Does the threshold effect of government debt on growth exist for Malaysia?

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Abstract

Malaysia's government debt ratio has almost doubled to 60.4% of GDP in 2022 since its lowest of 31.9% of GDP in 1997. In the same period, debt grew faster than nominal GDP, with a compound annual growth rate of 10.0% and 7.0%, respectively. Against this backdrop, this paper examines the existence of a non-linear relationship between government debt and economic growth. We estimated the growth-maximising debt threshold for Malaysia by employing a threshold autoregressive (TAR) model and a debt-augmented growth model. Both empirical approaches have yielded a threshold range between 70% and 74% of GDP at the lower bound whereas the upper bound estimate ranges between 97% and 103% of GDP. A conservative interpretation suggests that government debt below 70% of GDP fosters economic growth, while economic dynamism may be hindered above such level. While the estimates provide an assessments on the impact of government debt on growth, there could be limitation in the estimation that should be complemented by analysis on changing market dynamics and investor confidence. Hence, the paper also discusses the risks to growth that persist beyond the debt threshold, specifically concerns on fiscal sustainability and debt trajectory, with proposals for broader reforms to improve the fiscal landscape.

JEL Classification Numbers: C24, E62, H30, H63, O40

Keywords: Threshold regression, fiscal policy, government debt, economic growth

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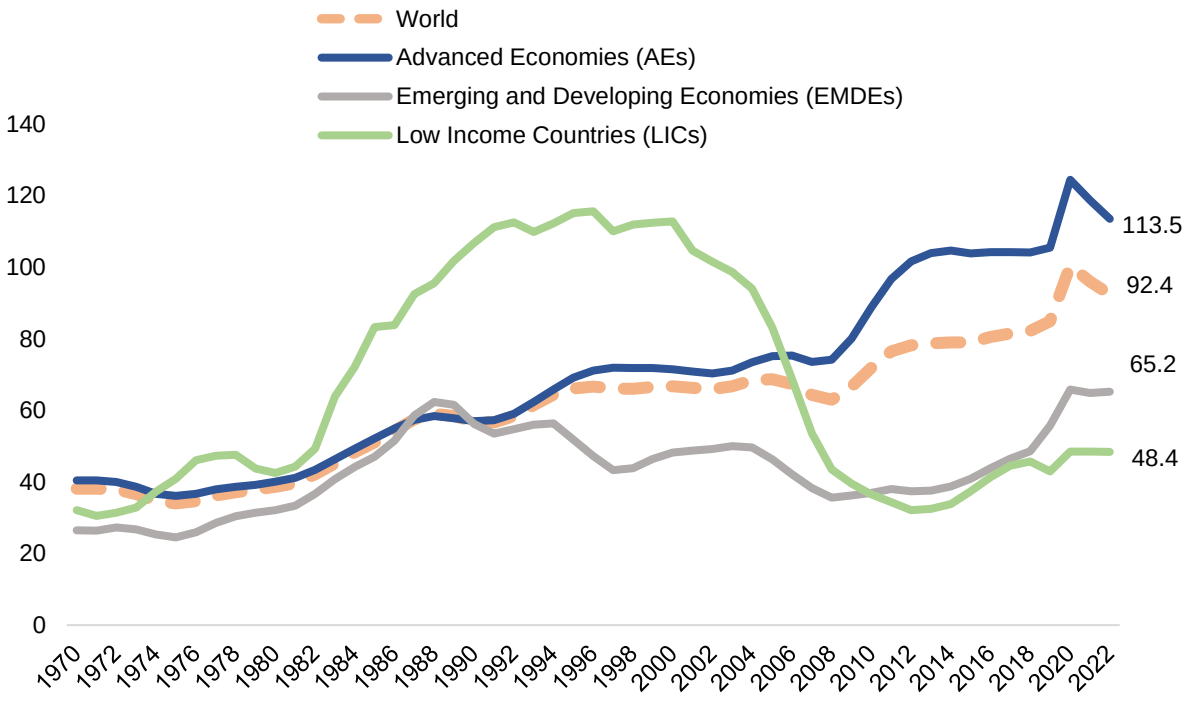
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1. Introduction

Global government debt levels have been on a rising trend since the early 1970s, observing a three-fold increase from 30% of GDP to over 90% in 2022 (Chart 1). This increase has been driven by higher government expenditure to fund key public investments as well as policy responses against economic shocks[1] (Eichengreen et al, 2019). During the 2008/09 Global Financial Crisis, the global government debt ratio increased significantly from 64.3% of GDP in 2007 to 71.9% in 2010. Most recently, the COVID-19 pandemic resulted in an increase in the global government debt ratio from 84.9% of GDP in 2019 to 100.4% of GDP in 2020. Although it has gradually declined to 92.4% in 2022 due to favourable macroeconomic conditions,[2] the historically high levels of government debt ratios have set off warning bells among policymakers particularly during a period of higher real interest rates, weaker global growth prospects and increased financial stability risks (IMF, 2023).

