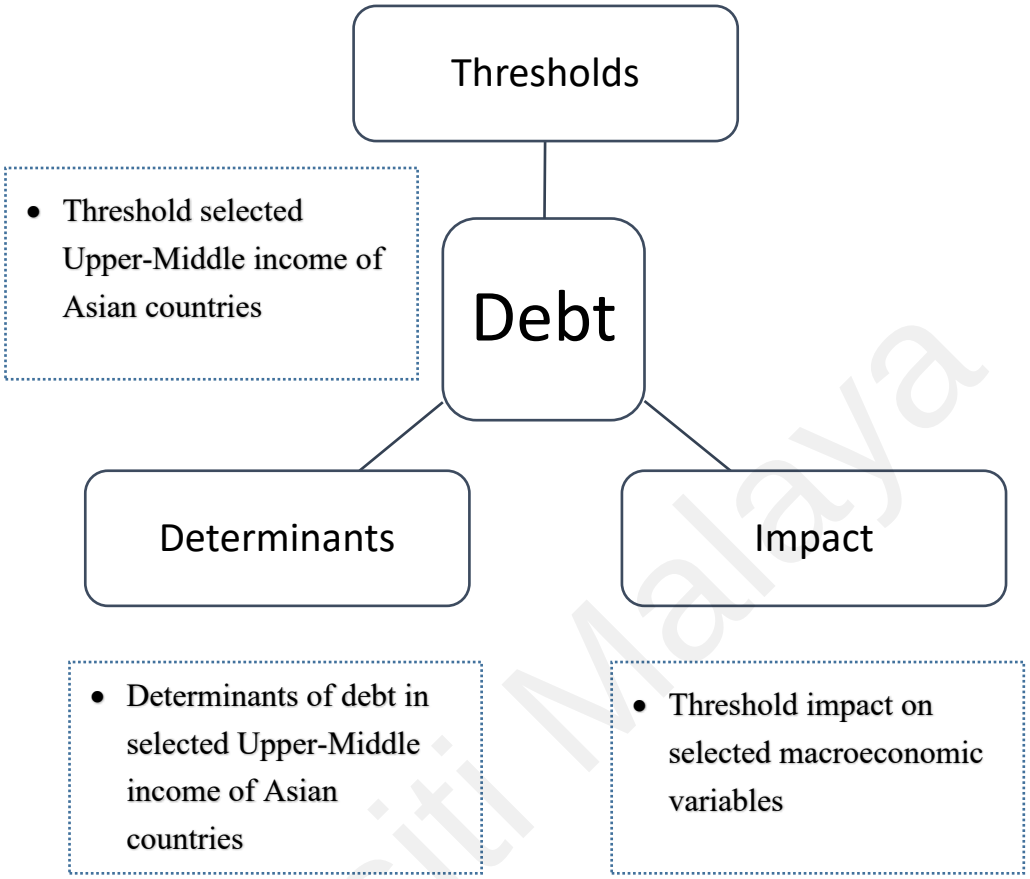
Checherita-Westphal, Hallett and Rother (2012) develop a theoretical model where, over the business cycle, public debt can only be issued to finance public investment and the optimal public debt level determined by the public-private capital ratio that maximises growth. As such, they show that public debt level that maximises growth is a function of the output elasticity of the capital stock. Nevertheless, Greiner (2012) shows that framework by Checherita-Westphal, Hughes Hallett and Rother driven by their assumption that the deficit is equal to public investment all the time.

According to Greiner, in such a set-up, debt is completely irrelevant and the non-linear relationship between debt and growth is given by the growth-maximizing tax rate. Greiner then illustrate that allowing for a more general debt policy leads to a monotone and negative relationship between public debt and steady-state growth. Greiner (2011; 2013)

also argues that the outcome of public debt on growth depends on the presence of rigidities in the economy. Greiner noted that, in a model with no rigidities and elastic labour supply, public debt has a negative impact on labour supply, investment, and economic growth. On the contrary, with the presence of wage rigidities and unemployment, public debt has no impact on the allocation of resources and have a positive outcome if it is used to finance productive investment.

Greiner concludes that there is no well-specified framework that can produce an inverted U-shaped relationship between public debt and growth. Nevertheless, nonlinearities may arise if there is a turning point above which public debt suddenly become unsustainable (Ghosh et al., 2013). High levels of public debt constraints a country's ability to implement countercyclical policies, thus increase output volatility and drag economic growth. Conversely, the relationship between debt and the ability to implement conduct countercyclical policies is more likely to depend on the structure of public debt itself than the level of public debt (Hausmann & Panizza, 2011; De Grauwe, 2011). This suggests that countries with different debt profile most likely to start facing problems at very different levels of public debt.

3.3 Conceptual Framework



The focus of this research is public debt. The conceptual framework is built around the three main building blocks in regards to public debt. First is the determinants of debt in a country. Second, will be the threshold in which public debt threshold level be estimated for selected countries. Third is the impact of breaching the public debt threshold level on selected macroeconomic variables. All these three aspects will be estimated using a sample of upper-middle income countries between 1980 and2015.

3.4 Methodology and Data

3.4.1 Autoregressive Distributed Lag (ARDL)

To examine the determinants of debt, this research utilised a pooled mean group estimation method built on the panel ARDL framework developed by Pesaran et al. (1999). The ARDL method been extensively utilised as it provides several advantages as compared with other traditional statistical approaches for assessment of co-integration as well as short/long-run relationships. This allows long-run level relationship between public debt and the regressors estimated will be helpful to formulate long-term economic goals and policies.

Besides, short-run coefficients and error variances of other descriptive variables estimated in panel ARDL setting are presumed to be distinguished (Pesaran et al., 1999) as compared to panel fixed or random effects estimators that only permit the intercept to differ across the analysis. Furthermore, the speed of adjustment can be utilised as an initial signal of whether the future track of public debt is explosive (positive) or non-explosive (negative) shown by error correction term which. Another feature of the panel ARDL modelling approach which is adjust for endogeneity in the regressors through lags on short-run coefficients which may vary across cross-sections.

As compared to other methods such as vector auto-regression (VAR), ARDL has an advantage in which the model can be employed to examination for a level relationship for variables (integration) that either $I(0)$ or $I(1)$ or the combination of both (Duasa 2007). However, ARDL doesn't allow to run with non-stationary or $I(2)$ variables. The

possibility of combination $I(0)$ and $I(1)$ variables is a great advantage as most of the economic data often are integrated at $I(0)$ or $I(1)$. Another advantage of ARDL as compared to VAR is that in order to conduct VAR approach, the series are required to be stationary. If the data is non-stationary or $I(1)$, then the first difference of the series ($\triangle y_t$) needed to run VAR. However, the weakness of this approach is that connection between series may fade due to the difference in the long-run (Brooks, 2014). Therefore, in an ARDL model, this condition is not necessary and do not need to make an adjustment on the data. Thus, the data still holds and long-run relationships still possible to calculate.

In addition, another advantage of ARDL model it is integrating both short-run impacts with a long-run equilibrium using an error correction term (ECT). This allows long-run information still captured. This makes possible to assess the short-run and long-run relationships simultaneously. Furthermore, the possibility to determine different lags for each variable in the model makes it much flexible (Pesaran et al., 2001). Moreover, most methods are sensitive to the sample size, unlike ARDL model, provides robust and consistent results even for small sample size (Pesaran & Shin, 1998; Pesaran *et al*., 2001; Adom et al., 2012). This is as an advantage for the study as some of the countries have relatively smaller sample size as compared to others.

There are three important assumptions in estimating a panel ARDL model (Pesaran et al., 1999), which are:

(i) the disturbance εit are independently and identically distributed across the countries and time;

(ii) the model follows a stationary process to ensure the coefficient of the error correction term ranges between 0 and -1. This is important property to establish long-run relationship between the dependent variable and the explanatory variables. To fulfil the assumption, all variables should integrate at either (0) or (1); and

(iii) the pooled mean group or panel ARDL model assumes that there is long-run homogeneity where the coefficients of all explanatory variables are similar across the cross-sections in the long run.

In order to analyse the possible relationships between two or more variables, often postulate specifications according to equation (3.13), where Y is the dependent variable and X is a vector of independent variables. The ARDL model is a technique that capture the relationship in $f(X)$.

$$Y = f(X) \qquad \text{(Eq. 3.13)}$$

Hence, the public debt dynamics, the debt law of motion can be written in the equation form as follows (Croce & Juan-Ramon, 2003):

$$d_t = f(y_t, g_t, r_t, rer_t, \pi_t, c_t, s_t, tr_t, e_t, D_t) \qquad \text{(Eq. 3.16)}$$

Equation (3.16) is written as debt (d_t) as a function of economic growth rate (g_t), real interest rate (r_t), real exchange rate (rer_t) as well as inflation (π_t). Among other selected macroeconomic variables are capital stock (c_t), gross national saving (s_t), total trade (tr_t), employment (e_t) and a dummy variable to capture impact of various shocks in the form of crises (D_t).

Based on literature, r_t expected to have positive correlation with debt accumulation (Paesani et al., 2006; Ogawa et al., 2016; Pirtea et al., 2013; Mothibi & Mncayi, 2019). The behaviour of rer_t, π_t and the build-up of debt within the automatic debt dynamics is uncertain as its be subject to on the level of exchange rate pass-through. Therefore, the effect can be positive, negative or even insignificant depending on the pass-through. Since the g_t is endogenous, hence, factors influencing g_t such as capital stock, government consumption, terms of trade are incorporated in the equation as supplementary explanatory variables (Fischer, 1993; Bosworth & Collins, 2003; Chirwa & Odhiambo 2018). A dummy variable was created to cover several economic crisis period observed in 1985, 1997 and 2009. Therefore, these shocks expected to be a significant factor affecting public debt (Hashem & Fahmy, 2019; Romer & Romer 2018; Stuart, 2017; Battaglini & Coate 2016). The debt law of motion for panel ARDL (p,q,q,….,q) can be written as follow:

$$lDebt_{it} = \beta_i + \sum_{j=0}^{q} \beta_{1,ij} ly_{i,t-j} + \sum_{j=0}^{q} \beta_{2,ij} ls_{i,t-j} + \sum_{j=0}^{q} \beta_{3,ij} lg_{i,t-j} + \sum_{j=0}^{q} \beta_{4,ij} r_{i,t-j} + \sum_{j=0}^{q} \beta_{5,ij} lrer_{i,t-j} + \sum_{j=0}^{q} \beta_{6,ij} l\pi_{i,t-j} + \sum_{j=0}^{q} \beta_{7,ij} lc_{i,t-j} + \sum_{j=0}^{q} \beta_{8,ij} ltr_{i,t-j} + \sum_{j=0}^{q} \beta_{9,ij} le_{i,t-j} + \sum_{j=0}^{q} \beta_{10,ij} D_{i,t-j} + \varepsilon_{it} \quad \text{(Eq. 3.17)}$$

From equation (3.17), βi represents the fixed effects; while $\beta_{1,,\ldots,9,ij}$ represent the coefficients of the lagged dependent variable and regressors. In a panel error correction representation, equation (3.17) as follows:

$$lDebt_{it} = \beta_i + \sum_{j=0}^{q} \beta_{1,ij} \Delta ly_{i,t-j} + \sum_{j=0}^{q} \beta_{2,ij} \Delta ls_{i,t-j} + \sum_{j=0}^{q} \beta_{3,ij} \Delta lg_{i,t-j} + \sum_{j=0}^{q} \beta_{4,ij} \Delta r_{i,t-j} + \sum_{j=0}^{q} \beta_{5,ij} \Delta lrer_{i,t-j} + \sum_{j=0}^{q} \beta_{6,ij} \Delta l\pi_{i,t-j} + \sum_{j=0}^{q} \beta_{7,ij} \Delta lc_{i,t-j} + \sum_{j=0}^{q} \beta_{8,ij} \Delta ltr_{i,t-j} + \sum_{j=0}^{q} \beta_{9,ij} \Delta le_{i,t-j} + \sum_{j=0}^{q} \beta_{10,ij} \Delta D_{i,t-j} + \alpha_{1,ij} ly_{i,t-1} + \alpha_{2,ij} ls_{i,t-1} + \alpha_{3,ij} lg_{i,t-1} + \alpha_{4,ij} lr_{i,t-1} + \alpha_{5,ij} lrer_{i,t-1} + \alpha_{6,ij} l\pi_{i,t-1} + \alpha_{7,ij} lc_{i,t-1} + \alpha_{8,ij} ltr_{i,t-1} + \alpha_{9,ij} le_{i,t-1} + \alpha_{10,ij} D_{i,t-1} + \varepsilon_{it} \quad \text{(Eq. 3.18)}$$

Therefore, equation (3.18) will be the model used to test for no level relationship in a panel ARDL framework. The parameters $\beta_{1,,\ldots,}$ $\beta_{9,ij}$ are short-run elasticities while $\alpha_{1,ij,\ldots,}\alpha_{8,ij}$ long-run elasticities and used to estimate the speed of adjustment. Once a long-run level relationship estimated, the error correction model (ECM) in a panel ARDL framework is estimated as follows:

$$lDebt_{it} = \beta_i + \sum_{j=0}^{q} \beta_{1,ij} \Delta ly_{i,t-j} + \sum_{j=0}^{q} \beta_{2,ij} \Delta ls_{i,t-j} + \sum_{j=0}^{q} \beta_{3,ij} \Delta lg_{i,t-j} + \sum_{j=0}^{q} \beta_{4,ij} \Delta lr_{i,t-j} + \sum_{j=0}^{q} \beta_{5,ij} \Delta lrer_{i,t-j} + \sum_{j=0}^{q} \beta_{6,ij} \Delta l\pi_{i,t-j} + \sum_{j=0}^{q} \beta_{7,ij} \Delta lc_{i,t-j} + \sum_{j=0}^{q} \beta_{8,ij} \Delta ltr_{i,t-j} + \sum_{j=0}^{q} \beta_{9,ij} \Delta le_{i,t-j} + \sum_{j=0}^{q} \beta_{9,ij} \Delta le_{i,t-j} + \sum_{j=0}^{q} \beta_{10,ij} \Delta D_{i,t-j} + \rho_i ECM_{i,t-1} + \varepsilon_{it} \quad \text{(Eq. 3.19)}$$

F-Bounds Test

With the results from equation (Eq. 3.19), it is possible to determine if a long-run association exists among the variables. In order to establish the existence of a long-run relationship, F-bound test is needed to be performed. The test needs to analyse the coefficients computed from equation (Eq. 3.19) and for the one period lagged variables are jointly zero. Thus, the following hypothesis test is performed:

$H_0: \beta_1 = \beta_n = 0$ (Long run relationship does not exist)

$H_0: \beta_1 \neq \beta_n \neq 0$ (Long run relationship does exist)

The F-test in the ARDL framework has a non-standard distribution that be subject to three conditions as below:

i) The mix of *I*(0) and *I*(1) independent variables;
ii) The number of independent variables; and
iii) If the model includes an intercept and/or trend term.

The hypothesis testing involves both upper and lower bounds of critical values and the test has three different cases. The critical value tabulated by Pesaran et al. (2001) is used to reject the null in which if the estimated F-statistic greater than upper bound then null hypothesis is rejected. This confirms the existence of long-run relationship between the variables. The computed F-statistic has to be greater than the upper bound to reject the null hypothesis is rejected and it confirms the existence of a long-run relationship between the variables regardless of the integration order of the variables (Duasa, 2007). The null

hypothesis cannot be rejected if the F-statistic falls below the lower bound; therefore, the cointegration is not significant. However, the test is inconclusive if F-statistic falls in between the upper and lower bound.

Error Correction Modelling (ECM)

To define an ECM-term, there are few assumptions of this term as explained by Banerjee et al. (1998) and Kremer et al. (1992). Given that the F-bound test produce satisfactory results, it allow to determine the long-run equilibrium relationship without spurious regression as the linear combination of the non-stationary variables are stationary in a simple OLS framework (Haq & Larsson, 2016):

$$y_t = \beta_0 + \beta_1 x_t + \varepsilon_t \qquad \text{(Eq. 3.20)}$$

The convergence of the model towards equilibrium an error correction term defined by $ECM_{t-1} = y_{t-1} - \widehat{\beta_0} - \widehat{\beta_1} x_{t-1}$,where βs are the estimators from equation (3.20). The ECM_{t-1} is the residuals from equation (3.20). To ensure the model is moving towards equilibrium in the long-run, the difference between the independent and dependent variables ECM_{t-1} has to reduce. As x_t, y_t, β_j are all given from the regression in equation (3.20), ECM_{t-1} becomes a new data series. The short-run dynamics are estimated by replacing the lagged variables x_t and y_t, with the error correction term in equation (4.9). The equation can be written as:

$$\Delta y_t = \beta_0 + C_0 t + \sum_{i=1}^{q} \varsigma_i \Delta y_{t-i} + \sum_{j=0}^{p} \omega_j \Delta x_{t-j} + \lambda ECM_{t-1} + \epsilon_t \qquad \text{(Eq. 3.21)}$$

The ECM coefficient λ must be statistically significant and negative in order for the model to converge to equilibrium. A stable long-run relationship and cointegration between the variables can be confirmed given significant ECM coefficient. The coefficient can be interpreted as the speed of adjustment towards equilibrium. In example, for annual data, the $\lambda=-0.5$, a shock in *x* will adjust the *y* to return to equilibrium in the long-run with a speed of 50% per year. The ECM term is very useful for policy makers as it can determine how fast any policies impact in the economy can be expected or in other words it also explains the speed of adjustment towards baseline given any shock.

3.4.2 Threshold Regression

The second objective of this study is to identify threshold level of selected upper middle-income countries. A panel threshold regression method developed by Hansen's (2000) and Caner and Hansen's (2004) has been adopted which allow for multiple threshold regimes. The statistical theory developed by Hansen (2000) allows to detect and estimate thresholds of either cross-section or time series panel. The threshold regression model takes the form:

$$y_i = \theta_1' x_i + \varepsilon_i \qquad q_i \leq \gamma \qquad \text{(Eq. 3.22)}$$

$$y_i = \theta_2' x_i + \varepsilon_i \qquad q_i > \gamma \qquad \text{(Eq. 3.23)}$$

where q_i is the threshold variable that being tested; γ is the threshold level of the variable which can be used to divide the sample into two groups (below and above threshold levels as illustrated in **Figure 3.2**) and ε_i is the error term of the regression. To begin with, the sum of square errors (SSE) is to be calculated for a given threshold. This followed by the estimation of $(\hat{\gamma})$ is to reducing the sum of squares. An F test is then used to conclude if there exists a threshold effect and to test the null hypothesis, such that:

$$F(\gamma) = \frac{(SSE_0 - SSE_1(\hat{\gamma}))/1}{SSE_1(\hat{\gamma})/n(T-1)} = \frac{SSE_0 - SSE_1(\hat{\gamma})}{\hat{\sigma}^2} \qquad \text{(Eq. 3.24)}$$

If the null hypothesis rejected, a significant threshold is said to be found. The presence of nuisance will cause F-test statistic to follow non-standard pattern, hence, Hansen (1999, 2000) recommended a "bootstrap" method. Through this, the asymptotic distribution of test statistics can be computed using likelihood ratio test to test the threshold significance.

The bootstrap method attains the first-order asymptotic distribution, thus *p*-values obtained from the bootstrap are asymptotically valid. In addition, according to Hansen (1999) the best option to construct confidence intervals for γ is by forming 'no-rejection region' using the likelihood ratio statistic for tests on γ. Hence, to test the hypothesis:

$H_0: \gamma = \gamma_0$

$H_1: \gamma \neq \gamma_0$

Therefore, the following test statistic is calculated:

$$LR_1(\gamma) = \frac{SSE_1(\gamma) - SSE_1(\hat{\gamma})}{\hat{\sigma}^2} \qquad \text{(Eq. 3.25)}$$

The null hypothesis is rejected when $LR_1(\gamma_0)$ is large and the p-value is less than the significance level. The distribution of threshold estimate is nonstandard. Since it is built on an asymptotic[11] distribution theory, a confidence interval of the test statistics can be created. Monte Carlo simulations are used to calculate the accurateness of the asymptotic approximations. Hansen's (2000) procedure is widely used in both cross-sectional and fixed effect panel analysis with condition that no endogenous problem occurs. The threshold level γ is obtained by utilising the least-square method developed by Hansen (2000). Once a threshold variable is established, a simple regression can be utilised to produce reliable estimation for the remaining parameters within each cluster. This method is known as Hansen (2000) panel approach.