Chart 1: Global government debt (% of GDP)



Source: IMF Global Debt Monitor 2023

[1] In advanced economies, the debt accumulation was driven by military spending and expansion of welfare state. In contrast, debt accumulation for low-income countries (LICs) was driven by externally financed public projects and counter-responses to the 1970s growth slowdown.
[2] Rebound in GDP and elevated inflation in 2022 (IMF, 2023c).

Table 1: Government debt for selected economies (% of GDP)

Country	1997	2000	*Change in debt*	2007	2010	*Change in debt*	2019	2022	Change in debt
World	**66.1**	**66.7**	***0.6***	**64.3**	**71.9**	***7.6***	**84.9**	**92.4**	***7.5***
Advanced economies	**71.9**	**71.5**	***-0.4***	**73.5**	**88.8**	***15.3***	**105.4**	**113.5**	***8.1***
France	61.4	58.9	*-2.5*	64.5	85.3	*20.7*	97.4	111.7	*14.2*
Japan	105.0	135.6	*30.6*	173.0	205.9	*32.9*	236.4	261.3	*24.9*
United Kingdom	43.2	37.7	*-5.5*	43.1	75.7	*32.5*	85.5	101.4	*15.9*
United States	65.8	53.2	*-12.7*	64.6	95.1	*30.6*	108.7	121.4	*12.6*
Developing Economies	**43.3**	**48.2**	***4.9***	**38.3**	**36.9**	***-1.4***	**55.7**	**65.2**	***9.5***
Brazil	42.5	62.6	*20.2*	63.0	62.4	*-0.6*	87.1	85.3	*-1.8*
China	20.6	23.0	*2.4*	29.2	33.9	*4.8*	60.4	77.1	*16.7*
India	67.8	73.6	*5.8*	74.1	66.4	*-7.7*	75.0	83.1	*8.1*
Russia	54.7	55.9	*1.2*	8.0	10.1	*2.1*	13.7	19.6	*5.8*
Regional economies	**37.6**	**57.5**	***19.9***	**48.1**	**50.5**	***2.4***	**56.3**	**69.5**	***13.2***
Indonesia	23.3	87.4	*64.1*	38.1	26.4	*-11.8*	30.6	39.9	*9.4*
Philippines	56.9	59.2	*2.3*	50.2	47.6	*-2.6*	37.0	57.5	*20.6*
Singapore	71.4	83.8	*12.5*	89.4	101.3	*11.8*	127.7	135.9	*8.2*
Thailand	4.6	22.0	*17.3*	22.9	27.8	*4.9*	34.0	53.8	*19.7*
Malaysia	31.9	35.2	*3.3*	40.1	49.6	*9.5*	52.4	60.4	*8.0*

Source: IMF Global Debt Monitor 2023

When it comes to debt, the dose makes the poison. Government debt can be beneficial insofar it leads to higher economic spillover (Kose et al, 2020). At low and moderate levels, it can help stabilise short-term economic volatility (Yared, 2019), facilitate the development of domestic financial markets by providing a benchmark safe asset (Hauner, 2009), and promote long-term economic growth through

investments in physical and human capital (World Bank, 2018).[3] However, at high levels, it can incur significant costs such as limiting the effectiveness of fiscal policy (Debrun and Kinda, 2016), constraining fiscal space available for growth-enhancing spending or countercyclical policies (Obstfeld, 2013), increased challenges of debt repayment and rollover (Arellano and Ramanarayanan, 2012; Henderson, 2019) and higher vulnerability to financial crises (Blanchard, 2019). Ultimately, high government debt could act as a drag on economic growth (Reinhart and Rogoff, 2010).

Shifting our focus towards the domestic context, Malaysia's government debt has also been on a rising trajectory similar to global trends. Government debt has almost doubled from 31.9% of GDP in 1997 at the onset of the Asian Financial Crisis (AFC) to 60.4% of GDP in 2022 – a period characterised by persistent fiscal deficits amidst narrow revenue base coupled with high expenditure. During this period, government debt grew faster with a compound annual growth rate of 10.0% compared to nominal GDP at 7.0%. Significant upticks were also observed during crisis years where the government debt ratio increased by approximately 10 percentage points between 2008-09 and 2019-20. In the recently approved Public Finance and Fiscal Responsibility Act (FRA), the government has capped the maximum limit of federal government debt at 60% of GDP. Nevertheless, the government debt ratio is expected to remain elevated in the near term, as the average medium-term fiscal balance target[4] of -3.5% of GDP hovers above the estimated debt-stabilising overall balance[5] of -3.0% of GDP[6] (equivalent to the debt-stabilising primary balance of -0.9% of GDP). This has naturally heightened concerns over the implications towards from growth from the high government debt ratios.

[3] Notable exception includes Singapore which has a high government debt ratio, but its net debt is zero. This is due to its strong balance sheet where the value of its financial assets exceeds its liabilities. Moreover, the government debt is primarily issued for non-spending purposes (e.g. development of debt market, meeting investment needs of the provident fund, and facilitating transfer of excess official foreign reserves from the central bank to the government) (IMF, 2023d).

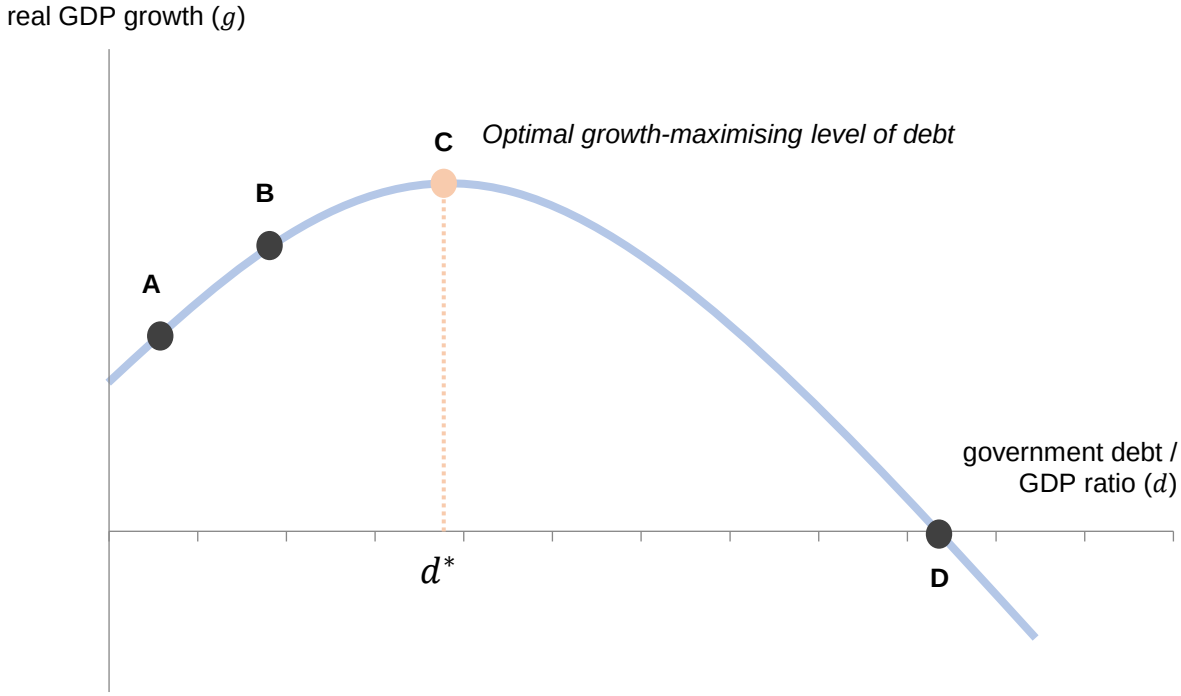
[4] The Medium-Term Fiscal Framework (MTFF), which serves as guidance for budgetary planning by setting a three-year average macro-fiscal projection, outlines a fiscal deficit target of -4.3%, -3.2% and -3.0% of GDP in 2024, 2025 and 2026 respectively (Ministry of Finance, 2023).

[5] The debt-stabilising overall balance refers to the fiscal balance at which the debt ratio starts to moderate. The builds on the concept of debt-stabilising primary balance, which essentially captures the overall balance minus interest payments.

[6] Based on author's estimate as of 2024. The debt-stabilising overall balance is sensitive to the assumption used in the estimate.

Concerns over the impact of government debt on economic growth has been a key policy question in academic literature since the early 1940s (de Soyres et al, 2022). The main premise suggests a non-linear, concave relationship between the two variables. As shown in Figure 1, additional government debt accumulation at low levels (from point A to point B) improves growth dynamism (Salmon, 2021). After a certain threshold (point B to point C), the marginal impact of additional debt towards growth starts to diminish. As debt ratios increase beyond point C, additional debt eventually slows down growth. Between point C and D, the additional government debt causes economic growth to be lower than what it would have been in a counterfactual scenario, despite having a positive impact. After point D onwards, additional debt has a negative impact on growth. Thus, point C can be considered as the optimal growth-maximising level of debt. Ascertaining this threshold is vital for policymakers to balance the trade-off between the benefits and costs of incurring higher government debt.

Figure 1: Theoretical relationship between government debt and growth



Source: Adapted from Pattillo, Poirson & Ricci (2002) and Salmon (2021)

This paper aims to contribute to this strand of literature by estimating the growth-maximising debt threshold for Malaysia by employing a threshold

autoregression (TAR) model. This is complemented with further estimation using a debt-augmented growth model, which acts as a robustness check on the TAR estimates. Firstly, by focusing on Malaysia, we derive an estimation that is tailored to the unique structural features of its economy, which can be used to guide specific policy recommendations. Secondly, it would contribute to expanding the body of research available on emerging markets and developing economies (EMDEs), specifically on country-specific debt thresholds, which has been sparse to date.