[11] Asymptotic theory describes the behaviour of random variables as the sample size increases toward infinity. It is appeal due to several factors among which it is sometimes very difficult, or even not possible, to establish the properties of estimators in finite samples, whereas the "large sample" or asymptotic properties may be more easily known. Consistency is one such asymptotic property of great importance. Although some may accept an estimator that is biased in small samples, but some are hesitant to use one that is an inconsistent estimator-that is, one that does not converge on the population parameter even when the sample size is arbitrarily large (Greene, 2004).

The technique needs that all right-hand-side variables are exogenous. In certain conditions, if the variables on the right-hand side could be endogenous; therefore Hansen (2000) method will not be appropriate. Caner and Hansen (2004) further enhanced the model in which the descriptive variables are permitted to be endogenous. Therefore, the model can be written as:

$$y_i = \theta_1' z_i + \varepsilon_i \qquad q_i \leq \gamma \qquad \text{(Eq. 3.26)}$$

$$y_i = \theta_2' z_i + \varepsilon_i \qquad q_i > \gamma \qquad \text{(Eq. 3.27)}$$

$$z_i = g(x_i, \pi) + \mu_i \qquad \text{(Eq. 3.28)}$$

Hence, z can be endogenous and q_i is essential to be exogenous variable. π is the unidentified parameter vector and g(.) is an assumed known function that maps exogenous variables and the instrumental variables from X to Z vector. The threshold test is a Sup Wald statistic.

3.5 Sample Selection and Data

This research uses sample of upper middle-income Asian countries. **This sample selection also recommended by Abd Rahman, Ismail & Ridzuan (2019), stressing the lack of information on these economies and more attention needed**. Upper middle-income countries are those with Gross National Income (GNI) per capita between USD 4,036 and USD12,475 in year 2015 based on The World Bank Atlas method[12]. By using this classification, it allow to choose upper-middle Asian countries sample based on an established method. By doing so, sample biasness and outliers can be avoided which may cause result to be less accurate. Based on GNI per capita range given by the World Bank, there are 14 countries within this category, which are Armenia, Azerbaijan, China, Georgia, Indonesia, Iran, Jordan, Kazakhstan, Lebanon, Malaysia, Maldives, Thailand, Turkey and Turkmenistan.

However, due to data insufficiency issue Maldives and Turkmenistan dropped from the sample. Nevertheless, remaining sample size is sufficient to conduct both panel ARDL and threshold regression estimation. Upper-middle income Asian countries chosen for this research as many literatures available provide reasonable understanding of the research subject covering high-income and to a certain extend low-income Asian countries. Upper-middle income countries often not analysed thoroughly and only limited literature available in regards to this sample.

[12] To calculate GNI in U.S. dollars for certain operational and analytical purposes, the World Bank utilise the Atlas conversion factor instead of simple exchange rates. The reason for Atlas conversion factor is to reduce the impact of exchange rate fluctuations in the cross-country comparison of national incomes. The Atlas conversion factor for any year is by taking an average of a country's exchange rate for that year and its exchange rates for the two preceding years, adjusted for the difference between the rate of inflation in the country and international inflation. The objective of this adjustment is to reduce any difference in the exchange rate caused by inflation.

Data for this research mainly sourced from World Bank covering 1980 to 2015 period. Additionally, data from IMF, also used for certain indicators. Using data from international sources ensure consistency of data in analysis. The variables used for this research are GDP, debt, capital, exchange rate, interest rate, inflation rate, trade, government consumption, saving and employment. Additionally, a dummy variable also included to capture crisis impact on debt. Description of each variable attached in Appendix 2.

CHAPTER FOUR

Determinants of Debt: An Analysis on Selected Upper-Middle Income Asian Countries

4.0 Introduction

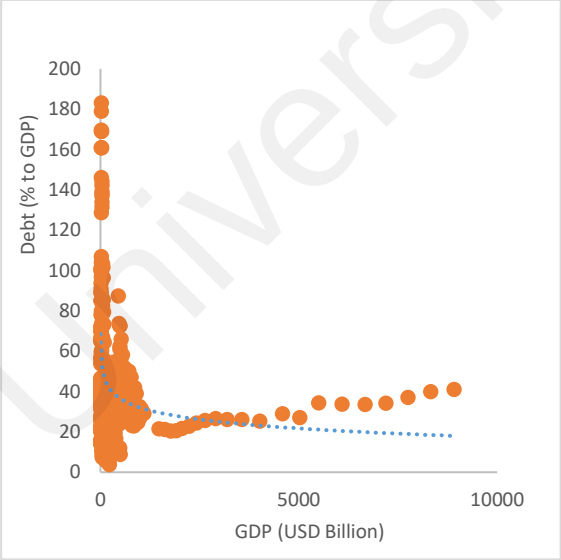
This chapter illustrates the findings on determinants of public debt for upper-middle income Asian countries using Auto-Regressive Distributed Lag (ARDL) approach. The findings are elaborated according to both aggregate level (the selected upper-middle income Asian countries[13]) as well as country-specific (China, Indonesia, Malaysia, Thailand and Turkey). The upper-middle income Asian economies were selected as these countries had experienced several major economic crises, namely commodity crisis (1980), Asian Financial Crisis (1997), Global Financial Crisis (2008) and the recent COVID-19 pandemic crisis. These crises had caused public debt ratios in these selected countries to rise following countercyclical measures adopted by the governments to review the economy. (Asterioue et al., 2020). Furthermore, among the selected upper-middle income Asian countries, China has the highest debt level of with its total debt (public and private) quadrupled from USD7 trillion in 2007 to USD28 trillion in 2014, mainly fuelled by real estate and shadow banking (MGI, 2015).

Available evidence suggests that public debt determinants differ depending on the study period, sample selection and estimation methods. In line with previous literatures, a number of macroeconomic variables were identified to analyse the determinants of debt.

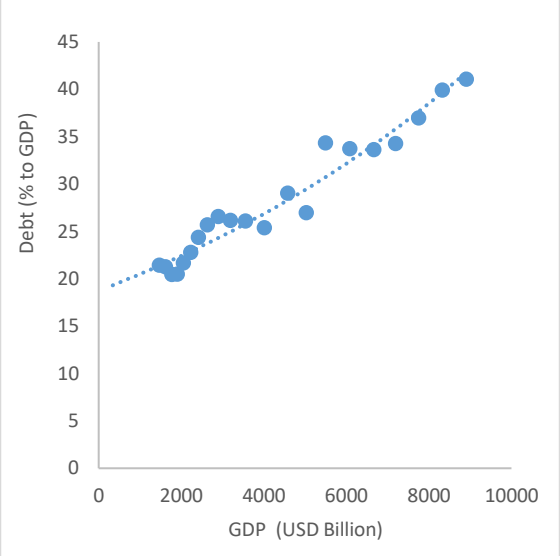
[13] Armenia, Azerbaijan, China, Georgia, Indonesia, Jordan, Kazakhstan, Lebanon, Malaysia, Thailand and Turkey.

These include real GDP, capital stock, national saving, government consumption, real interest rate, real exchange rate, total trade, employment and inflation.

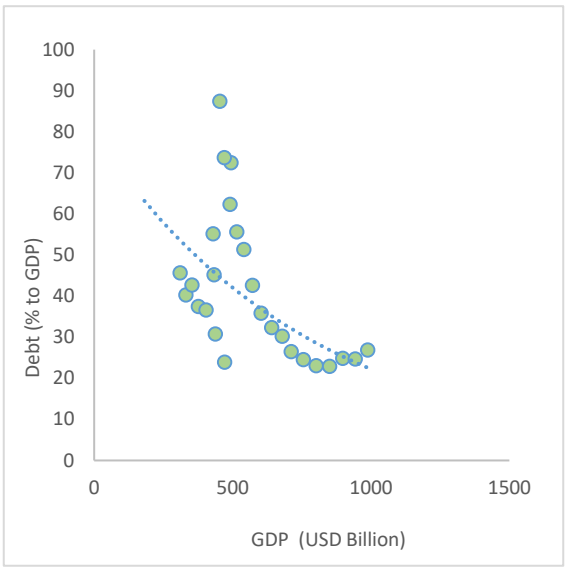
The scatter plot in Figure 4.1 (Panel a – f) illustrates the relationship between public debt and real GDP. The plot for the overall upper-middle income Asian countries shows a negative trend, indicating an inverse association of public debt and growth. Meanwhile by country-specific, China and Thailand demonstrate a positive trend between public debt and GDP, while for Indonesia, Malaysia and Turkey there is a downward trending pattern. The relationship displays a mixed trend unlike most literature conclude that public debt and growth are negatively associated. Hence, this research provides country-specific analysis and in depth explanation on the public debt and macroeconomic relationships.



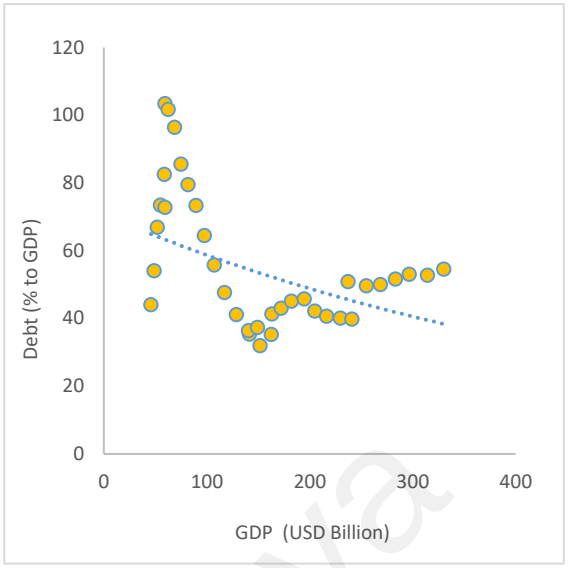
(a) Asian Upper-Middle Income Countries



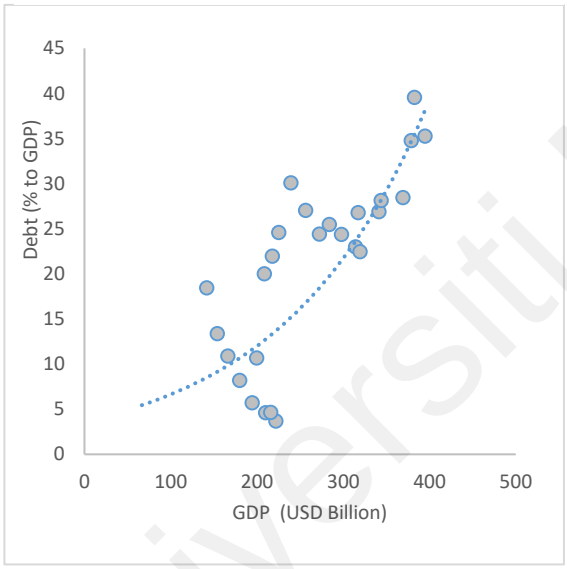
(b) China



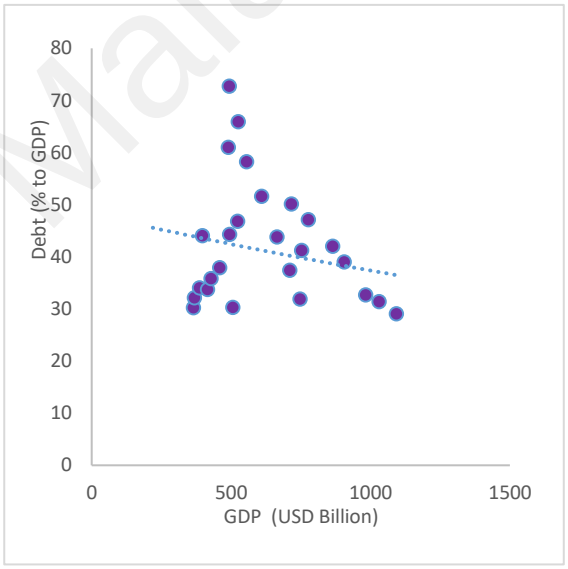
(c) Indonesia



(d) Malaysia



(e) Thailand



(f) Turkey

Figure 4.1: Scatter Plot of Public Debt and GDP For Upper-Middle Income and Selected Asian Countries

Source: World Bank and author's calculation

4.1 Correlation and Descriptive Statistics Analysis

4.1.1 Correlation Analysis for Selected Upper-Middle Income Countries

The results of correlation analysis for upper-middle income countries between public debt and selected macroeconomic variables are presented in Table 4.1. Except for real exchange rate and total trade, other variables such as real GDP, capital stock, saving, employment, government consumption, real interest rate and inflation rate are negatively correlated with public debt. The negative correlation between public debt and employment as well as savings is found to be highest at -0.45 and -0.43, respectively. This is followed by real interest rate (-0.18), real GDP (-0.14), capital stock (-0.13), government consumption (-0.10) and inflation (-0.10).

4.1.2 Descriptive Statistics Analysis for Upper-Middle Income Countries and Country-specific

Descriptive statistics of the pooled-sample is accessible in Tables 4.2 and Table 4.3 for the selected Asian countries. Public debt for upper-middle income Asian countries averaged at 35.3% while minimum and maximum level were at 45.6% and 183.1%, respectively. Average public debt in China, Indonesia, Malaysia, Thailand and Turkey is at 26.2%, 37.1%, 50.4%, 23.7% and 40.1%, respectively. China has largest GDP of USD11 trillion (in nominal terms) in 2015 followed by Turkey USD864 billion, Indonesia USD861 billion, Thailand USD401 billion and Malaysia USD301 billion. Average inflation rate for pooled-sample recorded at 5.1%. At country-specific level, highest average inflation was noted in Turkey (33.3%) followed by Indonesia (7.7%), Thailand (3.3%), Malaysia (2.8%) and China (1.9%).

Table 4.1: Correlation between Public Debt and Selected Macroeconomic Variables for Upper-Middle Income Asian Countries

	Public debt	GDP	Real exchange rate	Real interest rate	Capital stock	Total trade	Government Consumption	Inflation	Employment
Public Debt	1.0000								
GDP	-0.1446	1.0000							
Real exchange rate	0.1306	-0.0173	1.0000						
Real interest rate	-0.1848	-0.0671	0.3868	1.0000					
Capital stock	-0.1300	0.9845	0.0039	-0.0828	1.0000				
Total trade	0.1291	-0.2788	0.0596	-0.3614	-0.2669	1.0000			
Govt. Consumption	-0.0959	0.9657	0.0294	-0.0797	0.9730	-0.2095	1.0000		
Inflation	-0.0983	-0.0559	-0.3075	0.3116	-0.0743	-0.2718	-0.0785	1.0000	
Employment	-0.4458	0.2987	-0.1198	-0.4011	0.2861	0.1309	0.2367	-0.1884	1.0000
Saving	-0.4306	0.3535	0.1429	0.1429	0.3378	0.0596	0.2922	-0.0313	0.2299

Note: Panel data consists of 12 upper middle-income countries, which are Armenia, Azerbaijan, China, Georgia, Indonesia, Jordan, Kazakhstan, Lebanon, Malaysia, Thailand and Turkey.
Source: Author's calculation

Table 4.2: Descriptive Statistics of Selected Macroeconomic Variables for Upper Middle-Income Asian Countries

	Public debt	GDP	Employment	Capital stock	Inflation	Government consumption	Real exchange rate	Real interest rate	Saving	Total trade
Mean	45.6	540,551.6	98.4	187,628.0	10.0	66,112.8	102.4	19.5	213,752.5	85.1
Median	35.3	166,156.9	21.6	39,593.4	5.1	11,170.5	100.0	6.9	33,915.7	75.0
Maximum	183.1	8,913,504.0	944.7	4,035,840.0	176.0	1,793,950.0	296.3	366.2	5,034,883.0	220.4
Minimum	3.7	3,354.4	1.3	-949,892.7	-8.5	166.3	51.2	-24.9	-773.1	29.2
Std. Dev.	36.3	1,294,103.0	243.2	595,694.7	18.8	222,249.3	26.9	45.9	683,741.5	41.9
Skewness	1.75	4.35	3.02	4.34	4.65	5.74	2.77	4.41	5.37	1.15
Kurtosis	6.03	23.05	10.37	24.37	30.84	37.94	17.75	25.91	33.13	3.96
Jarque-Bera	240.83	5,355.83	1,016.95	5,963.38	9,653.24	15,163.84	2,782.25	6,752.69	11,465.64	70.14
Observations	269	269	269	269	269	269	269	269	269	269

Note: Panel data consist of 12 upper middle-income countries, which are Armenia, Azerbaijan, China, Georgia, Indonesia, Jordan, Kazakhstan, Lebanon, Malaysia, Thailand and Turkey.
Source: Author's calculation

Table 4.3: Descriptive Statistics of Selected Macroeconomic Variables for Selected Upper Middle-Income Asian Countries

	Public debt	GDP	Employment	Capital stock	Inflation	Government consumption	Real exchange rate	Real interest rate	Saving	Total trade
China										
Mean	28.2	4,279,335.0	922.0	1,738,960.0	2.9	614,996.7	97.1	2.7	1,884,168.0	46.3
Median	26.2	3,562,110.0	915.7	1,310,176.0	1.9	338,269.5	94.6	3.6	1,050,511.0	45.2
Maximum	41.1	8,913,504.0	944.7	4,035,840.0	16.8	1,793,950.0	129.9	7.4	5,034,883.0	64.5
Minimum	20.4	1,475,769.0	910.2	398,883.6	-1.4	97,754.5	78.6	-2.3	290,367.4	32.4
Std. Dev.	6.5	2,400,795.0	11.3	1,263,253.0	4.0	556,765.3	12.4	3.0	1,704,379.0	10.4
Skewness	0.57	0.55	0.79	0.58	2.05	0.96	1.03	-0.21	0.73	0.30
Kurtosis	2.11	1.96	2.17	1.86	7.86	2.48	3.70	1.95	2.01	1.86
Jarque-Bera	1.84	2.02	2.81	2.30	35.41	3.44	4.16	1.13	2.75	1.44
Probability	0.40	0.36	0.25	0.32	0.00	0.18	0.12	0.57	0.25	0.49
Indonesia										
Mean	41.4	574,818.9	137.2	104,638.7	10.2	33,634.4	97.5	5.1	291,899.5	56.4
Median	37.1	504,049.7	133.4	266,058.5	7.7	18,145.4	102.1	6.6	164,964.3	54.4
Maximum	87.4	988,128.6	164.0	1,045,478.0	58.5	86,851.5	116.0	15.6	682,696.8	96.2
Minimum	23.0	309,821.1	114.3	-949,892.7	3.7	5,434.2	51.2	-24.6	58,774.8	41.9
Std. Dev.	17.6	196,697.2	15.0	545,551.9	10.5	28,889.1	16.0	7.9	233,300.9	10.7
Skewness	1.02	0.67	0.51	-0.35	4.02	0.94	-1.19	-1.98	0.62	2.07
Kurtosis	3.26	2.31	2.09	2.23	19.02	2.23	3.89	8.61	1.73	8.52
Jarque-Bera	4.59	2.46	2.02	1.19	347.97	4.43	7.00	51.09	3.38	51.68
Probability	0.10	0.29	0.36	0.55	0.00	0.11	0.03	0.00	0.18	0.00