This paper is structured as follows: Section 2 highlights a brief review of the literature on the relationship between government debt and economic growth. Section 3 reviews the cross-country empirical estimation of government debt thresholds. Section 4 outlays a background on government debt dynamics in Malaysia whilst section 5 presents the data and methodology. Section 6 explains the findings from our estimation using the TAR and the debt-augmented growth models. Section 7 follows by discussing the policy implications arising from these findings. Finally, section 8 summarises the findings and provides concluding comments.

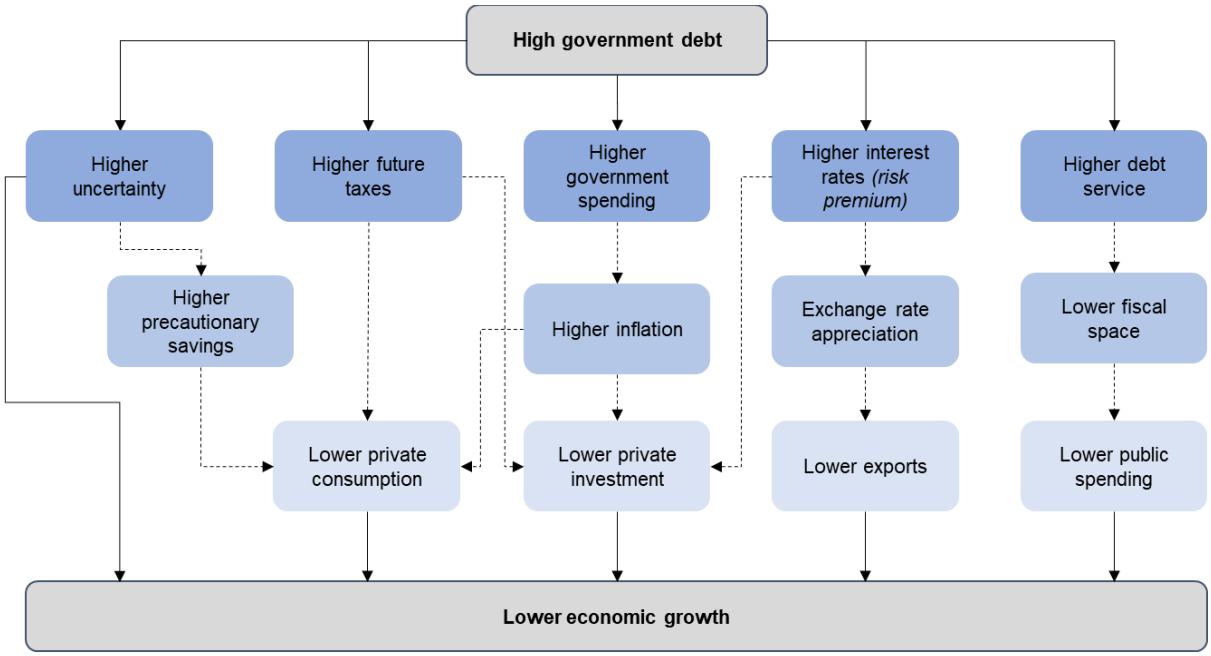
2. Literature review of the relationship between government debt and economic growth

Both Classical and Keynesian theory share consensus that higher government debt has a positive impact on growth in the short run, especially during periods of downturn (Elmendorf and Mankiw, 1999). Higher fiscal deficit through increased spending and lower revenue increases households' disposable income, thus boosting aggregate demand (Rosoiu, 2019; Heimberger, 2021). However, the long run impacts have been subject to expansive debates (Kjosev, 2021). Classical theory asserts the government debt causes economic stagnation due to its crowding-out impact on private investment (Domar, 1944). On the contrary, Keynesian theory suggest that the positive multiplier effect from debt-financed public expenditure would increase national output (Elmendorf and Mankiw, 1999).

In terms of transmission channels of the negative long run impact, firstly higher government debt will result in higher interest rates as increased government borrowing crowds out private investment, thus lowering capital accumulation (Baldacci and

Kumar, 2010). Consequently, such rise in interest rates could result in exchange rate appreciation, thereby reducing the competitiveness of net exports (Heimberger, 2021). Moreover, at a higher debt level, the fiscal space of the government to undertake countercyclical fiscal policies in the period of economic shocks may be constrained. This could result in higher output volatility and lead to lower growth (Aghion and Kharroubi, 2013). As posited by the debt overhang hypothesis, concerns over the Government's debt repayment capacity and potential future tax increases would discourage production and investment decisions (Krugman, 1988; Reinhart et al, 2012). Besides that, higher government debt from increased public spending could also spur inflationary pressures that act as a drag on economic growth (Ash et al, 2020). Of importance, Cochrane (2010) asserts that high government debt may have a negative effect on growth if it induces uncertainty in fiscal policy conduct, financial repression or expectations of higher inflation. Figure 2 summarises the various transmission channels through which high levels of government debt exert a negative impact on economic growth in the long run.

Figure 2: Transmission channels of the negative impact of high government debt on economic growth in the long run



Source: Authors' compilation

In contrast, higher government debt may also impact growth positively in the long run in several ways. De Long and Summers (2012) assert that higher debt can

increase long-run growth under certain macroeconomic conditions. In an environment of deep recession amidst constrained monetary policy, a combination of low borrowing rates and positive fiscal multiplier can raise both current and potential output. Besides that, the long-run impact on growth from higher debt depends on the purpose of debt-financed expenditure (Aschauer, 1989), as it can be used to finance current or capital expenditure (Aizenman et al, 2007). This was corroborated by the Abiad et al (2015) who found output effects tend to be larger when public investments are debt-financed by examining the impacts of public investments in 17 OECD countries from 1985 to 2013. Woodford (1990) also asserted that a higher government debt can increase economic efficiency and crowd-in investments in a liquidity-constrained economy. This is because government debt acts as safe and liquid assets for collateral for private agents, amidst shortages of private collateral (Angeletos, 2021).

3. Empirical estimation of the relationship between government debt and economic growth

Progression and advancement in the understanding of the government debt-growth nexus has influenced the focus of empirical evaluations. The primary objective is to examine whether a discernible non-linear and causal relationship exists between government debt and economic growth, which facilitate the search for a threshold at which economic growth is adversely impacted. This analytical framework also necessitates addressing complexities surrounding endogeneity and reverse causality.

3.1 Establishing a causal negative relationship between government debt and growth

Several approaches have been employed in the literature to address the issues of endogeneity. Kumar and Woo (2010) used the Generalised Method of Moments (GMM) estimation and found that an increase in the lagged government debt to GDP ratio by 10 percentage points is associated with an average fall in GDP growth rate by 0.25 percentage points. Others have used instrumental variables such as lagged values of government debt ratio (Cecchetti et al, 2011) and average government debt ratios of other countries (Checherita-Westphal and Rother, 2012) to report robust negative relationship between government debt and economic growth in the long run. However, Panizza and Presbitero (2014) argue that above approaches do not

adequately address endogeneity. Instead, they proposed to employ an external instrument that captures valuation effects from the currency composition of government debt and found the causal negative link between government debt and growth fails to hold.

Recently, Ash et al (2020) attempted to address endogeneity by using leads and lags of GDP growth in relation to government debt and found no evidence of a causal relationship. The authors suggested that earlier results in the literature could have been driven by small sample sizes, outliers and peculiar econometric approaches. Additionally, when authors account for heterogeneity among countries in their samples, the results tend to vary significantly between countries (Eberhardt and Presbitero, 2015; Bentour, 2021). Thus, there are no clear consensus in the literature on the causal negative relationship between government debt and economic growth in the long run as well as on the best empirical approach in addressing these econometric challenges.

3.2 Establishing the threshold effect of government debt on growth

The seminal paper by Reinhart and Rogoff (2010), which laid the foundation for many other studies after it, found government debt ratios above 90% of GDP are associated with lower economic growth rates. However, their findings have been heavily contested for data exclusion, coding errors and unusual weighting of summary statistics (Herndon et al, 2014). Using the same sample as Reinhart-Rogoff, Egert (2015) and Lee et al (2017) found the estimates are sensitive to specifications, with the latter finding the threshold estimate to be much lower at 30%.

Nevertheless, the findings on the government debt threshold drawn from Reinhart-Rogoff align closely with many other empirical studies. For advanced economies, Cecchetti et al (2011) estimated the threshold to be around 85% of GDP, using an ordinary least squares (OLS) regression with quadratic government debt ratio term. Similarly, other papers have found the threshold estimate to be slightly higher, falling within the range of 90%–100% of GDP (Checherita-Westphal, 2012, Baum et al, 2013) while Caner et al (2010) found it to be lower at 77% of GDP. For emerging markets and developing economies (EMDEs), the threshold estimates generally tend to be lower. Cottarelli and Moghadam (2011) estimated the threshold to range

between 63%–78% of GDP for a sample of 50 emerging economies. Some studies have estimated the threshold to be lower at 45% (Mercinger et al, 2015) meanwhile others have reported slightly higher threshold closer at 88% of GDP (Yolcu Karadam, 2018).

Related to the scope of this paper, there are some studies attempting to examine country-specific debt thresholds although they remain limited at this juncture. Kjosev et al (2021) estimated the government debt threshold for North Macedonia to be close to 30% of GDP using a non-linear multiple regression model. Similarly, the government debt threshold for Zimbabwe was estimated to be around 45%–50% of GDP using a bivariate quadratic growth model (Mupunga N., Le Roux P, 2015) meanwhile Nepal's debt threshold estimated to be 33% of GDP using the autoregressive distributed lag (ARDL) bound model (Bhatta and Mishra, 2020).