	Public debt	GDP	Employment	Capital stock	Inflation	Government consumption	Real exchange rate	Real interest rate	Saving	Total trade
Malaysia										
Mean	56.1	153,974.2	21.9	39,836.9	3.0	15,346.2	119.0	4.9	39,875.5	159.8
Median	50.4	145,387.6	21.8	41,544.0	2.8	10,150.8	109.6	4.6	30,191.9	157.9
Maximum	103.4	330,321.4	30.3	84,622.5	9.7	45,059.4	183.9	23.0	101,547.4	220.4
Minimum	31.9	45,772.0	13.8	11,504.9	0.3	4,047.5	89.6	-3.9	6,312.2	104.7
Std. Dev.	19.6	85,467.3	5.2	20,974.2	1.9	13,001.8	27.3	5.0	31,873.9	37.4
Skewness	1.02	0.44	0.03	0.34	1.25	1.23	1.04	1.21	0.73	-0.02
Kurtosis	3.02	2.03	1.71	2.26	5.37	3.15	2.91	6.06	2.13	1.68
Jarque-Bera	6.19	2.57	2.52	1.53	17.84	9.11	6.53	22.83	4.37	2.60
Probability	0.05	0.28	0.28	0.47	0.00	0.01	0.04	0.00	0.11	0.27
Thailand										
Mean	20.9	263,226.2	45.6	78,195.5	3.4	31,028.2	100.3	4.5	65,237.9	112.2
Median	23.7	247,652.6	45.8	82,543.0	3.3	20,443.2	103.3	4.2	52,991.0	119.8
Maximum	39.6	394,514.3	49.1	113,057.4	8.0	68,907.0	114.0	11.9	116,563.1	140.4
Minimum	3.7	141,610.9	41.3	44,618.5	-0.9	8,026.2	84.8	-0.6	28,189.0	75.8
Std. Dev.	10.2	76,126.5	2.3	19,170.2	2.3	20,709.7	9.5	3.4	30,575.4	22.7
Skewness	-0.28	0.22	-0.24	-0.24	-0.12	0.83	-0.32	0.29	0.59	-0.41
Kurtosis	2.11	1.83	1.94	2.16	2.35	2.16	1.76	2.20	1.82	1.65
Jarque-Bera	1.18	1.68	1.45	1.00	0.51	3.72	2.11	1.07	3.00	2.72
Probability	0.55	0.43	0.48	0.61	0.77	0.16	0.35	0.58	0.22	0.26

	Public debt	GDP	Employment	Capital stock	Inflation	Government consumption	Real exchange rate	Real interest rate	Saving	Total trade
Turkey										
Mean	42.5	625,442.4	23.9	157,135.9	40.3	60,306.2	79.4	15.1	103,801.2	45.4
Median	40.1	540,365.6	24.5	124,989.4	33.3	36,164.8	80.5	7.5	67,992.4	47.3
Maximum	72.7	1,093,419.0	27.4	299,598.5	105.2	134,268.0	103.2	91.9	233,797.2	55.0
Minimum	29.1	365,276.1	20.7	71,317.6	6.3	15,235.0	56.8	-8.3	23,772.4	30.5
Std. Dev.	11.7	215,758.1	1.8	72,348.2	33.8	43,499.3	12.7	21.9	73,845.3	7.3
Skewness	1.01	0.67	-0.06	0.50	0.34	0.52	0.00	2.03	0.51	-0.84
Kurtosis	3.27	2.35	1.97	1.88	1.57	1.60	1.95	7.26	1.69	2.60
Jarque-Bera	4.53	2.43	1.16	2.47	2.72	3.31	1.19	37.56	2.98	3.20
Probability	0.10	0.30	0.56	0.29	0.26	0.19	0.55	0.00	0.23	0.20

Source: Author's calculation

4.2 Diagnostic Tests

4.2.1 Co-integration Test

This study employed the Augmented Dickey-Fuller (ADF) co-integration test as proposed by Kao (1999), which identifies the first stage regressor cross-section intercepts and homogeneous coefficients. It is crucial to check the existence of a co-integration between the variables in order to establish a long-run stable relationship.

The hypotheses to test for co-integration are:

$H_0 : \alpha_1 = \alpha_2 = \alpha_n = 0$ (There is no cointegration in the model)
$H_1 : \alpha_1 \neq \alpha_2 \neq \alpha_n \neq 0$ (There is a cointegration in the model)

	t-Statistic	Prob.
ADF	-1.29152*	0.0983
Residual variance	0.040279	
HAC variance	0.041519	

Note: *p*-values: ***1% significance level; ** 5% significance level; *10% significance level.
Source: Author's calculation

Based on the result, H_0 is rejected at 10% significance to conclude that there is a long-run co-integration among the variables. Thus, the ARDL estimation can be performed to examine the determinants of debt.

4.2.2 Stationary Test

The first step in ARDL is the unit root test to identify the degree of integration. To satisfy the bound test assumption, each variable must integrated at I(0) or I(1). For time series data, stationarity test is crucial to check the existence of unit root issue (Dickey & Fuller 1979; Brooks 2014). Unit root analysis is performed with a long array of tests such as augmented Dickey Fuller (ADF), Kwiatkowski–Phillips–Schmidt–Shin (KPSS), Phillips–Perron (PP), Ng–Perron test, cross-sectional augmented IPS-CIPS, LS test and many others. Nevertheless, the tests often provide similar conclusions, therefore, this research utilises ADF test and considered sufficient (Brooks 2014).

The hypotheses to test for unit root are:

$H_0: \alpha = 0$ (Panel data has a unit root − non stationary)

$H_1: \alpha < 0$ (Panel data does not have a unit root − stationary)

The ARDL method accept regardless of the variables are *I*(0) or *I*(1) or a combination of both. However, it cannot be applied if the variables are integrated by of order *I*(2), as it crashes the model. Therefore, it is necessary to test for unit roots and identify variables that are integrated at order *I*(2). Based on unit root test conducted on both pooled group and specific countries, all selected variables satisfy the *I*(0) or *I*(1) requirements. As such, it is concluded that all the variables are stationary. The result of the unit root test is as shown in Table 4.4.

Table 4.4: Unit Root Test for Upper-Middle Income Asian Countries

	Level				1st difference			
	Without trend		With intercept & trend		Without trend		With intercept & trend	
Pooled	Statistic	p-value	Statistic	p-value	Statistic	p-value	Statistic	p-value
Public debt	0.4321	0.6672	1.5235	0.9362	-11.1327	0.0000	-7.3825	0.0000
GDP	7.0480	1.0000	0.8293	0.7965	-3.0614	0.0011	-3.6505	0.0001
Real exchange rate	1.4555	0.9272	1.9187	0.9725	-9.1782	0.0000	-4.1135	0.0000
Real interest rate	-4.6343	0.0000	0.8404	0.7997	-15.6218	0.0000	-4.1037	0.0000
Capital stock	3.5534	0.9998	0.8030	0.7890	-6.3704	0.0000	-4.6547	0.0000
Total trade	0.9643	0.8325	0.2594	0.6023	-9.0813	0.0000	-5.1471	0.0000
Government consumption	5.5094	1.0000	0.1173	0.5467	-5.3077	0.0000	-3.6859	0.0001
Inflation	-2.1944	0.0141	-2.1518	0.0157	-14.3284	0.0000	-4.4336	0.0000
Employment	-0.0123	0.4951	-1.1229	0.1307	-0.9301	0.1762	-6.7406	0.0000
Saving	4.3008	1.0000	9.1903	1.0000	-7.2025	0.0000	6.4843	1.0000
China								
Public debt	2.9019	0.9979	-3.4425	0.0739	-1.8857	0.0583	-6.5459	0.0002
GDP	1.2702	0.9420	-2.8984	0.1881	-4.0996	0.0004	-4.0643	0.0269
Real exchange rate	1.1045	0.9234	-0.5750	0.9692	-1.4183	0.1401	-3.3885	0.0828
Real interest rate	-0.8957	0.3145	-0.5793	0.9664	-5.5220	0.0000	-4.0278	0.0287
Capital stock	1.9408	0.9835	-0.8839	0.9383	-6.4844	0.0000	-3.6771	0.0599
Total trade	0.2296	0.7425	-0.3264	0.9833	-3.0818	0.0040	-3.4789	0.0707
Government consumption	1.6850	0.9728	-2.4048	0.3655	-4.0253	0.0005	-3.8687	0.0380
Inflation	-0.5124	0.4802	-3.9291	0.0301	-4.5234	0.0001	-4.2472	0.0182
Employment	-1.1083	0.2319	-3.1089	0.1322	-2.0142	0.0447	-3.0241	0.1544
Saving	1.3864	0.9527	-2.2504	0.4338	-4.8647	0.0001	-4.0187	0.0308

	Level				1st difference			
	Without trend		With intercept & trend		Without trend		With intercept & trend	
Indonesia								
Public debt	-0.3774	0.5376	-4.7009	0.0049	-8.8513	0.0000	-8.4737	0.0000
GDP	5.5919	1.0000	-1.3884	0.8393	-2.2060	0.0291	-3.5469	0.0568
Real exchange rate	-0.1669	0.6159	-2.5636	0.2980	-6.4282	0.0000	-6.2125	0.0002
Real interest rate	-3.8822	0.0004	-5.1187	0.0019	-9.4887	0.0000	-6.0058	0.0003
Capital stock	-0.3774	0.5376	-4.7009	0.0049	-8.8513	0.0000	-8.4737	0.0000
Total trade	-0.4406	0.5129	-2.9478	0.1656	-7.2666	0.0000	-7.1609	0.0000
Government consumption	1.5906	0.9689	-1.7795	0.6841	-4.5827	0.0001	-4.9133	0.0032
Inflation	-0.2378	0.5895	-4.0702	0.0198	-6.8881	0.0000	-6.5974	0.0001
Employment	2.2976	0.9929	-1.8315	0.6576	-2.2826	0.0245	-3.3309	0.0852
Saving	4.2575	0.9999	-1.7599	0.6891	-2.6183	0.0112	-4.2795	0.0128
Malaysia								
Public debt	-0.2669	0.5825	-1.5923	0.7757	-3.6580	0.0006	-3.4941	0.0561
GDP	9.1240	1.0000	-1.2267	0.8891	-0.9998	0.2781	-4.8079	0.0025
Real exchange rate	-1.6288	0.0966	-2.5620	0.2988	-4.1489	0.0001	-4.0841	0.0153
Real interest rate	-1.5528	0.1116	-6.5668	0.0000	-7.2141	0.0000	-7.0102	0.0000
Capital stock	2.1025	0.9900	-1.9532	0.6057	-4.6821	0.0000	-4.9764	0.0016
Total trade	0.1600	0.7262	0.0642	0.9954	-3.4037	0.0013	-3.4924	0.0573
Government consumption	3.2721	0.9995	-1.9478	0.6085	-3.9619	0.0002	-4.7051	0.0032
Inflation	-0.7514	0.3832	-3.6411	0.0406	-5.1686	0.0000	-5.2244	0.0009
Employment	0.5094	0.8189	-0.5631	0.9732	-2.7807	0.0074	-8.6860	0.0000
Saving	2.7196	0.9978	-2.1822	0.4843	-1.9361	0.0517	-5.3485	0.0006

	Level				1st difference			
	Without trend		With intercept & trend		Without trend		With intercept & trend	
Thailand								
Public debt	0.7683	0.8720	-3.6267	0.0506	-2.8120	0.0073	-2.9067	0.1810
GDP	5.2904	1.0000	-3.1691	0.1141	-2.3158	0.0227	-3.3796	0.0779
Real exchange rate	0.2620	0.7540	-0.9775	0.9294	-4.5182	0.0001	-2.5732	0.2942
Real interest rate	-1.4931	0.1239	-2.6287	0.2718	-7.3413	0.0000	-7.2353	0.0000
Capital stock	0.3499	0.7783	-1.7690	0.6891	-4.1201	0.0002	-3.9526	0.0253
Total trade	1.2923	0.9459	-1.3446	0.8522	-5.4170	0.0000	-3.3579	0.0844
Government consumption	1.4198	0.9561	-3.5315	0.0605	-2.2425	0.0268	-2.3048	0.4136
Inflation	-0.8644	0.3311	-4.0762	0.0190	-7.9245	0.0000	-7.7125	0.0000
Employment	2.0404	0.9876	-1.0854	0.9116	-3.9127	0.0004	-4.7630	0.0045
Saving	0.4976	0.8148	-2.9556	0.1658	-2.0582	0.0404	-2.0696	0.5319
Turkey								
Public debt	-0.1620	0.6173	-1.1019	0.9045	-7.7667	0.0000	-3.2996	0.0949
GDP	4.6796	1.0000	-2.1221	0.5094	-1.6444	0.0934	-4.1517	0.0206
Real exchange rate	0.8408	0.8860	-1.8950	0.6258	-7.4367	0.0000	-7.2827	0.0000
Real interest rate	-1.1608	0.2169	-3.5482	0.0557	-7.5080	0.0000	-7.2525	0.0000
Capital stock	1.4318	0.9580	-3.4939	0.0619	-6.2570	0.0000	-3.6789	0.0495
Total trade	0.8664	0.8906	-4.6684	0.0062	-3.9277	0.0004	-4.2650	0.0137
Government consumption	2.5041	0.9956	-2.2199	0.4582	-3.7195	0.0007	-4.2572	0.0134
Inflation	-1.4480	0.1344	-1.9399	0.6030	-3.7793	0.0006	-3.8963	0.0284
Employment	1.4092	0.9560	-0.5377	0.9738	-3.9504	0.0004	-4.8907	0.0034
Saving	1.7044	0.9752	-3.1884	0.1094	-2.6858	0.0096	-6.0155	0.0003

Note: Pooled data consist of 12 upper middle-income countries, which are Armenia, Azerbaijan, China, Georgia, Indonesia, Jordan, Kazakhstan, Lebanon, Malaysia, Thailand and Turkey.
Source: Author's calculation

4.3 Result and Discussion

4.3.1 Pooled Group Analysis

Through the ARDL approach, selected macroeconomic variables were analysed to comprehend how these variables respond with public debt. The ARDL model was applied on a pooled sample of 12 upper-middle income Asian countries as well as five specific countries from 1980 to 2015. Analysing at both the pooled and country-specific level allows apprehending the differences between overall and country-specific dynamics.

Pooled and individual samples tested on three different equations.[14] The research follows a canonical public debt-growth regression system that considers the following determinants from Loayza, Fajnzylber & Calderon (2005) as below:

1) Traditional convergence (GDP);
2) Structural factors (capital stock, employment and saving); and
3) Policy environment (government expenditure, inflation, interest rate, trade and exchange rate)

The sets of regressions analyse public debt-growth relationship, controlling for the structural factors and policy environment. In this estimation, real GDP was controlled at the beginning and traditional growth pattern took place across countries. Hence, a negative coefficient could provide theoretical evidence of public debt and growth

[14] Equation 1 : $d_t = f(y_t, g_t, \pi_t, c_t, s_t, tr_t, e_t)$
Equation 2 : $d_t = f(y_t, g_t, r_t, c_t, s_t)$
Equation 3 : $d_t = f(y_t, rer_t, c_t, tr_t, e_t)$

relationship. Following Loayza, Fajnzylber & Calderon, a set of structural factors such as capital stock, employment, saving, interest rate expected to enhance long-run growth. Employment enters as a reproducible factor in the production function that increases growth. It also improves the ability of nations to create or adapt to new technologies (Acemoglu & Zilibotti, 2001). Policy environment involves both domestic and foreign policy of a country. Domestic policy includes price stability, measured through inflation, while foreign policy comprises trade openness and exchange rate.

The results indicate that there is a long-run relationship for the pooled-sample where real GDP, total trade, inflation, saving and capital stock are found to be negatively correlated with public debt while real interest rates, government consumption and employment has positive relationship with public debt. The estimated results are presented in Table 4.5. The negative association between public debt and GDP growth implies that in the long-run, **a 1% increase in real GDP will reduce the debt level of the upper middle-income Asian countries between the range of 0.4% and 1.7% and vice versa**. This result is similar to past literatures. For example, Sinha et al. (2011) concluded that GDP growth is the most important determinant and negatively correlated with the public debt. In addition, Bittencourt (2015) emphasised the significance of GDP in reducing public debt, which is negatively correlated.

Total trade is another variable found to have negatively related with public debt. The results are significant to conclude that an increase in total trade will decrease debt by 1.1%. By running a trade surplus, debt-servicing capacity improved and reduces public debt level, especially external debt (Kızılgöl & İpek, 2014). Trade surplus is

expected to generate revenue stream for government, allowing paying back public borrowings. Likewise, **inflation is negatively related with debt demonstrating an increase in inflation could reduce debt by -0.23%.** Similar result was found by Aizenman & Marion (2009) and Fukunaga et. al. (2019), concluding that a 1% shock to inflation rate reduces debt by about 0.5%~1% for 19 advanced economies. High inflation contributes to public debt reduction, especially when accompanied by financial repression, in which real interest rates of the government debt is kept below-market levels due to regulations or institutional factors (Reinhart and Sbrancia, 2015).

Saving and capital stock among other variables that are negatively correlated with public debt. **Improvement in capital stock and national saving rate by 1% will reduce debt level by -0.20% and -0.12%, respectively**. This implies that as the debt level surges, the capital stock and saving level of a country tends to decline. A high level of public debt adverse consequences on macroeconomic stability, which discourages capital stock inflows (Singh, 2006). In addition, public debt has a negative effect on marginal growth, as high debt causes speculation over the government's ability to pay resulting in capital flight, causing the capital stock of the country to fall. On the contrary, higher capital stocks also indicate greater ability of the economy to promote growth, therefore, has the ability of generating primary surpluses and enabling the government to lower public debt (Moreira, 2013). On the other hand, an increase in public debt indicates a reduction saving rate. Vice versa, improvement in saving rate leads to investment expansion, boosting growth rate and reducing public debt (Araujo & Martins, 1999). This also indicates that both capital stock and saving works mutually where saving rate affects a country's investment level and thus the capital stock. Hence, changes in saving and capital stock influences public debt level through economic growth channel.

An increase in real interest rate by 1%, causes a surge public debt level by 0.03% as the borrowing cost becomes more expensive. Additionally, the accumulation of public debt is due to a rise in the real interest rate, which in turn shrinks interest-sensitive demand and further increases public debt (Ogawa, Sterken & Tokutsu, 2016). Government consumption and employment are positively correlated with public debt. The results shows that a **1% increase in government consumption leads to the debt level to rise by 0.63%.** Meanwhile, **as employment improves by 1%, the debt level surges by 1.6%**. In other words, the evidence shows that as debt level increases, employment in a country tends to improve as well. Therefore, in the long-run, debt is able to generate employment in a country.

According Hauptmeier et. al. (2015), expansionary fiscal policy during the period from 1999 to 2009 was mainly driven by higher government consumption contributing to a surge in public debt in many economies. As such, government's decision to implement expansionary expenditure through borrowings will improve the employment but at the same time will increase the public debt level. **Real exchange rate and public debt has a positive association, specifying that real appreciate[15] of 1% will lead to a surge in debt level by 0.9%**. Real exchange rate appreciates indicate government's burden surge as more fund to allocated for repayment purposes. Research finding by Kouladoum (2018) suggests that debts are positively and significantly correlated with real exchange rates.

[15] The real exchange rate reflects the economy-wide relative price of non-traded to traded goods, substituted by real effective real exchange measures. A rise (decline) in the latter means an RER appreciation (depreciation).

In a nutshell, the analysis reveals that real GDP, capital stock, saving, total trade and inflation have negative relationships with public debt. Any improvement in these variables will reduce the debt level. Conversely, employment, government consumption, real interest rate and real exchange rate have positive relationships. The co-integration coefficient also fulfils the expected negative sign. Statistically significant with negative signs indicate that long-run disequilibrium among dependent and independent variables will converge to baseline in long-run.

Table 4.5: Asian Upper Middle-Income Countries Pooled ARDL Estimation

	Equation 1		Equation 2		Equation 3		Overall Relationship
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	
GDP	-1.7708***	0.0000	-0.4229*	0.0979	-0.4466**	0.0301	-
Employment	2.8374***	0.0000	-	-	1.6008***	0.0000	+
Capital stock	-0.2021**	0.0357	-0.6887***	0.0001	-0.5368***	0.0001	-
Saving	-0.1209***	0.0000	-0.0216***	0.0053	-	-	-
Total trade	-1.0951***	0.0000	-	-	0.0201	0.9281	-
Gov. Consumption	-0.0406	0.5544	0.6319***	0.0000	-	-	+
Inflation	-0.2934***	0.0000	-	-	-	-	-
Real interest rate	-	-	0.0270***	0.0000	-	-	+
Real exchange rate	-	-	-	-	0.9273***	0.0018	+
Co-integration	-0.347012***	0.0027	-0.090848**	0.0105	-0.223168***	0.0012	

Note:
1) *p*-values: ***1% significance level; ** 5% significance level; *10% significance level
2) Panel data consist of 12 upper middle-income countries, which are Armenia, Azerbaijan, China, Georgia, Indonesia, Jordan, Kazakhstan, Lebanon, Malaysia, Thailand and Turkey.
Source: Author's calculation.