More importantly, a few studies have specifically examined Malaysia. Kueh et al. (2017) used the threshold regression method and found the debt-to-GDP threshold for domestic debt to be low, at 37% of GDP for domestic debt specifically. On a slightly tangential study, Lau et al. (2022) examined the external debt threshold of 16 Asian economies, found that the debt threshold for Malaysia registers at 78.1% of GDP. However, the study covers total public and private debt owed to non-residents, rather than the total outstanding obligations of the federal government, which is of primary interest for this paper. Table 2 provides a summary of the findings from the literature.

Table 2: Summary of studies on the relationship between government debt and economic growth

Advanced economies (AEs)			
Paper	**Threshold**	**Paper**	**Threshold**
Yolcu Karadam (2018)	107%	Padoan et al. (2012)	82% - 91%
Baum et al. (2013)	95%	Mercinger et al. (2014)	80% - 94%
Rother et al. (2013)	95%	Caner et al. (2010)	77%
Ghosh et al. (2013)	90% - 100%	Afonso et al. (2015)	75%
Kumar et al. (2010)	90%	Topal (2014)	72% - 80%
Reinhart et al. (2010)	90%	Afonso et al. (2013)	59%

Brida et al. (2017)	90%	Egert (2015)	20% - 60%
Emerging markets and developing economies (EMDEs)			
Paper	**Threshold**	**Paper**	**Threshold**
Yolcu Karadam (2018)	88%	Caner et al. (2010)	64%
Afonso et al. (2013)	79%	Mercinger et al (2015)	45%
Cottarelli and Moghadam (2011)	63% – 78%	Kjosev et al (2021)	30%

Source: Adapted from De Rugy and Salmon (2020)

The lower debt threshold in EMDEs can be attributed to differences in structural factors (Caner et al, 2010). First, relatively shallow financial and capital markets would limit a government's ability to access domestic financing at lower costs (Gennaioli et al, 2013). Given the less diversified domestic credit base, governments turn to foreign investors for financing, which is priced with higher premia/interest rates. Second, higher volatility in key macroeconomic variables would reduce investor confidence and demand for government bonds (Kose et al, 2020). Another key difference is the weak economic environment can affect the Government's ability to generate stable revenue collection, thus impeding on debt servicing capacity. Third, relatively weaker public institutions are perceived to have less control over public finances, which undermines market confidence and result in an increase in borrowing costs (Acemoglu et al, 2003). Lastly, EMDEs with a history of default tend to have higher ratios of debt servicing (i.e., debt to revenue and debt service to revenue ratios) as well as larger share of foreign currency borrowing (Panizza and Taddei, 2020), which cause investors to place higher risk premia. Given these factors, the threshold at which government debt has a negative impact on growth is likely to vary systematically between Aes and EMDEs, as well as within EMDEs (Bentour, 2021).

Overall, the literature points to varying results based on the empirical approaches employed in the estimations. Given the absence of consensus in addressing issues of endogeneity, reverse causality, and heterogeneity (specifically for panel estimations), caution should be exercised in similar attempts to estimate government debt threshold effect on growth, which are key considerations undertaken in the empirical estimation employed in this paper.

4. Government debt profile in Malaysia

For the scope of this paper, government debt refers to the outstanding obligations of the Malaysian federal government. It can be categorised into domestic debt and offshore borrowing. The domestic debt constitutes of Malaysian Government Securities (MGS), Malaysian Government Investment Issues (MGII), treasury bills such as Malaysian Treasury Bills (MTB) and Malaysian Islamic Treasury Bills (MITB) as well as the Housing Loan Fund debt.[7] Offshore borrowing, which comprises market and project loans, refers to debt instruments issued in foreign currency[8] (Ministry of Finance Malaysia, 2021).

Prior to the recent passing of the FRA on 11 October 2023 in the House of Representatives of the Malaysian Parliament, the Federal Government debt was governed under several different legislations by type of debt instruments, which mandated specific statutory limits on borrowing (Table 3). Nevertheless, official communications and media reporting tend to highlight a specific statutory debt limit or referred to as statutory limit 1 for the purposes of this paper, which covers the sum of outstanding MGS, MGII and MITB. This debt limit has undergone several revisions in the last three decades, reflecting the growing needs to support the economy particularly during crisis year. It was temporarily increased to 65% of GDP under the Temporary Measures for Government Financing (Coronavirus Disease 2019 (COVID-19)) Act 2021. Subsequently, under the newly approved FRA, all three statutory limits on Federal Government borrowing have been consolidated to a single limit of 60% of GDP.

[7] Refers to the Sukuk Perumahan Kerajaan (SPK) raised for civil servant housing loans, issued by the Federal Government before the establishment of the Public Sector Home Financing Board (LPPSA).
[8] Only accounts debt instruments issued in foreign currency regardless of the residential status of the holder (e.g., residents or non-resident) as gazetted of the External Loan Act.

Table 3: Debt instruments and governing legislation

Legislation	Statutory limit	As at end-2022
• Loan (Local) Act 1959 [Act 637] • Government Funding Act 1983 [Act 275] • Temporary Measures for Government Financing (Coronavirus Disease 2019 (COVID-19)) (Amendment) Act 2021 [Act A1635]	**Statutory limit 1:** Outstanding MGS, MGII, and MITB not exceeding 65% of GDP	RM1,032 billion (57.7% of GDP)
• Treasury Bills (Local) Act 1946 [Act 188]	**Statutory limit 2:** MTB not exceeding RM10 billion	RM9 billion (0.5% of GDP)
• External Loans Act 1963 [Act 403]	**Statutory limit 3:** Offshore borrowing not exceeding RM35 billion	RM29.5 billion (1.6% of GDP)

Source: Updates on Economic & Fiscal Outlook and Revenue Estimates 2023, Ministry Of Finance, Malaysia.

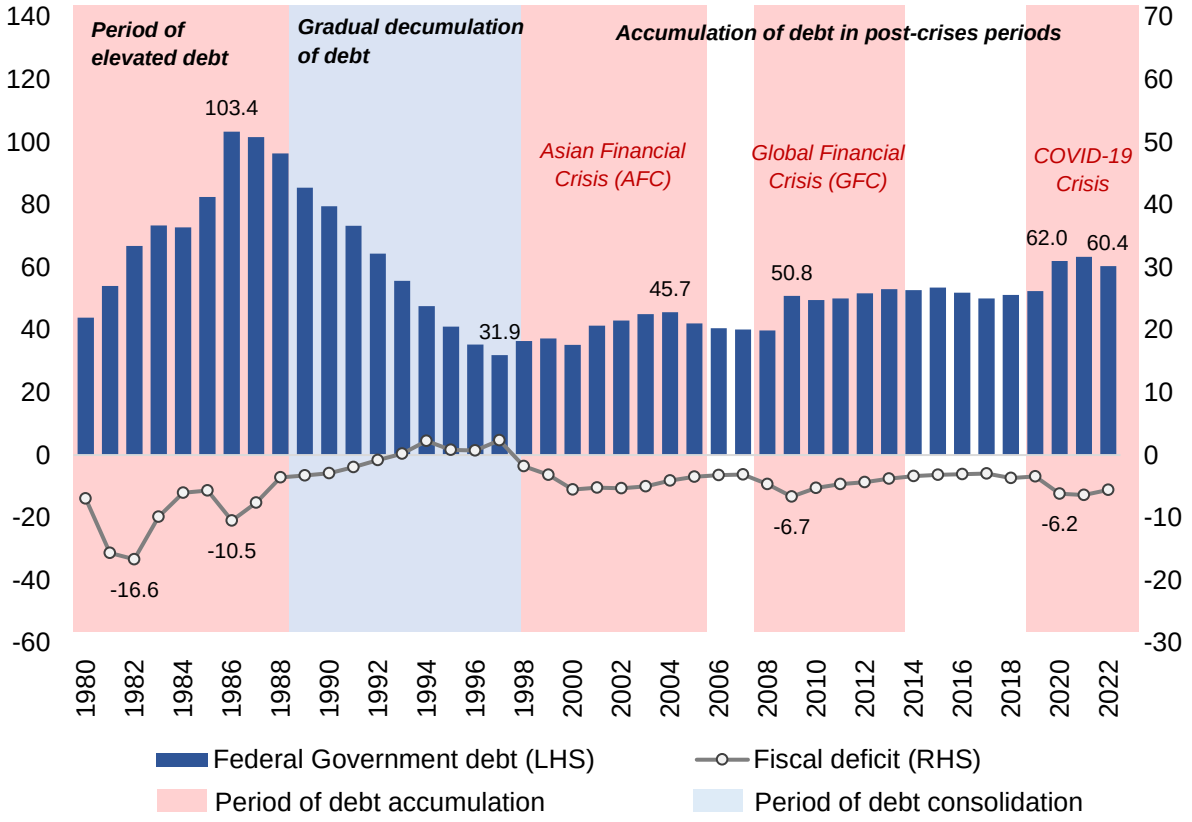
Table 4: Changes to the statutory debt ceiling (RM bil, % of GDP)

Pre-2003	2003	2006	2008	2009	2020*	2021*
MGS: RM120 bil MGII: RM30 bil	MGS: 40%	MGS: 40% MGII + MITB: RM30 bil	MGS + MGII + MITB: 45%	MGS + MGII + MITB: 55%	MGS + MGII + MITB: 60%	MGS + MGII + MITB: 65%

*Note: The changes in 2020–2021 were temporary revisions accorded under the COVID-19 Act which has expired at the end of 2022.
Source: Loan (Local) (Statutory Ceiling for Borrowing) and Government Funding (Statutory Ceiling of Moneys Received) Order 2009

The evolution of the Malaysian Government debt in the last four decades can be characterised into 3 periods: 1) a period of elevated debt in the 1980s, 2) a protracted period of debt consolidation prior to 1998 Asian Financial Crisis and 3) the accumulation of debt in the periods of economic and financial crises (Chart 2).