4.3.2 Country-Specific Analysis and Results

In depth country-specific analysis were conducted for China, Indonesia, Malaysia, Thailand and Turkey, which are the major economies within the upper-middle income group. Country-specific estimation reveals that not all the countries have similar relationship between their macroeconomic variables and public debt. Therefore, the country-specific analysis will help to understand the dynamics of public debt and macroeconomic variables. Country specific public debt determinants' relationship is presented in Table 4.6 – Table 10 while the summary of overall macroeconomic link in Table 4.11.

a) China

In China, the real GDP has a positive relationship with public debt. A 1% increase in real GDP increases the debt level between 3%~3.7%. Similar results were found by Spilioti (2015), Jacobo & Jalile (2017) and Grobéty (2017) that the public debt and real GDP growth are positively related in the case of China. Effective expansionary fiscal policy able to increase aggregate demand, national income, employment and growth, particularly when the economy is around the liquidity trap (Ewaida, 2017). Additionally, countries with moderate public debt have a positive short-run impact on growth, through implementation of accommodative monetary policy, institutional reforms, enhanced private savings and deepened financial intermediation (Gómez-Puig & Sosvilla-Rivero, 2018). These conditions suit well China which have relatively lower average public debt (26.2%) and high saving rate (45%). Therefore, this could explain the positive sign or relationship in China.

Public debt level in China expected to decline by 1.8% with employment rate rising by 1%. Aggressive fiscal policy, expansion in investment programmes, large import-intensive infrastructure projects are among the main factors for new employment creation and preserve export-oriented sectors in China (Wing, 2003). Employment rate in China stands at 70% is among the highest compared with other countries. The high employment rate fuelled China's economic growth for many years which helped to keep the public debt low. **Capital stock has a significant positive relationship with public debt in China where debt level surges 0.8% as capital increase 1%**. In the last three decades, half of the increase in output per worker in China was attributed to capital deepening. China's growth relied on momentous amount on capital accumulation which accounted for over 80% output per worker (Brandt et al., 2020). This makes capital stock and public debt level to hike collectively. **Improvement in saving rate is expected to reduce public debt between 0.3%~0.5%**. Higher saving rate will lead to higher investment, thus, enhance growth rate which in turn lowers public debt. **As the total trade improves by 1%, China's public debt declines between 0.4%~0.5%**.

Expansion in government expenditure by 1% lowers public debt between 0.3%~0.4% in China. Government expenditure channelled into productive spending is able to stimulate economic growth and generate revenue for the government. Consequently, the Chinese government is able to pay back the borrowings which then reduces public debt (Butkus et al., 2021). **A 1% increase in real exchange rate helps to reduce public debt by 0.3% in China**. Real exchange rate increase indicates a real depreciation in which this will able to boost trade performance which able to reduce public debt (Rapetti, Skott & Razmi, 2011). As for inflation and real interest rate, it does not have any significant relationships with China's public debt.

Table 4.6: China - Country Specific ARDL Estimation

	Equation 1		Equation 2		Equation 3	
	Co-efficient	**p-value**	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**
GDP	3.7337***	0.0000	2.0972***	0.0000	3.0210***	0.0000
Employment	1.0984	0.2402	-	-	-1.8364***	0.0034
Capital stock	0.7857***	0.0001	0.3670***	0.0038	0.1015	0.5357
Saving	-0.5087***	0.0021	-0.3130***	0.0071	-	-
Total trade	-0.3687***	0.0000	-	-	-0.5062***	0.0000
Government Consumption	-0.3384*	0.0923	-0.3955***	0.0016	-	-
Inflation	0.0013	0.8610	-	-	-	-
Real interest rate	-	-	0.0008	0.8112	-	-
Real exchange rate	-	-	-	-	-0.3788*	0.0665
Co-integration	-0.4088***	0.0000	-0.1141***	0.0008	-0.3104***	0.0001
Test Statistic	Value	k	Value	k	Value	k
F-statistic						
Critical Value Bounds	5.8490	7	11.5264	5	6.6567	5
Significance	I0 Bound	I1 Bound	I0 Bound	I1 Bound	I0 Bound	I1 Bound
10%	2.38	3.45	1.81	2.93	2.75	3.79
5%	2.69	3.83	2.14	3.34	3.12	4.25
1%	**3.31**	**4.63**	**2.82**	**4.21**	**3.93**	**5.23**

Note: *p*-values: ***1% significance level; ** 5% significance level; *10% significance level.
Source: Author's calculation

b) Indonesia

Indonesia's real GDP and public debt is negatively correlated, where a 1% expansion in growth rate is able to reduce debt by 4.1%. **As employment rate rises by 1%, the public debt level is anticipated to decrease by 2.5%**. Manufacturing sector in Indonesia remains as one of the main contributors for employment improvement. The rapid manufacturing sector transformation supported a quantum shift in employment and living standards (ADB, 2018), hence, supports the economic growth as well as reduces public debt. Indonesia's employment and public debt indicate average employment rise about 2% while debt fell 1% in line with estimated results. **As capital stock improves by 1%, Indonesia's debt level fall by 0.1%**. **Meanwhile, when savings improve by 1%, the public debt reduces by 0.7%**. Physical capital is the most important factor that generate higher national output which helps lower public debt in Indonesia (Cholifihani, 2008)

Indonesia's public debt predicted to decline by 1.2% as government consumption expands 1%. Government expenditure utilised on productive spending and investment will affect economic growth positively. Such spending is anticipated to a have substantial influence on economic development which contributes to debt reduction (Glomm & Ravikumar, 1997; Mundle, 1999). **A 1% increase in inflation is expected to lower public debt by 0.3%**. Hilscher et al. (2014) argued that higher inflation would reduce real value of outstanding public debt. This is generally possible if the government is able to practice financial repression, which is found to be a way to inflate public debt. Abbas et al. (2014) and Akitoby et al. (2014) also provide evidence that inflation effectively reduces debt level.

As the real exchange rate appreciate by 1%, Indonesia's public debt declines by 3.9%. Real appreciation lowers public debt through the trade channel, where government's revenue expands as total trade surges. Thus, this allows government to capitalise higher revenue to reduce the public debt level (Milesi-Ferreti & Lane, 2000). Estimation results shows real interest rate is insignificant determinant in Indonesia. Besides, economic shocks and public debt also has insignificant association in Indonesia.

Table 4.7: Indonesia - Country specific ARDL estimation

	Equation 1		Equation 2		Equation 3	
	Co-efficient	**p-value**	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**
GDP	-4.1488**	0.0147	-1.3081	0.6073	8.8367	0.1242
Employment	-2.1915	0.2578	-	-	-2.4980*	0.0727
Capital stock	-0.0049	0.4304	-0.0039	0.5694	-0.0717**	0.0500
Saving	-0.3346	0.4211	-0.7275**	0.0460	-	-
Total trade	-0.1737	0.7619	-	--	0.1311	0.8903
Government Consumption	-1.1626***	0.0032	-1.2661***	0.0002	-	-
Inflation	-0.3475*	0.0648	-	-	-	-
Real interest rate	-	-	0.0070	0.4083	-	-
Real exchange rate	-	-	-	-	-3.9297*	0.0531
Co-integration	-0.4631***	0.0001	-0.0962***	0.0000	-0.7060**	0.0302
Test Statistic	Value	k	Value	k	Value	k
F-statistic						
Critical Value Bounds	3.8193	7	6.5092	5	7.8719	5
Significance	I0 Bound	I1 Bound	I0 Bound	I1 Bound	I0 Bound	I1 Bound
10%	**2.38**	**3.45**	2.75	3.79	2.75	3.79
5%	2.69	3.83	3.12	4.25	3.12	4.25
1%	3.31	4.63	**3.93**	**5.23**	**3.93**	**5.23**

Note: *p*-values: ***1% significance level; ** 5% significance level; *10% significance level.
Source: Author's calculation

c) Malaysia

Real GDP and public debt is negatively correlated in Malaysia where **a 1% growth is expected to lower debt level between 1.1%~2.6%**. Meanwhile, with a **1% rise in employment rate, the public debt is predicted to increase by 2.8%**, hence signifying that there is a positive link between the two variables**.** Federal government debt has a positive and significant effect on employment growth, where manufacturing and service sectors have been the greatest contribution to employment growth that benefited from increase in government debt (Asmaddy & Abubaker, 2015). Thus, this explains the positive relationship between public debt and employment in Malaysia**. Public debt surges by 0.4% as capital stock rises by 1%**. This condition is in line with Kumar (2010) and Spilioti & Vamvoukas (2015), pointed out that capital stock can influence the debt level positively. As government utilise borrowings on productive investments, this will be able to create higher capital stock. Hence, as public debt increases in tandem with the surge in capital stock. Malaysia's capital stock and public debt over the years has risen on annual average of 7% and 1.3%, respectively.

Malaysia's public debt level is expected to fall between 0.2%~0.3% as the saving rate increase by 1%. When surplus savings deployed on an investment it significantly reduces public debt levels in Malaysia (Mirakhor, 2010). Similarly, expansion in total trade performance by 1% bring down the public debt level between 0.2%~0.7%. Siti Nurazira (2016) noted that trade is a significant factor that influence positively on growth which indirectly reduces public debt level in Malaysia. **As the Malaysian government increases its consumption by 1%, the debt level is projected to increase by 0.2%**. The public debt has increased significantly over the years as result of several economic crises.

Therefore, Malaysian government focused on expenditures for development policies to stimulate economic growth, such as Outline Perspective Plan, mainly aimed at developing heavy industries. These industries require high production costs; thus, the government embark on large budget deficit and government debt. **Likewise, public debt surges about 0.01% as real interest rate increases by 1%**. Shocks on real interest rates threaten debt and drives on an explosive path (Paesani et al., 2006). In addition, real interest rate hike decreases aggregate demand, causing economic slowdown and leads to a further spike in the public debt. Although real interest rate and public debt in Malaysia positively related, the impact of real interest rate has a minimal impact only. Malaysia's public debt composition dominated by domestic debt where the Employees' Provident Fund (EPF) holds about 50%~60% of Malaysia government securities (Aslam & Raihan, 2020). As such the government has the authority in setting the interest rate which is reflected by the relatively smaller impact of real interest rate on public debt.

As the real exchange rate increases by 1%, the public debt reduces by 0.8%. This condition explained by Milesi-Ferreti & Lane (2000) similar to the case of Indonesian. Furthermore, Federici & Gandolfo (2002) and Forslund et al. (2011) argues that real exchange rate appreciation in developing countries reduces public debt burden significantly. **Economic shock has a significant positive connection in which it found to increase Malaysia's public debt by 0.1%**. Public debt in Malaysia registered an increase during the commodity crisis (9.7%), Asian financial crisis (4.5%) as well as global financial crisis (11%). On the other hand, in Malaysia inflation and public debt does not have any significant connection.

Table 4.8: Malaysia - Country specific ARDL estimation

	Equation 1		Equation 2		Equation 3	
	Co-efficient	**p-value**	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**
GDP	-1.0733**	0.0315	-1.7235***	0.0013	-2.6186***	0.0001
Employment	2.8236***	0.0085	-	-	-16.7068	0.3877
Capital stock	-0.1022	0.2344	0.0218	0.8238	0.3830***	0.0036
Saving	-0.3039***	0.0001	-0.1704**	0.0239	-	-
Total trade	-0.2124*	0.0934	-	-	-0.7396***	0.0001
Government Consumption	0.1530**	0.0416	0.1580**	0.0321	-	-
Inflation	0.0157	0.7748	-	-	-	-
Real interest rate	-	-	0.0052***	0.0044	-	-
Real exchange rate	-	-	-	-	-0.8202***	0.0001
Co-integration	-0.6187***	0.0000	-0.2319***	0.0000	-0.3843***	0.0001
Test Statistic	Value	k	Value	k	Value	k
F-statistic						
Critical Value Bounds	4.6725	7	26.5421	5	15.0891	5
Significance	I0 Bound	I1 Bound	I0 Bound	I1 Bound	I0 Bound	I1 Bound
10%	2.38	3.45	2.26	3.35	1.81	2.93
5%	2.69	3.83	2.62	3.79	2.14	3.34
1%	**3.31**	**4.63**	**3.41**	**4.68**	**2.82**	**4.21**

Note: *p*-values: ***1% significance level; ** 5% significance level; *10% significance level.
Source: Author's calculation

d) Thailand

Thailand's real GDP and public debt are negatively associated. An increase in Thailand's real GDP by 1% will reduce public debt level between 2.8%~2.9%. Expansion in employment rate by 1% leads to an increase in debt level by 1.6%. Thailand has put in a lot of effort in industrialising its agrarian economy which was the major contributor to its economic growth and improvement in employment level. In this effort, the Thai government involved in heavy borrowing activities to fuel the industrialisation process (Kusakabe, 2006). **A 1% increase in capital stock will lower public debt between 0.5%~0.9%**. Government debt utilised to finance public capital stock is able to boost growth which in turn generate revenue for government to service the borrowings. Hence, an increase in capital stock will be able to lower public debt. Thailand's public debt level reduces between 0.9%~1% as the saving rate rises 1%.

Public debt is expected to increase by 0.7% as the total trade surges by 1%. The correlation coefficient between public debt and total trade is high at 0.8 indicating that these variables are highly associated. During the Asian financial crisis, the Thai government implemented various measures to reduce impact on external sector. Among the measures were increasing duties on luxury imports as well as surcharges on consumption imports to reduce trade deficit and spur exports in addition to stimulus packages worth of USD17.2 billion (Bullard, Bello & Malhotra, 1999). As a result, between 1997~1999, both public debt and total trade surged by 16%.

Inflation rate in Thailand is positively correlated with public debt. **A 1% surge in inflation will cause public debt to rise by 0.5%**. Nyong & Odubejan (2002) argued that public debt financed through monetary instruments causes money supply to increase and affects inflation. Additionally, inflation also leads to capital outflows which cause economic slowdown, hence, increases the debt level. Real exchange rate and public debt are negatively associated in Thailand. **As real exchange rate increases by 1%, the public debt is anticipated to fall by 1.7%**. On the other hand, inflation rate and economic shocks do not have any significant relationship with public debt in Thailand.

Table 4.9: Thailand - Country specific ARDL estimation

	Equation 1		Equation 2		Equation 3	
	Co-efficient	**p-value**	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**
GDP	-0.3769	0.6493	-2.9122*	0.0811	-2.8406**	0.0413
Employment	1.5884*	0.0697	-	-	1.0669	0.5023
Capital stock	-0.8620***	0.0017	-0.4736*	0.0860	0.1680	0.4594
Saving	-0.9773*	0.0542	-0.7633	0.1300	-	-
Total trade	-0.4352	0.2991	-	-	0.7256*	0.0694
Government Consumption	1.2174**	0.0236	1.4862*	0.0701	-	-
Inflation	0.4809*	0.0556	-	-	-	-
Real interest rate	-	-	0.0168	0.1695	-	-
Real exchange rate	-	-	-	-	-1.7021**	0.0290
Co-integration	-0.2143***	0.0028	-0.1975**	0.0197	-0.5941**	0.0191
Test Statistic	Value	k	Value	k	Value	k
F-statistic						
Critical Value Bounds	7.1666	7	11.2127	5	33.1676	5
Significance	I0 Bound	I1 Bound	I0 Bound	I1 Bound	I0 Bound	I1 Bound
10%	1.70	2.83	1.81	2.93	2.75	3.79
5%	1.97	3.18	2.14	3.34	3.12	4.25
1%	**2.54**	**3.91**	**2.82**	**4.21**	**3.93**	**5.23**

Note: *p*-values: ***1% significance level; ** 5% significance level; *10% significance level.
Source: Author's calculation

e) Turkey

Real GDP and public debt in Turkey are negatively correlated. Turkey's public debt level is expected to fall between 7.5%~8.6% as the real GDP expands. As Turkey's employment rate rises by 1%, the public debt level reduces by 3.5%. Yilmaz (2012) also emphasises that improvement in employment reaching towards full employment is able to cut public debt level in Turkey. **With capital stock expanding by 1%, the public debt level fall between 2%~2.4% in Turkey**. Spilioti (2015) explains that whenever public debt is used to finance public capital stock, the debt level will increase accordingly following the built-up in capital stock. **Public debt in Turkey will reduce by 0.9% as the saving increases by 1%**. As the savings are channelled for capital stock accumulation and investment, the country would be able to finance the economic growth by its own and as a result, public debt level will fall accordingly (Hjertholm, 2001).

In Turkey real exchange rate is positively linked with public debt. Real appreciation increases debt level by 1.7%. Turkey has experienced severe currency crisis in several occasions leading to high current account deficit and poor trade performance (Saygılı et al., 2010). Moreover, a sudden stop in capital flows triggered by Turkish Lira crisis simultaneously increasing pressure on exchange rate and borrowing cost, resulting in higher public debt (Özata, 2017). Therefore, real appreciation causes public debt level to surge in Turkey. **A 1% increase in total trade also causes Turkish public debt level to surge between 0.7%~1.3%**. This is also linked to Turkish Lira impact where the real exchange rate appreciation increases the price of imported intermediate inputs used in the production process, hence making exports more expensive (Karahan, 2020).

Government consumption in Turkey is capable of reducing public debt by 1.6% as the expenditure surge 1%. Turkey made significant improvement over the last two decades regarding fiscal consolidation and a strong fiscal policy reform. The government had focused on physical infrastructure investment, previously below 10% of GDP and now over 17% (Kaya & Yılar, 2011). These reforms and consolidation led to economic expansion which reduces public debt in Turkey. **Surge in inflation by 1% makes public debt to rise by 0.6%. Inflation swells government's borrowing cost thus leading to higher public debt level. Turkey is another country where the economic shock has a significant relationship with public debt**. Economic shocks push up debt level by 0.3%. Turkey experienced numerous crises in 1994, 1999, 2001 and 2009, where public debt level increased 10.3%, 30.7%, 25.9% and 8.9%, respectively. Real interest has insignificant relationship with Turkish public debt.

Table 4.10: Turkey - Country specific ARDL estimation

	Equation 1		Equation 2		Equation 3	
	Co-efficient	**p-value**	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**
GDP	-8.6255**	0.0108	-7.5834***	0.0038	-2.7847	0.2143
Employment	-3.5108**	0.0149	-	-	0.7936	0.1846
Capital stock	2.3938**	0.0348	2.0119**	0.0255	-0.8518	0.2383
Saving	-0.0490	0.8574	-0.9107***	0.0041	-	-
Total trade	0.6668*	0.0768	-	-	1.2845***	0.0038
Government Consumption	1.-1.6141**	0.0218	0.6539	0.1070	-	-
Inflation	0.5850***	0.0059	-	-	-	-
Real interest rate	-	-	-0.0009	0.4424	-	-
Real exchange rate	-	-	-	-	1.7336***	0.0029
Co-integration	-0.8531***	0.0093	-0.4612**	0.0103	-0.5120***	0.0066
Test Statistic	Value	k	Value	k	Value	k
F-statistic						
Critical Value Bounds	7.0150	7	3.6401	5	3.5365	5
Significance	I0 Bound	I1 Bound	I0 Bound	I1 Bound	I0 Bound	I1 Bound
10%	2.380	3.450	1.810	2.930	1.810	2.930
5%	2.690	3.830	**2.140**	**3.340**	**2.140**	**3.340**
1%	**3.310**	**4.630**	2.820	4.210	2.820	4.210

Note: *p*-values: ***1% significance level; ** 5% significance level; *10% significance level.
Source: Author's calculation

Table 4.11: Economic Shocks country specific ARDL estimation

Economic shocks	**Malaysia**		**Turkey**		**Thailand**		**Indonesia**	
GDP	0.1786	0.4699	-3.5221	0.0940	0.1119	0.8445	1.4732	0.1618
Shock	0.0668**	0.0126	0.3073*	0.0700	0.1496	0.1377	-0.2465	0.6802
Co-integration	-0.3235	0.0000	-0.9254	0.0021	-0.3235	0.0000	-0.8799	0.0127
Test Statistic	Value	k	Value	k	Value	k	Value	k
F-statistic								
Critical Value Bounds	5.4681	10	5.3777	10	8.0737	10	2.9987	10
Significance	I0 Bound	I1 Bound	I0 Bound	I1 Bound	I0 Bound	I0 Bound	I0 Bound	I0 Bound
10%	1.83	2.94	2.07	3.16	1.83	2.94	**1.83**	**2.94**
5%	2.06	3.24	2.33	3.46	2.06	3.24	2.06	3.24
1%	**2.54**	**3.86**	**2.84**	**4.1**	**2.54**	**3.86**	2.54	3.86

Note: *p*-values: ***1% significance level; ** 5% significance level; *10% significance level.
Source: Author's calculation

Table 4.12: Summary of Country Specific Overall Macroeconomic Relationship with Public Debt

	GDP	Employment	Capital stock	Saving	Total trade	Government Consumption	Inflation	Real interest rate	Real exchange rate	Economic Shock
China	+	-	+	-	-	-	+	+	-	N.A
Indonesia	-	-	-	-	-	-	-	+	-	-
Malaysia	-	+	+	-	-	+	+	+	-	+
Thailand	-	+	-	-	+	+	+	+	-	+
Turkey	-	-	+	-	+	-	+	-	+	+
Expected sign	(-)	(+)	(-)	(-)	(+/-)	(+)	(+/-)	(+)	(+)	(+)

Note: Red sign indicates insignificant relationship; N.A – Not Applicable.
Source: Author's calculation

4.6 Conclusion

The objective of this chapter to identify factors that influence public debt. For this purpose, a sample of 12 upper-middle income Asian countries from 1980 to 2015 was tested using ARDL approach. Additionally, country-specific relationship between public debt and its determinants were examined for five major economies namely China, Indonesia, Malaysia, Thailand and Turkey. Overall, as many literatures concluded, the results show that public debt and real GDP is negatively correlated in the pooled sample. As for country-specific, Indonesia, Malaysia, Thailand and Turkey showed a significant negative relationship as well. (i) However, an interesting outcome was found in China, whereby debt and real GDP are positively correlated. This finding is similar to the results by Spilioti (2015), Jacobo & Jalile (2017) and Grobéty (2017) that public debt and real GDP growth are positively related in China. This reflects that effective expansionary fiscal policy able to increase aggregate demand, national income, employment and growth.

The results also indicate that national saving and capital have negatively correlated in both the pooled- and country-specific level. The decline in national saving in many countries is directly attributed to the fall in government's saving portion and shift from investment expenditure towards consumption. Moreover, fiscal deficit tends to curtail investment expenditure leading to lower capital stock growth. Estimation results indicate that improvement in total trade could bring down public debt in overall. This also the case for China, Indonesia and Malaysia having negative relationship. (ii) Nonetheless, total trade has a positive relationship with Turkish public debt. Increase in the imported intermediate inputs prices used in production process makes exports more expensive. As

a result, the higher total trade is mainly supported by higher export prices, hence, the public debt surges in tandem.

On the other hand, government consumption, real interest rate and real exchange rate positively affect public debt for pooled sample. (iii) At country level, government consumption and public in China, Indonesia and Turkey negatively correlated. Government expenditure utilised on productive spending and investment anticipated to have substantial influence on economic development which reduce debt level. (iv) Real exchange rate is negatively associated with public debt in China, Indonesia, Malaysia and Thailand. Real exchange rate increase indicates a real depreciation in which this will able to boost trade performance which able to reduce public debt. (v) The novelty of this research is the introduction of economic shock as determinants of debt. The economic shock element found to have a positive relationship with public debt in Malaysia and Turkey, while in Thailand and Indonesia, the result is not significant.

CHAPTER FIVE

Estimating the Public Debt Threshold for Upper-Middle Income Asian Countries

5.0 Introduction

Analysis on public debt threshold gained popularity, predominantly after the 2008/09 GFC. Continues upward trend in public debt in many countries has raised concerns over whether it is starting to hit a 'threshold', which may slowdown the economic growth. As such there are three critical questions of which many researchers attempt to explain, namely i) Does a public debt "threshold" exists? ii) Would the growth impact significantly if the debt level surpassed its threshold? iii) What would happen if public debt remains at elevated levels for an extended period of time? Currently there is no common agreement to these critical questions and subject to an intense debate in academia. Various literatures indicate there are two sets of opinions with one arguing that high levels of debt are associated with negative effects on growth while the other disputes the notion.

Research on public debt 'threshold' was pioneered by Reinhart and Rogoff (2010, 2012) through their influential seminal papers highlighting that debt level beyond 90% of GDP will drag a country's economic growth. Since the publications, many studies were conducted, nonetheless, mostly focusing on developed economies such as the US, UK, Euro Zone as well as HIPCs. Existing research related to Asia or selected countries within the region provide estimated threshold levels between 27% and 72.5% of GDP for ASEAN+3 (Pham et al., 2020).

Public debt threshold analysis involving developing economies, particularly in the Asian region, is still limited. Therefore, this chapter attempts to fill the gap in the literature by estimating the public debt threshold level, particularly for upper-middle income of Asian economies. It is important to note that the past 50 years has recorded the largest, fastest and most broad-based surge in debt level among emerging market and developing economies (EMDEs[16]). Since 2010, total debt of EMDEs rose to a historic peak of more than 170% of the GDP in 2019, recording a surge of 60 percentage points (IMF, 2020). The IMF chronologically documented events that led to the surge in public debt among EMDEs, where number of countries from the samples were part of the events. The events are summarised as below:

1) 1970 – 1989: Low real interest rates coupled with rapidly growing syndicated loan market in the 1970s encouraged Latin America and low-income countries, particularly in sub-Saharan Africa, to borrow heavily, leading to a series of financial crises in the early 1980s. Since then, growth and poverty reduction are still a great concern in these countries.

2) 1990 – 2001: Financial and capital market liberalisation allowed heavy banking sector borrowings among Asian and Europe countries, particularly in foreign currencies, caused series of crises between 1997 and 2001 mainly due to low investor sentiment within the Asian region. Thailand, Malaysia and Indonesia were among the countries to fall into crisis in 1997 following the domino effect stem from negative investors' sentiment leading to heavy foreign capital flight.

[16] All economies except OECD member (excluding Turkey) prior to 1990 are classified as EMDEs, which divided into two groups: low-income countries (LICs) - 51 economies that eligible for concessional IMF loans; emerging markets (EMs) - the remaining 69 economies (IMF, 2012).

As a result, the World Bank and IMF[17] conducted bailouts of large-scale banks and corporations in these regions.

3) 2002 – 2009: Regulatory easing allowed private sectors in the Europe and Central Asian countries to borrow massively from the EU-headquartered megabanks. When the global financial crisis loomed in 2007 and erupted in 2008/2009, a number of countries fell into recession. The spill over effect was again felt in many Asian economies. This again required bank bailouts and international assistance from international agencies.

4) 2010 – Current: Beginning in 2010, debt has reached record highs. Among commodity exporter countries, public debt increased significantly due to the 2014/2015 commodity price fall. The average annual growth in public debt since 2010 of almost 7% of GDP among these countries is significantly higher than during each of the previous three waves.

It is worthy to note that these events also part of the crises that seen public debt in upper-middle income Asian countries to rise over the years. Figure 5.1 clearly illustrates that as public debt increases, GDP growth become slower, triggering the question of which level of economic growth is compromised with the debt threshold level.

[17] Malaysia did not accept the IMF's rescue packages and follows fiscal consolidation recommendations such as the cut of public spending and tightening of credit instead headed for a striker financial adjustment. Malaysia implement its own measures through controlling the movement of the Ringgit (ringgit trading done entirely within the country's borders), the Ringgit fixed at an exchange rate of RM 3.80 to the USD as well as enforced the concept of capital controls (it allowed the authorities to lower interest rates to cushion the recession without causing the ringgit to collapse) (Furuoka et. al, 2012).

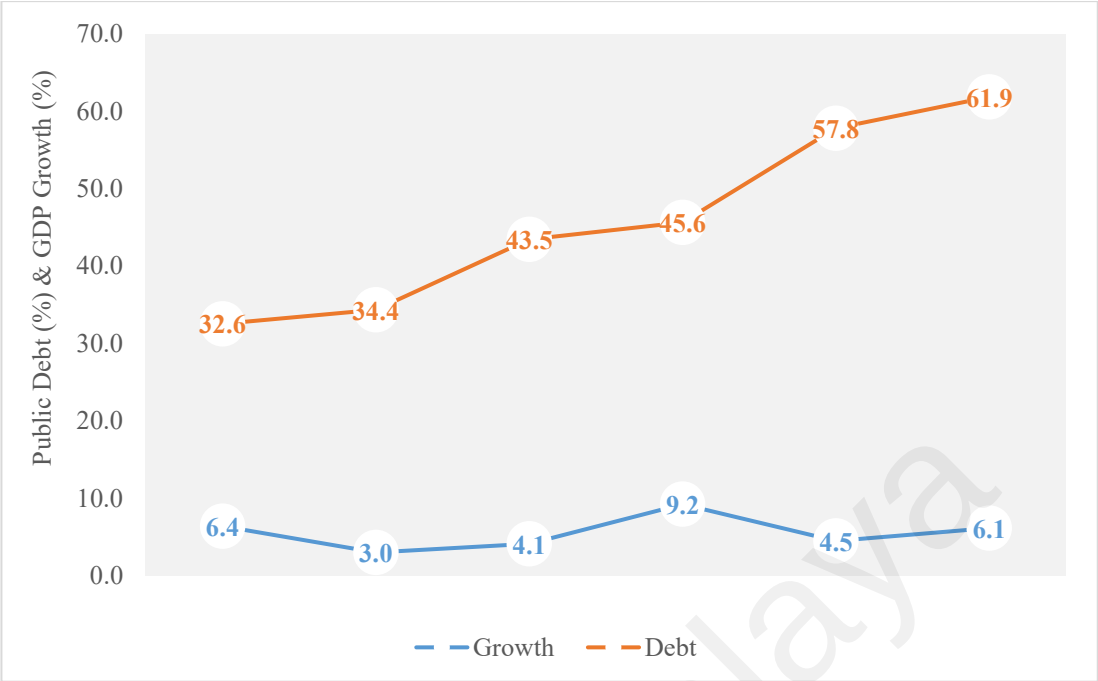


Figure 5.1: Average debt vs GDP growth rate trend in Upper-Middle Income Asian countries

Source: Author's calculation

5.1 Previous Estimations on Public Debt Threshold

Following Reinhart and Rogoff (2010), there are many similar researches available on estimating the debt threshold for various countries and regions. A summary of these studies is presented in Table 5.1. Based on the summary, it is clear that debt threshold estimation involving upper-middle income Asian countries is still limited or unavailable. It is also evident that the threshold can differ based on the selection of countries, estimation method and time period.

Table 5.1: Summary of Previous Debt Threshold Estimations

Author(s)	Debt threshold (% to GDP)	Sample	Method
Boukhatem and Kaabi (2015)	15	19 Middle East and North Africa countries	GMM
Cordella et al. (2005)	15–30	Heavily indebted poor countries (HIPCs)	OLS and SGMM
	0-20	Non-heavily indebted poor countries (HIPCs)	
Baglan and Yoldas (2013)	20	20 advanced economies	Panel regression
Clements et al. (2003)	20-25	55 low-income countries	GMM
Égert (2015)	20-60	44 developed and developing	Threshold regression
Nasa (2009)	24 – 46	56 low to medium income heavily indebted countries	Quadratic model
	45		Threshold regression
Pham, Mai and Nguyen (2020)	27 – 72.5	ASEAN+3	Panel threshold regression
Lee et al. (2017)	30	44 developed and developing	Median regression
Baaziz et al. (2015)	31	South African economy	Smooth transition regression
Nhu et al. (2016)	30 – 60	15 developing countries	GMM

Kueh, Liew and Yong (2017)	37 (Domestic debt)	Malaysia	Threshold regression
Omrane et al. (2017)	39.5	Tunisia, Turkey, Morocco and Egypt	Panel threshold regression
Gómez-Puig and Sosvilla-Rivero (2017)	40 (Central) 50 (Peripheral)	European Economic and Monetary Union	Time-series analysis
Mencinger et al. (2015)	44 – 45 (non-OECD) 90 – 94 (OECD)	31 OECD member economies and 5 non-OECD EU	Panel regression and GMM
Mupunga and Roux (2015)	45 and 50	Zimbabwe	Bivariate quadratic equation and threshold regression
Craigwell et al. (2012)	55 – 56	Caribbean economy	Least square regression model
Alshammary et al. (2020)	58	20 Middle East and North Africa	Panel threshold regression
Chang and Chiang (2009)	66	15 OECD countries	Panel unit root, panel co-integration and panel Granger test
Elmeskov and Sutherland (2012)	60	111 OECD and developing countries	Pooled OLS and PVAR
Pérez and Roja (2017)	60	Spain	VAR
Matsuoka (2020)	60	11 advanced economies and 14 emerging markets	Panel Smooth Transition Regression and Generalized Panel Smooth Transition Regression
Chudik et al. (2015)	60 – 80	Developing and advanced countries	ARDL
Wright and Grenade (2014)	61	13 Caribbean countries	Panel OLS and Threshold regression
Ahlborn and Schweickert (2016)	60 75 No threshold	Liberal countries Continental countries Nordic countries	2SLS
Omotosho et al. (2016)	73	Nigerian	GLS and 2SLS

Hansen (1996, 2000) and Caner et al. (2010)	77	Advanced and emerging countries	Threshold regression
Cecchetti (2011)	85	18 OECD countries	Panel data regressions
Reinhart and Rogoff (2010)	90	44 developed and developing countries	Histograms
Bilan and Ihnatov (2015)	94	33 European countries	Generalized model
Baum et.al. (2013)	95	Euro Zone	Dynamic threshold panel regression
Minea and Parent (2012)	115	44 developed and developing countries	Panel smooth threshold regression

Source: Author's compilation

5.2 Country Background: Public Debt and GDP Growth Trends

This chapter investigates the existence of non-linear relationship in the form of U-shape or inverted U-shape between public debt and GDP growth. The nonlinear relationship can be established if a threshold level exists for public debt level. For this purpose, a pooled sample of 12 upper-middle income Asian countries (Armenia, Azerbaijan, China, Georgia, Indonesia, Iran, Jordan, Kazakhstan, Lebanon, Malaysia, Thailand and Turkey) and five selected countries from the pool, namely China, Indonesia, Malaysia, Thailand and Turkey, are estimated. A brief description of public debt and GDP trend presented in Table 5.2. The graphs of public debt and GDP growth trend for 12 upper-middle income countries is attached in Appendix 3.

Based on Table 5.2, China (9.8%) recorded highest average GDP growth while Georgia (0.5%) the lowest growth. China also has the biggest average GDP size of USD2,463.6 billion and Armenia the smallest at USD5.1 billion. Lebanon (135.6%) logged the highest average public debt and Kazakhstan (11.7%) has the lowest debt level.

Table 5.2: Average GDP Growth, Nominal GDP & Public Debt for Upper-Middle Income Asian Economies, 1980-2015

Country	Average real GDP growth (%)	Average nominal GDP (USD)	Average Public Debt (%)	Highest public debt level / year
Armenia	3.2	5.1	34.2	46.8 / 2015
Azerbaijan	4.8	25.3	16.9	35.0 / 2015
China	9.8	2,463.6	28.2	41.1 / 2015
Georgia	0.5	7.9	43.1	71.9 / 1999
Indonesia	5.2	299.3	41.4	87.4 / 2000
Iran	2.1	221.9	15.7	42.3 / 2015
Jordan	4.4	12.6	79.0	101.2 / 1998
Kazakhstan	2.9	78.7	11.7	21.9 / 2015
Lebanon	5.9	21.7	135.6	183.1 / 2006
Malaysia	5.9	120.2	56.1	103.4 / 1986
Thailand	5.3	168.3	20.9	39.6 / 2014
Turkey	4.6	346.1	42.5	72.2 / 2001

Source: World Bank, 2021

5.3 Public Debt Threshold Estimation: Results and Discussion

5.3.1 Results and Discussion on the Pooled Sample

The earlier empirical studies illustrate that public debt may have nonlinear characteristics due to the potential presence of the threshold effect in debt-growth nexus (Pattillo et al. 2003; Kumar & Woo 2010; Cordella et al. 2010). To determine the nonlinear relationship between public debt and growth, this research employed the panel threshold regression method proposed by Hansen (2000) and Caner and Hansen (2004) which allows to estimate multiple regimes. The statistical theory developed by Hansen (2000) permits to detect and estimate thresholds of either cross-section or time series panel. Therefore, this method considered suitable for this research. Additionally, threshold regression method can handle well on unbalanced panel data. The threshold regression method is considered as a reliable model for analysing many economic issues and was recently been utilised in many empirical studies, especially those dealing with nonlinear issues (Lee and Wang 2015). Hence, this method used to investigate the existence of nonlinear relationship and estimate public debt threshold level for the sample of 12 upper-middle income countries covering the years between 1980 and 2015. The model's equation can be written as:

$$GDP_{i,t} = \mu_i + \beta_1 X_{i,t} I\left(debt_{i,t} \leq \lambda\right) + \beta_2 X_{i,t} I\left(debt_{i,t} \geq \lambda\right) + e_{i,t} \qquad \text{(Eq. 5.1)}$$

where $GDP_{i,t}$ is the gross domestic product per capita and $debt_{i,t}$ is the public debt, which is ultimately the threshold control variable that allows for the division of samples into upper and lower regimes. λ is an unknown parameter while $I(.)$ is the test parameter. μ_i

is the individual effect and $e_{i,t}$ is the disturbance variable. X_i is a vector of independent variables. The independent variables are real GDP, capital stock, exchange rate, interest rate, inflation rate, trade, government consumption, national saving and employment. These variables transformed into log variables to ensure the model is stable and easy to deduce the estimation results.

The estimation results are shown in Table 5.2. From the results it can be concluded that sufficient evidence is available to confirm**:**

a) a nonlinear Ω-shape relationship between public debt and real GDP growth in upper-middle income Asian countries;

b) the public debt threshold effect kicked-in at public debt level of 96.9% of the GDP, reflecting that the GDP growth becomes slower when the public debt level exceeds 96.9%; and

c) the public debt below the threshold level will support faster GDP growth, but becomes slower when it breaches the threshold level. To be precise, GDP grow faster for public debt level between 79.5% and 96.9%.

Specifically, the results confirm that:

a) the GDP grows by 0.16% for every 1% increase in the debt level when the public debt level is below 54.5%;

b) the GDP grows at 1.6% for every 1% increase in the debt level when the public debt level increases between 54.5% and 79.5% of GDP;

c) the GDP growth rate increases at a faster pace of 3.4% for every 1% increase in the debt level when the public debt level ranges between 79.5% and 96.9% of GDP; and

d) the GDP expands at a slower pace of 2.3% for every 1% increase in the debt level when the public debt level exceeds the threshold level of 96.9%.

Therefore, the **slower growth indicates a nonlinear relationship, confirming the theory that high public debt will drag down growth rate**. The nonlinear or ∩-shape relationship of the estimated results illustrated in Figure 5.2.

Table 5.3: Estimated Public Debt Threshold and GDP Growth for Upper-Middle Income Asian Countries

Public Debt Threshold (% to GDP)	Co-efficient	se	*t*-stat	*p*-value
Below 54.5	0.1634**	0.0823	1.9861	0.0485
above 54.5	1.3229***	0.2400	5.5125	0.0000
below 79.5	0.2709***	0.0332	8.1693	0.0000
above 79.6	3.0571***	0.3160	9.6754	0.0000
below 96.9	0.3872*	0.1172	3.3042	0.0807
Above 96.10	2.2615***	0.1804	12.5334	0.0000

Note:
1) *p*-values: ***1% significance level; ** 5% significance level; *10% significance level
2) Panel data consist of 12 upper middle-income countries, which are Armenia, Azerbaijan, China, Georgia, Indonesia, Jordan, Kazakhstan, Lebanon, Malaysia, Thailand and Turkey.
Source: Author's calculation.

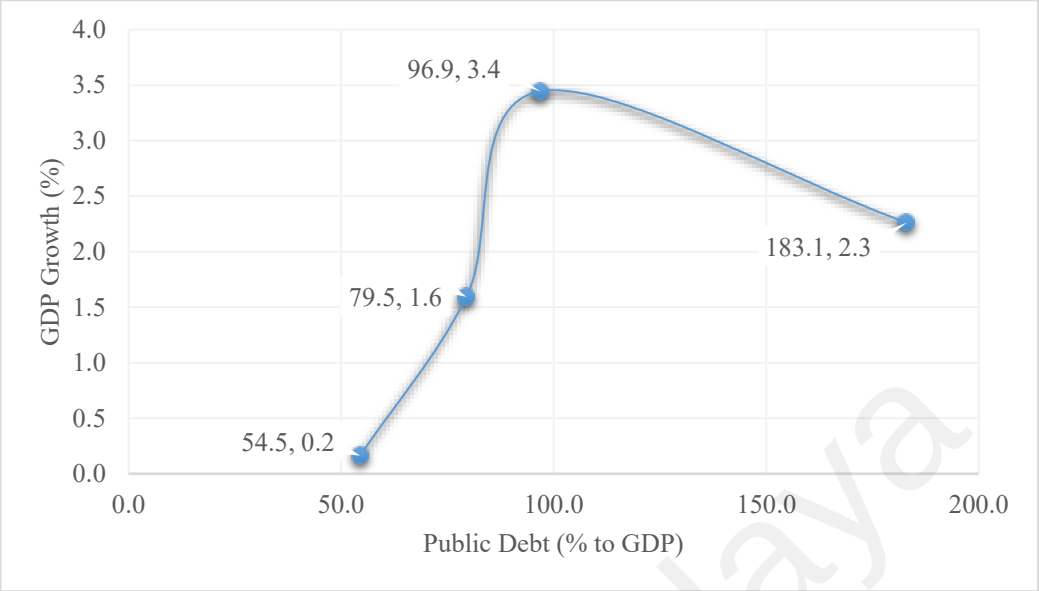


Figure 5.2: Nonlinear Relationship between Public Debt and GDP for Upper-Middle Income Asian Countries

Source: Author's calculation.

The findings also contribute to the literature as it further explains the nonlinear or negative relationship connotation, whereby **'negative' does not directly refers to negative growth**. Instead, the negative growth in this research describes growth rate that becomes slower beyond the threshold level. Therefore, this explanation adds to the literature knowledge by providing additional explanation on the 'negative' relationship. Literature does not provide a common conclusion about the relationship between public debt and economic growth as well as the threshold level, which may differ due to methods, samples and periods. Public debt mainly originates from budget deficits, in which the purpose of it is to increase capital supply for economic growth. Nonetheless, in most countries, budget deficit depends on the government revenue and types of expenditure. In other words, portion of public debt stems from many subjective expenditures that can be avoided, with the ultimate goal of stimulating economic growth. Hence, exploring the

relationship between public debt and economic growth under the influence of macroeconomic variables will provide useful policy recommendations in regards to public debt management and effective fiscal policies formulation. Pham et al., (2020) argues that it is rational to assume that relationship between public debt and economic growth is nonlinear or Ո-shaped indicating low or moderate rates of public debt has a positive effect on economic growth. As the debt level increases and exceeds a particular threshold, debt has limited or affect the economic growth.

5.3.2 Country Specific Results and Discussion

Similar estimation was conducted at country-specific level, namely China, Indonesia, Malaysia, Thailand and Turkey. The results are presented in Table 5.3. The illustration on the estimated GDP growth rate below and above the estimated threshold for the selected countries is presented in Figure 5.2. Country-specific analysis is much more important than pooled sample analysis to understand the ∩-shaped or nonlinear relationship between public debt and growth. Country-specific estimation reveals that **threshold effect did not appear for all the countries, such as Turkey, where the model could not find the existence of a threshold** for the country. This is an important finding, where a threshold or nonlinear relationship does not automatically exist for all the countries (Pescatori et al., 2014; Ahlborn and Schweickert, 2016). Additionally, based on the country-specific results, it can be concluded that **nonlinear relationship indicates a ∩-shaped, above threshold GDP growth become slower and also exist in a U-shape in which the growth rate becomes higher as public debt exceeding threshold level**.

Among the major findings in the country-specific analysis are:

a. the public debt threshold level for Thailand is 23% of GDP, China (26.1% of GDP), Indonesia (37.5% of GDP) and Malaysia (54% of GDP). The nonlinear relationship in China and Malaysia exists in ∩-shaped, where beyond the public debt threshold level, the GDP growth becomes slower. China's GDP growth becomes slower by 0.7% when public debt rises above 26.1% of GDP. Meanwhile in Malaysia, the GDP grows slower by 0.1% when the public debt exceeds 54% of GDP.

b. A U-shape nonlinear relationships were found for Thailand and Indonesia. This indicates that beyond the threshold level, public debt could support or drag down the GDP growth rate. The results indicate that Thailand's GDP growth increases by 0.2% when the public debt level is above 23% of GDP. Similarly, in Indonesia, GDP growth expands by about 3% when the public debt level increases beyond 37.5% of GDP.

Table 5.4: Estimated Public Debt Threshold and GDP Growth for The Specific Countries

	Public Debt Threshold (%)	Co-efficient	se	*t*-stat	*p*-value
Thailand	Below 23.0	-1.0471*	0.3771	-2.7767	0.0692
	Above 23.0	0.2761**	0.0545	5.0646	0.0149
China	Below 26.1	3.0132***	0.2416	12.4692	0.0000
	Above 26.1	-0.6673***	0.0445	-14.9985	0.0000
Indonesia	Below 37.5	1.1452***	0.2343	4.8875	0.0081
	Above 37.5	2.9982**	0.4376	6.8520	0.0206
Malaysia	Below 54.0	0.3059*	0.1538	1.9887	0.0682
	Above 54.0	0.1269*	0.0497	2.5517	0.0838

Note:
1) *p*-values: ***1% significance level; ** 5% significance level; *10% significance level
Source: Author's calculation.

c. the public debt threshold level is very much influenced by sample selection. For example, the estimated threshold level for pooled sample of upper-middle income countries is much higher at 96.9% of GDP as compared the country-specific estimation. Therefore, it exposes the risk of using pooled samples which may tend to produce higher threshold level. As such, country specific estimation is deemed as a more appropriate way in setting the threshold level. The significant difference in threshold level between pooled sample and country-specify reveals the risk of

using panel data. The decision rule for threshold estimation for the pooled sample as well as country-specific is presented in Appendix 4.

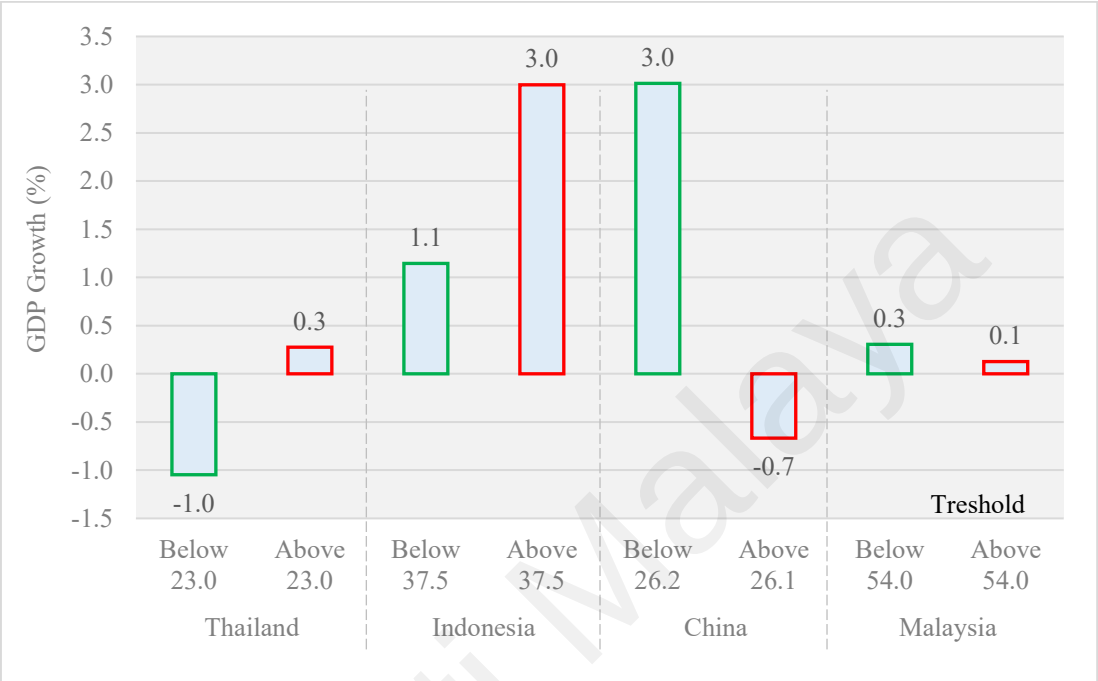


Figure 5.3: Public Debt Threshold and GDP Growth Pattern For The Specific Countries

Source: Author's calculation

The key concern of threshold estimation is the quantitative impact of public debt on economic growth. How costly in terms of economic growth when the public debt remains above the threshold for a prolonged period. To address these concerns, the impact of the public debt exceeding the threshold level and the cost in terms of GDP growth are presented in Table 5.4. The impact or cost in terms of GDP is calculated by multiplying average growth below and above the threshold by number years a country remains above the threshold value. For example, average growth for Thailand is -1.0% (below threshold) and 0.3% (above threshold) and Thailand has been above the threshold level of 23% of GDP for 13 years. By multiplying average growth below and above threshold level with

number of periods, gives the cumulated average GDP gain/forgone for each country. Hence, this will indicate the total cost in terms of GDP as result of breaching the threshold.

Table 5.5: Cumulated Average GDP Growth Gain/Loss as a Result of Exceeding the Public Debt Threshold

	Public Debt Threshold (% of GDP)	Number of periods (years) above threshold	Average GDP growth (%) below threshold	Average GDP growth (%) above threshold	Cumulated GDP growth over periods if the debt below threshold	Cumulated GDP growth over periods if the debt above threshold
Indonesia	37.5	12	1.1	3.0	13.7	36.0
Thailand	23.0	13	-1.0	0.3	-13.6	3.6
China	26.1	11	3.0	-0.7	33.1	-7.3
Malaysia	54.0	13	0.3	0.1	4.0	1.6

Source: Author's calculation.

Indonesia and Thailand have a U-shape relationship between public debt and growth, reflecting that the country gains more when the above threshold as compared to below threshold. Based on the calculation, Indonesia gains the most in terms of cumulated GDP growth which is about 36% as a result of exceeding the threshold level. Meanwhile, Thailand gained about 3.6% in cumulated GDP growth when the public debt exceeds the threshold level. On the contrary, China and Malaysia registered a loss in terms of cumulated GDP beyond threshold. China's cumulated GDP growth fell 7.3% above threshold level while Malaysia's growth increased at a marginal pace of 1.6%. Nevertheless, the cumulated GDP for China and Malaysia below threshold level is 33.1% and 4.0%, respectively. Based on the total cost in terms of GDP, China and Malaysia

would have been better off if the public debt remained below the threshold level. Hence, this signifies the importance of public debt threshold as this provide crucial information on total gain or loss in terms of GDP as result of breaching the threshold level.

By utilising such information, it will enable the governments to make important decisions about continuing public borrowing to support growth. Additionally, if a country records a loss in terms of GDP by incurring more public debt above a certain level, hence, this will make it difficult to justify such borrowings to support or attain higher economic growth rate. The analysis of debt thresholds can be informative; however, threshold levels should be interpreted thoughtfully. If a country's public debt exceeds threshold for a year or two due to economic shock, its long-term growth most probably will not affected (Scott 2010). Nonetheless, the existence of debt thresholds should not prevent government from implementing short-term fiscal stabilisation policy even public debt is low in a country. However, economic growth is most likely to suffer if public debt is trending upward above the threshold and remain for a long period.

5.4 Conclusion

This chapter examined whether a public debt threshold exists for upper-middle income Asian countries as well as the specific countries (China, Indonesia, Thailand, Malaysia and Turkey) for the period of 1980 to 2015. This research adopted a panel regression model to estimate the public debt threshold level for the upper-middle income Asian economies. Except for Malaysia, the threshold estimation (domestic debt threshold) for other specific countries is not available. The estimation results provide **sufficient evidence to conclude the existence of a nonlinear relationship between public debt and GDP growth in upper-middle income Asian countries**. The public debt **threshold level for upper-middle income Asian countries is estimated at 96.6% of GDP**. An important discovery from the results is that **nonlinear or 'negative' relationship does not indicate that growth will become negative, but rather that the GDP growth becomes slower.** The **country-specific threshold level changes drastically as compared with the pooled sample**. Additionally, **the results indicate that the threshold effect does not exist for all countries** (Pescatori andet al., 2014; Ahlborn and Schweickert, 2016). Sufficient evidence is available to conclude the existence of nonlinear relationship when the public debt breaches the threshold level. A **U-shape nonlinear relationship is found for Thailand and Indonesia, where GDP growth is higher at beyond the public debt threshold level of 23% and 37.5% of GDP**, respectively. On the contrary, **China's GDP growth becomes slower for public debt threshold of 26.1% of GDP, where the growth level become slower**. Similarly, **GDP growth in Malaysia becomes slower as public debt breaching 54% of GDP**. Regarding the impact of the public debt exceeding the threshold level and the cost in terms of GDP growth, Indonesia and Thailand recorded a gain while China and Malaysia registered a loss.

CHAPTER SIX

Impact of Breaching the Public Debt Threshold on Macroeconomic Variables

6.0 Introduction

Public debt plays a significant role in a country's economic development, thus affecting many macroeconomic aspects such as economic growth, employment, inflation as well as capital stock to mention a few (Sinha et al., 2011). Nevertheless, public debt levels have skyrocketed over the past decades and reached an unprecedented level in many countries around the world (Yared, 2019). The impact of public debt on economic growth of this extraordinary surge now entered centre stage in academic and policy debates over the threshold effects (Ahlborn & Schweickert, 2016). Lately, various methods have been used to estimate public debt threshold levels for many different countries and regions following the influential seminal research by Reinhart and Rogoff (2010).

The ultimate goal of threshold estimation is to find any nonlinear relationship between public debt and growth, in which, beyond certain level, public debt may have a drag on growth. Advanced economies said to have capacity to tolerate high debt ratio as oppose to developing countries, lacking of such capacity, as high debt levels often prompt credit rating downgrades by global rating agencies alongside with pulling out of capital and a plunge in local currency values (Jong, 2021). As such, it is crucial for government to sustain debt level below certain limit for several reasons among which, maintaining credit rating, avoid higher interest rate on public borrowings (Amadeo and Boyle, 2021) and most importantly to have fiscal space during emergencies (IMF, 2005).

Although there is a large number of literatures in estimating public debt threshold level, these did not analyse the impact of breaching the threshold level on other macroeconomic indicators. Therefore, the novelty of this chapter is estimating impacts on macroeconomic indicators when the public debt exceeds the threshold. To ensure consistency in our analysis, we have selected the upper-middle-income Asian countries similar to the previous two chapters as well as country-specific analysis focussing on China, Indonesia, Malaysia and Thailand. The analysis covers the period between 1980 and 2015 on list of selected macroeconomic indicators namely real GDP, national savings, capital stock, employment, government consumption, total trade, real interest rate, real exchange rate and inflation.

6.1 Public Debt Threshold Impact Estimation

Impact of public debt threshold is estimated using a panel threshold regression method developed by Hansen (2000) as well as Caner and Hansen (2004). The statistical theory by Hansen allows to detect and estimate thresholds of either cross-section or time series panel. Therefore, this method seems suitable with time series panel data used in the research. The model equation can be written as:

$$GNI_{i,t} = \mu_i + \beta_1 X_{i,t} I\left(debt_{i,t} \leq \lambda\right) + \beta_2 X_{i,t} I\left(debt_{i,t} \geq \lambda\right) + e_{i,t} \qquad \text{(Eq. 6.1)}$$

Where $GDP_{i,t}$ is the GDP per capita and $debt_{i,t}$ is the public debt (% to GDP), ultimately the threshold control variable which allows division of samples into upper and lower regimes. λ is the unknown parameter while $I(.)$ is the indicator function. μ_i is the individual effect and $e_{i,t}$ is the disturbance variable. $\boldsymbol{X_i}$ is a vector of independent variables. As such X_i allows to include various independent variable of interest. The independent variables tested are real GDP, saving, capital, employment, government consumption, total trade, real interest rate, real exchange rate and inflation. The expected relationships between public debt and selected variable were established in literature review. Nevertheless, those relationships did not account for threshold effect. The impact of breaching public debt threshold on real GDP growth has been discussed in Chapter 5. Therefore, this chapter analyses and discusses public debt threshold impact on macroeconomic variables. First, overall impact of public debt threshold on the Asian upper-middle income countries is discussed and then followed by country-specific analysis. The overall impact of breaching the public debt threshold on macroeconomic variables for country-specific is attached in Appendix 5.

6.2 Threshold Impact for Upper-Middle Income Asian Countries

The real GDP growth in upper-middle income Asian countries becomes slower as public debt exceeds 96.9% of GDP threshold level. When public debt is lower than the threshold level of 96.9%, the real GDP grows at 3.1%. However, the growth rate slowed to 2.3% when the public debt surpasses the threshold level. The sluggish real GDP growth as public debt breaching 96.9% threshold level, the negative impact stemming from capital stock, saving and employment rate.

Saving

Results show that public debt and saving have a nonlinear relationship. Sufficient evidence is available to conclude as the public debt level increasing, saving rates turn negative, however the contraction magnitude becomes smaller. As the public debt increases beyond the threshold level, savings decrease from 0.04% to 0.002%. Reductions in government's saving has been the main factor contributing to the decline in national saving. Evidence indicates that countries with very high government debt tend to have lower saving rate, particularly from government's share and this influence the overall national saving (Dean et al., 1989). Higher public debt may also threaten domestic saving through crowding-out effect and shrinks economic growth (Krugman, 1988; Alesina & Tabellini, 1989; Tornell & Velasco, 1992). Accordingly, an upward trending public debt demonstrates the future debt is going to be greater than a country's expected repayment ability (Baaziz, 2015). Hence, this discourages private sector savings as well.

Capital

Capital stock is found to have a negative nonlinear relationship with public debt. Results indicate that as public debt increases beyond threshold, growth in capital stock becomes sluggish. Surge in public debt level exceeding threshold suppresses capital stock by 0.9% and 0.2%. Saving provides the resources for investment to build up capital stock of a country (GAO, 2001). As such, lower national saving causes slower capital stock accumulation. Additionally, it is contended that the decrease in capital stock is due to domestic borrowing of the government to finance the deficit (Alshammary et al., 2020). On the other hand, Hameed et al (2021) explains that there is a negative relationship between public debt and capital accumulation due to increasing public debt service ratio of total revenue. Therefore, as the public debt increases, capital stock declines accordingly.

Employment

Employment rate is found to decrease as public debt level surpasses the threshold level of 96.9% of GDP. As public debt expands above 96.9% of GDP, growth in employment rate reduced by 0.92%. According to Neck, Blueschke and Weyerstrass (2012) public debt is expected to result in better economic growth and improve employment level. However, Sundaram & Chowdhury (2013) argues that over reliance on public debt failed to induce growth and create employment as expected due to various factors, instead exacerbate the unemployment rate.

Government consumption

The result shows that government consumption expands significantly when the public debt surges towards 96.9% of GDP mark. As public debt increases, breaching the threshold level, government expenditure expands by 0.1% only as compared to 2.5% below the level. According to Slimani (2016), government expenditure may have positive "Keynesian" effects depending on the initial level of public debt. Moreover, government's spending is positively correlated with public debt only for a given debt ratio (Greiner and Semmler, 2000). Generally, Asian countries are heavily reliant on budget deficit and have a lower revenue mobilisation. Therefore, government expenditures which are financed through fiscal deficit adversely affect growth. This illustrate that budget deficits in Asian countries are not productive and growth enhancing, particularly when a country is heavily reliant on borrowing (Amgain & Dhakal, 2017). As such, this explains the smaller positive impact of government consumption when public debt exceeds the threshold level.

Trade

Total trade is found to expand as public debt increases. Nevertheless, the increase in trade level becomes smaller when public debt grows beyond the estimated threshold level. As public debt threshold reaching 96.9% of GDP, trade increases by 1.1%, however, total trade expand at a smaller rate of o.2%. Generally, most studies found that the effect of increasing the deficit raise private consumption leading to higher total trade. Nevertheless, continues budget deficit is associated with weak current account surplus (Bemheim, 1988). Hence, this will cause exchange rate to depreciate and make import to

be more expansive and slowing down the increase in private consumption (Altayligil & Çetrez, 2020). As such this explains the smaller total trade growth exceeding threshold.

Interest rate

Interest rate tends to increase as public debt increases. Public debt is found to have a significant impact on interest rate when it breaches the threshold level. The interest rate is expected to rise 0.001% as debt reaches 96.9% of GDP. According to Ogawa, Sterken and Tokutsu (2016) slowdown in growth increases the long-term real interest rate, possibly due to a lower inflation rate, which in turn reduces growth by decreasing interest-sensitive spending and leads to a further increase in public debt. Surge in the long-term interest rate also increases interest payments on public debt swells, consequently further raising the level of public debt and the process continues making both public debt and real interest rate increasing parallelly. Baldacci and Kumar (2010) affirm this inference and found that higher public debt leads to a significant increase in long-term real interest rates.

Exchange rate

Public debt and real exchange rate appreciate as debt surge. The exchange rate recorded an appreciation of 1.7% as public debt reaches 96.9% threshold mark. However, the real exchange rate become insignificant breaching 96.9% threshold level. Public debt affects real exchange rate mainly through increase in government expenditure puts pressure on the real exchange rate to appreciate (Miyamoto, Nguyen & Sheremirov, 2016). An increase in government spending, in, which is mainly financed through public debt, the impact on real exchange rate is positive (Monacelli and Perotti, 2010).

Inflation

The inflation rate indicates an increase as public debt threshold level rise. However, the inflation grew moderately when the public debt exceeds 96.9% of GDP threshold. Inflation rate grew 2.9% as public debt surges towards 96.9% of GDP and exceeding the threshold level, inflation expand at 0.03%. Nguyen (2015) noted that public debt has statistically positive correlation with inflation and entails that high level of public debt puts pressure on the inflationary level in Asian economies generally. Thus, this explains the positive correlation as public debt hike.

Table 6.1: Impact of Exceeding Public Debt Threshold on Macroeconomic Variables for Upper-Middle Income Asian Countries

Public Debt Threshold (% to GDP)	GDP	Capital	Saving	Government consumption	Interest rate	Employment	Exchange rate	Trade	Inflation
Below 54.5	0.1634**	0.0793***	0.0016	0.7258***	-0.0018***	-0.9296***	0.2997***	0.3590***	0.0375*
Above 54.5	1.3229***	0.0035	-0.0181***	-0.2041	0.0012	-1.0856***	1.2570***	0.2549**	0.0253*
Below 79.5	0.2709***	0.0115	0.1491	0.2837*	0.0118***	-0.6279***	0.0598	0.6438***	-0.1422
Above 79.5	3.0571***	-0.6125***	-0.0052**	-0.4143*	0.0032	-1.6392***	1.6801***	0.5398***	0.1562*
Below 96.9	**0.3872***	**-0.8697***	**-0.0385**	**2.5382****	**0.1425****	**-0.384**	**1.5807****	**1.1022****	**2.9195****
Above 96.9	**2.2615*****	**-0.2369*****	**-0.0022****	**0.1395***	**0.0015****	**-1.3029*****	**0.5270**	**0.1833***	**0.0335***

Note: p-values: ***1% significance level; ** 5% significance level; *10% significance level
Panel data consist of 12 upper middle-income countries: Armenia, Azerbaijan, China, Georgia, Indonesia, Iran, Jordan, Kazakhstan, Lebanon, Malaysia, Thailand & Turkey
Source: Author's calculation

6.3 Threshold Impact for Country-Specific

6.3.1 Indonesia

Indonesia's threshold level is estimated at 37.5% and the non-linear shape appears in U-shape suggesting that growth rate above the threshold level is higher. Indonesia's **GDP growth** above the threshold level is mainly supported by government consumption and employment. However, the country's **national saving** rate fell drastically from 0.9% to 0.3% as public debt threshold grew beyond 37.5% of GDP. In 1990, Indonesia's public debt was at 45.7% of GDP and in 2015 it stood at 26.9% of GDP. During the period, national saving rate had improved from 23.1% (1990) to 31.8% (2015). Djulius (2018) examined the role of government borrowings and domestic savings on economic development. The research found significant negative impact on economic growth stemming from lower saving caused by the country's external debt in particular.

Capital stock fell from 0.014% to 0.007% as public debt level top 37.5% of GDP. However, the result indicates that capital stock has an insignificant relationship with public debt threshold. Result indicates that employment rate is expected to improve as public debt level exceed threshold level. Indonesia's employment rate expands 0.3% as the public debt surge beyond 37.5%. Elias and Noone (2011) noted that as Indonesian government invest more in manufacturing and services sectors funded through public borrowings, the employment rate registers a significant improvement.

Government consumption surged significantly from 0.6% to 1.10% when the public debt increases beyond the threshold level of 37.5% of GDP. This indicates that Government expenditures plays a significant role in stimulating the country's economic growth (Sriyanto, Murwani and Sofilda, 2021). In Indonesia, government's spending in public investment and infrastructure supports the country's economic growth. Though moving above threshold level, public debt does not have a significant relationship with the country's **total trade**. Nevertheless, when public debt is below the threshold level, Indonesia's total trade is expected to grow at 0.8%. Meanwhile, **interest rate** and public debt does not have any significant relationship when the public debt neither below nor above the threshold level of 37.5% of GDP.

As the public debt increases beyond the threshold level of 37.5% of GDP, the **real exchange rate** depreciates by 1.9%. Exchange rate improvement can be a credible economic indicator to support a country's domestic economy. Real exchange rate depreciation indicates that the improvement in the rate is able to reduce public debt, especially from external sources. Cahyadin & Ratwianingsih (2020) argues that Indonesia's exchange rate improvement reduced its external debt leading to lower public debt. As a result, Indonesia utilises the favouring exchange rate condition to manage external debt appropriately and stimulate economic growth. **Inflation rate** is expected to increase at a faster rate as public debt rises beyond the level of 37.5% of GDP. Inflation rate grew at 0.7% when the public debt is below 37.5% of GDP but rose to 1.1% as the debt moves beyond the threshold level. According to Sabirin et al. (2019), rising inflation rate in Indonesia stems from higher public debt. Meanwhile, Iba et al. (2021) argues that public debt has an effect on increasing inflation through the higher money supply,

indicating that as more money is pumped into the economy, thus, creating inflationary pressure.

Table 6.2: Public Debt Threshold Impact on Macroeconomic Variables for Indonesia

Public Debt Threshold (% to GDP)	Variable	Co-efficient	se	*t*-stat	*p*-value
Below 37.5	GDP	1.1452***	0.2343	4.8875	0.0081
	Capital	0.0137	0.0602	0.2285	0.8304
	Saving	-0.3116**	0.0803	-3.8800	0.0178
	Government consumption	0.5887*	0.2437	2.4160	0.0731
	Interest rate	0.0045	0.0030	1.4882	0.2109
	Employment	0.5117	1.9769	0.2589	0.8085
	Exchange rate	0.0157	0.2385	0.0660	0.9506
	Trade	0.8167***	0.1118	7.3026	0.0019
	Inflation	-0.3148**	0.0970	-3.2450	0.0315
Above 37.5	GDP	2.9982**	0.4376	6.8520	0.0206
	Capital	0.0068	0.0026	2.6574	0.1172
	Saving	-0.9342**	0.1549	-6.0297	0.0264
	Government consumption	1.1038**	0.1838	6.0042	0.0266
	Interest rate	-0.0158	0.0063	-2.5172	0.1282
	Employment	0.3936*	1.9279	-3.3164	0.0801
	Exchange rate	-1.9358**	0.4145	-4.6703	0.0429
	Trade	-1.8273	0.6331	-2.8863	0.1020
	Inflation	0.1079*	0.0362	2.9785	0.0967

Note: p-values: ***1% significance level; ** 5% significance level; *10% significance level
Source: Author's calculation

6.3.2 Threshold Impact for Thailand

The public debt threshold for Thailand is 23% of GDP which found to be in U-shape suggesting growth above threshold level is higher. Among the variables that are significant when the public debt is above the threshold level are real GDP, capital stock, government consumption, real interest rate, real exchange rate, total trade and inflation. Higher GDP growth above threshold level buoyed by capital stock as well as government consumption.

National saving rate in Thailand expands by 0.47% when the public debt is below 23% of GDP. However, the impact on national saving is insignificant as public debt rises above threshold level. **Capital stock** expands by 0.1% as the public debt rises above the threshold level of 23% of GDP. Data indicates that initial surge in Thailand's public debt causes capital stock to fall, however, as the debt level rise above the threshold level, capital stock is on upward trending pattern. Capital stock declines from USD113 billion to USD81 as debt level increase towards 23% mark but beyond the threshold, the country's capital stock improves to USD101 billion. Hence, as the public debt surges beyond threshold level, improvement in capital stock supports Thailand's GDP growth rate.

Public debt threshold impact on **employment** become insignificant as debt level increases beyond 23% of GDP. The employment growth is at 3.77% for debt level below 23%. However, the threshold impact on employment above the 23% is insignificant. Expansion in **government consumption** becomes greater as public debt threshold grows. Government consumption grew 0.55% as public debt threshold level stays below 23% of

GDP. As the public debt level rises further exceeding 23% of GDP, government consumption expands at 0.68%. According to Suanin (2015), government expenditure remains the most preferable mode for the Thai government to drive both the short-and long-term economy growth. The government's intervention has a significant effect on the economy. This is further supported by Jiranyakul (2007), establishing highly significant impact causality effect that government expenditures has on economic growth. Thailand's **total trade** continues to decline as public debt level rises above threshold level of 23% of GDP, albeit at a smaller rate. Below the threshold level, total trade decline 0.27% and the contraction slowed to 0.14% as public debt threshold level exceed 23% of GDP. According to Lau & Baharumshah (2007) data are consistent with the twin deficit hypothesis where budget deficit causes current account deficit in Thailand. Furthermore, budget deficit indirectly causes higher interest rate, which in turn appreciates the exchange rate and eventually leads a contraction in trade.

Interest rate in Thailand rises in tandem with public debt threshold level. Thailand's interest rate increases 0.01% when public debt is below threshold level but rise to 0.02% when exceeding the level. Government borrowing activity has a significant impact and raises interest rate in Thailand (Bouraouia & Phisuthtiwatcharavongb, 2015). The data from Thailand indicate average real interest rate increased from 1.1% to 3.5% as the public debt rise beyond the threshold level of 23% of GDP. Thailand's **real exchange rate** registers a deprecation as public debt rises. The rate depreciates from 0.57% to 0.39% as public debt breaches 23% of GDP. Hsing (2018) discovered that higher public debt led to real depreciation in Thailand, nevertheless, the depreciation helps to make their products cheaper and stimulate exports leading to increase in aggregate output. As such, real exchange rate depreciation supports GDP growth when the public debt moves up

above threshold level of 23% of GDP. **Inflation rate** in Thailand indicates an increase amid at slower pace as public debt rises above the threshold level. The country's inflation rate expands at 0.23% when the debt is below the threshold level of 23% of GDP, while growing at 0.06% when moving beyond the threshold level. This is evident where inflation rate in Thailand averaging at 2.2% above 23% threshold as compared to 4.5% when below the level.

Table 6.3: Public Debt Threshold Impact on Macroeconomic Variables for Thailand

Public Debt Threshold (% to GDP)	Variable	Co-efficient	se	*t*-stat	*p*-value
Below 23.0	GDP	-1.0471**	0.3771	-2.7767	0.0692
	Capital	-0.0750*	0.0576	1.3006	0.0843
	Saving	0.4735**	0.1460	3.2427	0.0478
	Government consumption	0.5500***	0.0407	13.5250	0.0009
	Interest rate	0.0065**	0.0016	4.1305	0.0257
	Employment	3.7683**	0.7812	4.8238	0.0170
	Exchange rate	-0.5732**	0.1194	-4.8018	0.0172
	Trade	-0.2728***	0.0363	-7.5129	0.0049
	Inflation	0.2293***	0.0120	19.0679	0.0003
Above 23.0	GDP	0.2761**	0.0545	5.0646	0.0149
	Capital	0.1145**	0.0206	5.5698	0.0114
	Saving	0.0254	0.0253	1.0065	0.3883
	Government consumption	0.6779***	0.0188	36.0259	0.0000
	Interest rate	0.0153***	0.0007	22.6977	0.0002
	Employment	-0.2608	0.1285	-2.0302	0.1353
	Exchange rate	-0.3883***	0.0383	-10.1323	0.0020
	Trade	-0.1448**	0.0307	-4.7192	0.0180
	Inflation	0.0646**	0.0136	4.7620	0.0176

Note: p-values: ***1% significance level; ** 5% significance level; *10% significance level
Source: Author's calculation

6.3.3 Threshold Impact for China

The nonlinear ∩-shape relationship exists between public debt threshold and GDP in China. This illustrates that as public debt exceeds the threshold level at 26.1% of GDP, the real GDP growth becomes negative. In China, the GDP growth is higher when public debt is below the threshold level of 26.1% of GDP as compared to above the threshold level. The GDP growth above threshold level is affected due to slower employment as well as saving rate and contraction in capital stock.

Saving rate in China slowed down significantly, as public debt threshold exceeds 26.1% of GDP. China's saving rate grow at 0.69% for public debt below threshold but becomes slower to 0.21% beyond 26.1% of GDP. The average increase in annual saving rate fell from 0.7% to 0.2% as the public debt exceeds the threshold level. Ma & Yi (2010) noted that the government has been the smallest saver in China caused by higher borrowing activities. Thus, as the public debt surges, government's saving diminishes leading to lower total saving.

Capital stock in China contracts as public debt threshold surpasses 26.1% of GDP, causing the GDP growth to fall. Shiyi (2019) noted that the public debt and capita level shows ∩-shape relationship in which the government is subject to debt constraints where the debt level and capital stock debt level are negatively correlated beyond a certain level. Hence, falling capital stock leads to overall decline in GDP growth. In China, the public debt threshold impact on **employment** is significant. Employment grows at 17.6% when the public debt is below threshold level of 26.1% of GDP. However, employment growth rate slowed down significantly to 7.5% as public debt exceeds the threshold level of

26.1% of GDP. Due to poor performance, many state-owned enterprises (SOEs) in China were unable to service the loans, causing in high non-performing loans (NPLs) in the state-owned banks. The largescale bankruptcy of SOEs leads to high unemployment and the government was force to incur more debts to save the SOEs. Although this effort managed to avoid spike in unemployment rates, the employment rate declines since the SOEs were scaling down their operations (Li & Lin, 2011). This indicates that as the public debt increases above the 23% of GDP threshold level, employment grows at a smaller rate.

In China**, government consumption** rises in tandem with the increase in public debt. This indicates that the Chin government consumption and public debt are correlated positively when it exceeds the debt threshold level. Government consumption expands by 0.29% as public debt exceeds 26.1% of GDP. Fiscal spending reduces risk and uncertainty faced by households and encourage them to spend more, thus strengthening domestic demand and economic growth (Kim, et al., 2021). China's experiences generally consistent with literature suggesting that fiscal policy can have a significant and positive effect on economic growth. Nonetheless, China's growth has slowed down in recent years, primarily due to long-term structural issues. This situation is illustrated by the negative GDP growth when the public debt moves above the threshold level. **Trade level** in China expands as public debt threshold level exceeds 26.1% of GDP. China's trade performance expands further from 0.21% to 0.44% as public debt level rises. Average total trade stands at 50.6% when public debt is above the threshold level as compared to 41.6% when it is below the threshold level. China utilises its public borrowing by establishing free trade zone such as in Shandong, Hebei, Heilongjiang, Jiangsu, Yunnan and Guangxi provinces. As a result, these zones equipped with better

facilities and infrastructure which boosts China's trade performance (Hu, Wang & He, 2020).

The impact of public debt threshold level on **real interest rate** is insignificant in China. Although interest rate indicates a positive relationship below and above the threshold level, the relationship is insignificant. China's **real exchange rate** records a real appreciation when public debt exceeds the threshold level of 26.1% of GDP. China's real exchange rate appreciation implies a positive relationship between economic growth and the real exchange rate, driven by productivity as result of heavy public investment in Special Economic Zones through government borrowings (China Development Bank, 2017). Hence, this explains the real exchange rate appreciation above the threshold level as Chinese government borrow more to support its economic activity which leads to a real appreciation.

China's **inflation** is positively related to public debt below the threshold level. However, the inflation rate is negatively correlated above threshold level. Below the threshold level of 26.1% of GDP, the inflation increases by 0.01% but declines to 0.03% when above the threshold level. Christopher (2001) found that China's growth and inflation positive correlated. They suggest that rapid economic growth is accompanied by high inflation in China while the rate slowed down as the growth become sluggish. Since the estimated result indicate above threshold level China's GDP growth become negative, therefore, this explains negative inflation above 26.1% public debt level.

Table 6.4: Public Debt Threshold Impact on Macroeconomic Variables for China

Public Debt Threshold (% to GDP)	Variable	Co-efficient	se	*t*-stat	*p*-value
Below 26.1	GDP	3.0132***	0.2416	12.4692	0.0000
	Capital	0.0407	0.0942	0.4320	0.6693
	Saving	0.6947***	0.0284	24.5013	0.0000
	Government consumption	-1.7168***	0.1288	-13.3280	0.0000
	Interest rate	0.0057	0.0035	1.6141	0.1186
	Employment	17.6304***	0.9486	18.5866	0.0000
	Exchange rate	-0.6957***	0.0534	-13.0259	0.0000
	Trade	0.2133***	0.0593	-3.5962	0.0013
	Inflation	0.0092***	0.0019	4.9596	0.0000
Above 26.1	GDP	-0.6673***	0.0445	-14.9985	0.0000
	Capital	-1.0176***	0.0223	45.7268	0.0000
	Saving	0.2087***	0.0498	4.1942	0.0002
	Government consumption	0.2862***	0.0351	8.1540	0.0000
	Interest rate	0.0035	0.0047	-0.7496	0.4585
	Employment	7.5358***	1.0404	7.2431	0.0000
	Exchange rate	0.9184***	0.0421	21.8303	0.0000
	Trade	0.4405***	0.0260	16.9283	0.0000
	Inflation	-0.0322***	0.0035	-9.2193	0.0000

Note: p-values: ***1% significance level; ** 5% significance level; *10% significance level

Source: Author's calculation

6.3.4 Threshold Impact for Malaysia

The impact of public debt threshold on GDP growth in Malaysia is negative as the result indicates that growth rate becomes slower when public debt exceeds 54% of GDP. Malaysia's GDP growth becomes sluggish mainly due to lower capital stock and saving as well as higher real interest rate leading to slower growth as public debt rises beyond 54% of GDP.

Malaysia's **saving rate** becomes slower as public debt rises beyond the threshold level. Saving rate expands at 0.43% as public debt remain below 54% of GDP but the rate increases at a slower pace of 0.14% when public debt exceeds the threshold level. According to Yoong et al. (2020), increasing public debt has led to low savings, denting Malaysia's economic growth. Moreover, prolonged budget deficits in Malaysia affect interest rates causing fall in savings or deposits in the banking system (Aslam & Raihan, 2019). Malaysia's average saving rate below 54% of GDP threshold level stands at 35% of GDP and fell to 28.1% of GDP above the level. **Capital stock** in Malaysia is affected negatively as public debt swells beyond 54% of GDP. The capital stock contracts from 0.36% to –0.19% as public debt surpasses the threshold level. Lau, Tan & Liew (2019) conclude that higher public debt in Malaysia crowds out private investment which causes growth in capital stock becomes slower. Capital stock data from Malaysia indicates that average annual growth of capital in Malaysia fell from 7.8% to 5.8% as debt exceeds the threshold level 54% of GDP.

Malaysia's **employment** rate and public debt is positively correlated. Employment rate grow 0.94% as public debt remain below the threshold level but the rate slowed down to 0.13% when debt moves above the threshold. The rapid expansion of the public sector's investment which is financed through borrowings influences the country's economic growth and job creation between 1980 and 2000 (Lai, 2018). However, Choong, et al. (2010) argues that debts contribute negatively due to crowding-out effects which cause economic growth and employment rate to become sluggish. This also reflected by Malaysian employment rate where it recorded at 59.5% as public debt is below 54% but the rate decline to 57.7% exceeding the level. Malaysia's **government consumption** level indicates a significant increase as the threshold level rises. Government consumption expand at 0.04% and the rate increases drastically to 0.68% when debt is above threshold level of 54% of GDP. Public debt is found to be the engine of economic development in Malaysia. Government borrowings spent on public projects, improving infrastructure and human capital development boost economic growth of the country (Nur Fadhlina, Rosilawati & Ismadi, 2020).

Trade expands albeit at a slower rate as the public debt level surges above the threshold level. Below threshold level, total trade in Malaysia grows at 1.2% but the rate slowed to 0.2% when exceeding the threshold level. This indicate that the positive impact of total trade reduces as the public debt rises. Data shows that Malaysia's average total trade ratio reduces from 178% to 127% of GDP as public debt surges above the threshold level of 54 % of GDP. Public debt accumulation supports Malaysia's economic growth up to an optimal level through higher external trade, however, further increase in debt beyond the optimal level has an affect impact on the economy (Siti Nurazira, Abd Halim & Azman-Saini, 2013).

Malaysia's real **interest rate** increases to 0.04% as public debt stays below the threshold level of 54% of GDP. As the debt continues to rise beyond the threshold level, the interest rates rises albeit at a slower pace of 0.02%. Aslam & Raihan (2020) found that in Malaysia public debt deficit amplifies the adverse impact on interest rate. Increasing real interest rate as result of snowballing public debt transmit into negative effect on growth (Siti Nurazira, 2016). Hence, this explains the negative impact and lower GDP growth rate when public debt moves above threshold level. **Real exchange rate** and threshold impact in Malaysia found to be insignificant when the public debt is below and above 54% of GDP.

Inflation rate and public debt in Malaysia has a positive relationship. Below the threshold point of 54% of GDP, Malaysia's inflation rate increases to 0.03% and beyond the mark it rises at a slower pace of 0.01%. Although inflation rate tends to increase as public debt surges, it grows at a slower pace when debt is above threshold level. Khan, Marimuthu, & Lai (2020) argues that government borrowings may cause inflationary pressures, however, the source of borrowings can significantly change the magnitude of impact. Therefore, they suggests that Malaysian government borrowings if primarily from domestic sources (53% of GDP in 2015) then the inflationary pressure is lesser. Since Malaysia depend mainly on its domestic debt, this explains the smaller inflationary pressure as public debt exceeds the threshold level.

Table 6.5: Public Debt Threshold Impact on Macroeconomic Variables for Malaysia

Public Debt Threshold (% to GDP)	Variable	Co-efficient	se	*t*-stat	*p*-value
Below 54.0	GDP	0.3059*	0.1538	1.9887	0.0682
	Capital	0.3603***	0.0435	8.2746	0.0000
	Saving	0.4324***	0.0454	9.5249	0.0000
	Government consumption	0.0370*	0.0609	0.6070	0.0943
	Interest rate	0.0427**	0.0113	3.7872	0.0023
	Employment	0.9385***	0.1824	-5.1443	0.0002
	Exchange rate	-1.0883	0.1708	-6.3710	0.2142
	Trade	1.1736***	0.0897	-13.0889	0.0000
	Inflation	0.0307***	0.0096	3.1959	0.0070
Above 54.0	GDP	0.1269*	0.0497	2.5517	0.0838
	Capital	-0.1929*	0.0769	-2.5076	0.0871
	Saving	0.1411*	0.0475	2.9691	0.0591
	Government consumption	0.6785**	0.1236	5.4910	0.0119
	Interest rate	0.0165**	0.0036	4.6017	0.0193
	Employment	0.1263*	0.0440	2.8661	0.0643
	Exchange rate	0.1067	0.1131	0.9433	0.4151
	Trade	0.2045*	0.0758	2.6970	0.0740
	Inflation	0.0098**	0.0047	2.0620	0.0313

Note: p-values: ***1% significance level; ** 5% significance level; *10% significance level

Source: Author's calculation

6.4 Conclusion

The objective of this chapter is to analyse the impact of breaching the public debt threshold level on macroeconomic variables among the Asian upper-middle income countries. This chapter provides results on the pooled data as well as country-specific analysis on China, Indonesia, Malaysia and Thailand. The analysis was conducted by employing a panel threshold regression utilising data between 1980 and 2015. Earlier researches have been mostly preoccupied with the bivariate effects of public debt on economic growth. Currently, public debt and economic growth nexus has expanded from typical linear relationship experiment to nonlinear relationship with the introduction of threshold. Nevertheless, studies on public debt threshold only on estimating the threshold level between public debt and growth. Although many literatures on public debt threshold level are available, these studies do not cover the impact on macroeconomic variables. The novelty of this chapter is the contribution in terms of the impact of breaching the public debt threshold on macroeconomic indicators. Estimation result indicates a nonlinear association between public debt and real GDP growth for upper-middle income Asian countries present when the public debt is at the threshold level of 96.9% of GDP. Generally, it is found that saving and capital rate are affected when public debt breaches the threshold level in both pooled sample and country-specific. Though employment rate is positively correlated with public debt, the improvement in employment rate becomes slower as threshold level increases across the sample.

Interestingly, for country-specific analysis on Indonesia and Thailand, it shows that growth rate is higher when debt is above threshold level. The impact analysis reveals the higher growth is mainly supported by government expenditure. As for China and

Malaysia, when the debt is above the threshold level, real GDP growth becomes slower due to contraction in capital stock and saving rate.

CHAPTER SEVEN

Conclusion and Policy Recommendations

7.0 Conclusion

This research focuses on three dimensions of debt analysis. Firstly, the research identifies the determinants of public debt. Secondly, it estimates the public debt threshold, and finally analyses the macroeconomic impact of breaching the threshold level. In order to examine these three dimensions, a sample of twelve upper-middle income Asian countries, namely Armenia, Azerbaijan, China, Georgia, Indonesia, Jordan, Kazakhstan, Lebanon, Malaysia, Thailand and Turkey were selected, covering the period between 1980 and 2015. Apart from the pooled data analysis, this research also provides country-specific analysis for China, Indonesia, Malaysia, Thailand and Turkey. These countries were analysed further as they have the largest GDP among the upper-middle income countries in the Asian region.

The upper-middle income Asian countries generally maintain low public debt level below 50% of the GDP. Nevertheless, as the Asian economies are highly vulnerable, any shocks to the economic will affect the growth, causing an increase in the public debt to GDP ratio. High public debt may possibly lead to sovereign debt downgrades, which in turn makes government borrowings more expensive and reduce fiscal space. In addition, tight fiscal space also causes governments unable to implement counter cyclical measures during the crisis periods. However, thus far, public debt and crisis periods have not been analysed together. Manageable public debt level is ambiguous and subject to debate, but based on recent developments, a threshold may serve as a yardstick to set such a limit.

However, this type of threshold estimations are still lacking for countries in the Asian region. As Asian economies are exposed to high-level externalities, the impact of breaching the debt threshold also needs to analyse together with other macroeconomic indicators.

An ARDL model was employed for the first analysis, which is to examine the factors that contributes to public debt. Among the major findings for the pooled sample are as followings:

a) Real GDP, capital stock, total trade, national savings and inflation are found to have significant negative relationship on the pooled sample. An increase in these factors is expected to reduce the public debt level.

b) Employment rate, real exchange rate, government consumption as well as real interest rate are found to have to be the positive determinants of public debt. Surge in these determinants will cause the public debt level to accelerate further.

Meanwhile, for the country-specific level, the results are as below:

a) China – government consumption, employment rate, total trade, national saving and real exchange rate are significant in reducing debt. On the contrary, real GDP growth and capital stock are found build up China's public debt;

b) Indonesia – real GDP growth, real exchange rate, employment rate, government consumption, national saving, inflation rate and capital stock are the main determinants in reducing public debt level;

c) Malaysia – GDP growth, real exchange rate, total trade and national saving reduce public debt. In contrast, employment rate, capital stock, government consumption and real interest rate cause public debt to rise;

d) Thailand – an increase in real GDP growth, real exchange rate, national saving and capital stock reduces the country's public debt level. Conversely, surge in employment rate, government consumption, total trade and inflation rate leads to higher public debt level;

e) Turkey – real GDP growth, employment rate, government consumption and national saving are factors that reduce public debt level, while capital stock, real exchange rate, total trade and inflation are expected to increase the public debt level; and

f) This research also found that crisis periods significantly raise the public debt level, especially for Malaysia and Turkey. Nevertheless, the factor is not significant for Indonesia and Thailand.

For the second analysis which is to estimate the public debt threshold by applying panel threshold regression method. Among the major findings for the pooled sample include:

a) The existence of a non-linear relationship between public debt and economic growth in both U-shape and ∩-shape;

b) The public debt threshold level for Asian upper-middle income countries is 96.6% of the GDP above which the GDP growth rate become slower.

c) The existence of nonlinear or 'negative' relationship does not imply growth will contract, but the growth rate becomes slower. Below the estimated threshold,

average GDP growth is about 5.2%, while above the limit, average GDP is at 2.3%.

For the country-specific analysis on the threshold estimation, the results show the followings:

a) China and Malaysia – there is a ∩-shape nonlinear relationship between public debt and GDP growth. The estimated threshold is 26.1% of GDP for China while 54% of GDP for Malaysia, indicating that exceeding the threshold will cause the real GDP growth to slow down. In this regard, Malaysia sets the federal government debt limit at 60% of GDP, which is higher than the estimated threshold of 54% of GDP. However, such a debt limit for China is not available.

b) Indonesia and Thailand – there is a U-shape nonlinear relationship between public debt and GDP growth, indicating higher real GDP growth above the threshold level. The thresholds for Indonesia and Thailand are 37.5% of GDP and 23% of GDP, respectively. Thailand also imposes a limit of 60% of the GDP for total public debt, while Indonesia on the other hand sets budget deficit not more than 3% of the GDP annually. Since, the estimated thresholds indicate a U-shape nonlinear relationship for these countries, this study was unable to compare if those self-impose limit is too high or low.

c) Turkey – does not have a threshold level.

It is worth to take note of the glaring difference in threshold between the pooled-sample of countries and the specific countries, suggesting that countries need to individually estimate the threshold level to set a reasonable limit.

Finally, this research analyses the macroeconomic impact of breaching the public debt threshold. Generally, it is found that national saving and capital stock is affected by the public debt threshold for both the pooled sample of countries and the specific countries. Thus, this explains that as public debt exceeds the threshold, national saving and capital stock are the channels through which the negative impact will be transmitted to GDP growth. The impact of breaching the public debt threshold on employment rate is positive, albeit at a slower pace. The overall upper-middle income Asian country sample indicates that real GDP growth is higher, particularly when public debt level increases between 79.5% of GDP and 96.9% of GDP. This surge in the growth rate is mainly supported by an increase in government consumption. For the specific countries, the higher growth for Indonesia and Thailand beyond the threshold is also largely boosted by government consumption.

7.1 Policy Implications

From policy perspective, although governments around the world set debt ceiling, however, the basis for setting the limit is unclear. It also raises the doubt if the level is empirically tested before agreeing on the ceiling. Therefore, governments need to empirically estimate the debt ceiling as setting the limit too high or low could possibly hinder potential growth of the country.

7.1.1 China

China's astronomical rise in economic development comes with its escalating total debt (public and private debt) to reach more than 290% of GDP in 2020 (BIS, 2020). Although public debt hover around 70% of GDP only in 2020, nonetheless, the bulk of non-financial corporate borrowing consider one of China's source of financial fragilities could lead to severe liquidity risk in the event of adverse financial shocks (Garcia Herrero & Santabárbara, 2013). This instigated debate on the alarming speed of debt accumulation which possibly end with a hard-landing, giving shock to the economic system. Undeniably, China's debt issue become a great concern to the world given its significant role in the global trade and economy. As such, China's economic slowdown certainly will pull together other regional economies as well.

Estimated results indicate that China's public debt threshold is at 26.1% of GDP, which is relatively lower as compared to other Asian countries. Comparing China's gigantic debt level and lower threshold level, it raises the doubt on real situation. It is evident that public debt boosts economic growth of the country. The lower public debt ratio seems insufficient to support China's immense growth and therefore this possibly supported by

other types of debts which are not accounted as public debt. State-owned enterprises (SOEs) played an imperative role in the Chinese economy, however, the role of China's SOEs subject to criticism due to lack of transparency and claims that it is being used as the shadow banking sector to meet their financing needs and circumvent tightening regulations on bank loan issuance (Herrero & Le, 2014). Therefore, this could mask or suppress China's public debt level, leading to a lower threshold level.

Weakening profits of SOEs has caused nonperforming loans (NPLs) to surge lately. NPLs increased to 1.7% in 2015, however, some researchers suggest this figure could be higher, in fact more than 15%. Additionally, the bad debt accrued in the nonbanking financial system, projected to add 10% to the NPL ratio (Fitch Ratings, 2016; S&P Global Ratings, 2016). Assumed soaring China's total debt consist of public debt, household debt, non-financial and financial corporate debts from below 100% in early 1990s to almost 300% in 2015 coupled with slowing economic growth rate from double-digit to single digit raise concern on the debt level. Hence, **China is in a tough position to justify its debt accumulation as with the slowing economic growth rate does not support the argument of debt enhance growth. Additionally, China needs to be transparent in the public debt accounting as well as reduce its shadow banking activities to reflect the actual public debt level**.

7.1.2 Indonesia

Indonesia maintained relatively lower public debt level except during AFC and GFC which recorded a significant surge. Nevertheless, Indonesia managed to reduce public debt level substantially post crisis periods. Estimation results point out that public debt above 23% of GDP supports higher growth rate. Since public debt and growth has a positive relationship, hence, the turning of negative growth is yet to determine. In the meantime, Indonesia has set a self-imposed public debt ceiling at 60% of GDP, following the Maastricht Treaty which is expected to cause problems in future for the country. Maastricht Treaty was imposed on Euro Zone member countries which comprises of developed economy. The economic structure of these economies and Indonesia are totally different. Besides, the 60% of GDP threshold level for Euro Zone is mainly to ensure its common currency, euro's stability.

Therefore, **it is recommended for Indonesia to impose a debt ceiling which is suitable with its economic structure and capability**. In addition, there is lack of information if Indonesia has conducted sufficient empirical analysis to ensure that the threshold of 60% of GDP is an acceptable level and able to withstand any shocks. Self-imposed debt ceiling always attracts rating agencies attention and breaching those ceiling will cause sovereign downgrading. This in turn, will cause problem for Indonesia as downgrades will lead to higher borrowing cost and further increase the debt level.

7.1.3 Malaysia

Malaysia as an open economy subject to external shocks. However, economic openness is also the main factor to its remarkable growth. As far as the debt management is concerned, Malaysia has managed fairly well in 1980s, 1990s and early 2000s. The country was able to reduce public debt level considerably from the peak of 103.4% of GDP (1984) to lowest 31.9% of GDP (1997). During this period, the government recorded budget surplus for five consecutive years, which was before the AFC. Although the government was able to maintain debt level around 40% of GDP since AFC, the level seems to snowballing post GFC period.

Since independence, Malaysia is heavily relied on government's borrowing to spur growth. Initially this strategy has worked well as the public debt level declined and the GDP growth was among the highest within the Asian region. Since the GFC, Malaysian government still employed the same strategies to boost growth rate through various development programmes. However, the growth rate was not able to match the post AFC level in fact public debt has been on an upward trend since the GFC period. Additionally, the Malaysian government had revised the self-imposed debt ceiling in numerous occasions from 50% to 55% and 60% of GDP. Besides, the government also in midst of increasing the limit to 65% of GDP in 2021. Hence, this implies that **the government is losing its grip on the debt management where the growth rate has not been able to meet post AFC and GFC rates while public debt level is soaring**.

Snowballing public debt level had caused the debt service charges to surge tremendously about 3750%, from RM2 billion (1980) to RM77 billion (2015). Increasing debt service charges causes the government to reduce on productive spending or investment which are the catalysts for long-term economic development. Besides, the reasons to set the public debt ceiling in Malaysia is vague since the government tend to continuously revise it upwards from time to time. Therefore, **it is recommended that Malaysia should pay more attention on its surging debt level and implement policies to reduce it. Debt service charges also making up a significant portion of the government' revenue which should be utilised on productive spending**. Hence, Malaysia should re-strategies its debt management policies focusing on spurring the economic growth without heavy reliance on public debt.

7.1.4 Thailand

Thailand has done fairly in terms of its debt management thus far. Thailand with help of the IMF and World Bank during 1997 AFC, has managed to implement various reforms to strengthen its fundamentals. These reforms had helped to improve economic performance as well as reduced public debt level. Growth rate since AFC averaged at 5% per annum and public debt recorded a steady decline, reflecting strong macroeconomic performance. Nevertheless, since GFC, Thailand's public debt increased slightly stemming from government's stimulus packages to revive the economy. Growth rate also slowed down in Thailand which indirectly had caused the debt level to increase. Estimation results indicate that **Thailand relies on government expenditure to boost the country's economic growth, hence this will add pressure on debt management in the long term**. Therefore, **it is recommended for Thailand to implement policies to encourage private sector expenditure and investment to support economic growth**. This will allow Thailand to slowly reduce reliance on government expenditure as a tool to support growth and ease pressure on public debt.

7.1.5 Turkey

Turkey has a long history of high and volatile inflation coupled with large budget deficits. Nonetheless, Turkey succeeded in lowering inflation rate dramatically, while making substantial progress in improving public debt. Turkey's public debt level declined steadily over the years due to its prudent fiscal spending and various reforms enhancing macroeconomic fundamentals. Turkey is highly exposed to currency shocks, which is the major factor behind the surge in public debt. Turkey has implemented an exchange-rate-based stabilisation programme, supported by the IMF standby credits. In addition, this also accompanied by limited budgetary and monetary policies that empowered the central bank to increase domestic liquidity only with capital. As a result of fiscal discipline and the expanding economy, the public debt has been trending downwards lately. Nevertheless, **recent changes in the composition of public debt, with short maturity period and higher foreign borrowings increases vulnerability, affecting the country's exchange rate**. Due to Turkey's Lira crisis history, **greater attention needed on strengthening the exchange rate fundamentals**. Thus, this will enable Turkey to improve further its public debt level and boost economic growth.

7.2 Limitations and Future Research

The limitation of this research in terms of scope of the analysis. This may be expanded by including more macroeconomic variables, such as total factor productivity (TFP) as well as incorporating export and import separately rather than total trade. More country-specific analysis is also needed to understand the dynamics of each country. This research only focuses on total public debt, which includes both domestic and foreign borrowings. As such, in the future, this can be further improved by segregating the debt profile into domestic and foreign borrowings. Currently, on top of public debt, household and corporate debt is also on the rise. Thus, further research can be conducted on these types of debts given that the rate is growing exponentially which may also drag down the economic growth.

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