Chart 2: Malaysia's Federal Government Debt and Fiscal Balance (% of GDP)



Source: Ministry of Finance, Malaysia

In the 1980s, the government debt ratio escalated and peaked at above 100% of GDP in 1986 due to the combination of sizeable fiscal deficits and adverse growth shocks.[9] The widening of the fiscal deficit was driven by large expenditure programmes[10] and low revenue collection due to a downturn in the global commodity prices, especially for crude oil and tin. This necessitated the Government to review and reprioritise projects as well as privatise several Government functions and agencies.

The combination of high growth environment and the Government's continued commitment to fiscal consolidation efforts from the late 1980s resulted in the fiscal balance turning positive[11] in 1993 and for the debt-to-GDP ratios to steadily decline. Government debt was significantly reduced by about 72 percentage points from

[9] Real GDP growth in 1985 was -1% and correspondingly, debt ratio in 1986 peaked at 103.2% of GDP (BNM Monthly Statistical Bulletin, 1985).
[10] Intended to support the New Economic Policy (NEP)'s objective of restructuring the economy which yielded robust growth performances. (Thillainathan & Cheong, 2016).
[11] Since 1980, Malaysia has only recorded a surplus fiscal balance for 5 years between 1993-1997.

103.2% of GDP in 1986 to 31.3% of GDP in 1997. As part of the efforts, the Government had also embarked on a large-scale privatisation programme, which provided the budgetary space to implement pro-growth economic policies (Table 5).

Table 5: Proceeds and Savings from Privatisation Programme (1983-1995)

	1983 – 1990		1991 – 1995		1983 – 1995	
	RM billion	% revenue	RM billion	% revenue	RM billion	% revenue
Proceeds						
Sale of equity	7.3	4.2	11.8	5.5	19.1	4.9
Sale of assets	0.1	0.05	2.3	1.1	2.4	0.6
Savings						
Development expenditure	21.2	12.1	51.6	24.0	72.8	18.6

Note: Savings refer to the cutback in capital spending due to transfer of operations to the private sector.
Source: Economic Planning Unit, Malaysia

Nevertheless, the consolidation efforts were disrupted by the Asian Financial Crisis (AFC) in 1997, which required the Government to implement counter-cyclical fiscal measures to support growth[12]. Consequently, the fiscal balance turned negative, and the debt-to-GDP ratio rose in 1998. The Government resumed its consolidation efforts between 2000 and 2007, during which fiscal deficit narrowed from -5.5% of GDP to -3.1% of GDP.

However, before fiscal aggregates could improve to pre-AFC levels, the Malaysian economy experienced another shock in the form of the 2008/09 Global Financial Crisis (GFC). Once again, the Government deployed counter-cyclical measures by implementing substantial stimulus packages amounting to 6.7% of

[12] The Government provided additional allocation of RM7 billion for development expenditure, with RM1.5 billion channeled towards debt and corporate restructuring efforts by Pengurusan Danaharta Nasional Berhad.

GDP[13], which led to an increase in the government debt ratio, from 39.8% of GDP in 2008 to 50.8% of GDP in 2009.

After the Global Financial Crisis (GFC), the Government embarked on a steady fiscal consolidation to gradually rebuild fiscal space. This was augmented by several reforms. Notable ones include subsidy rationalisation[14] in 2010, which resulted in the subsidy bill to fall from an average of RM30.1 billion between 2011–2014[15] to an average of RM10.7 billion between 2015–2019. Another key reform was the introduction of the Goods and Services Tax (GST) in 2015 to broaden the revenue base. Indirect tax collection increased from an average of RM35.9 billion between 2012–2014 to an average of RM58.4 billion between 2015–2017. Additionally, the Government also undertook one-off debt reduction efforts in 2016 by transferring some of its debt to the newly established Public Sector Home Financing Board (Lembaga Pembiayaan Perumahan Sektor Awam, LPPSA), a statutory body responsible for managing public sector housing financing facilities.[16] As a result, the fiscal deficit was reduced from -6.7% of GDP in 2009 to its lowest of -2.9% of GDP in 2017. In the same period, Federal Government debt declined from a peak of 53.0% of GDP in 2013 to its lowest in 2017 at 50.0% of GDP. In 2018, however, fuel subsidies were reintroduced, and the Sales and Services Tax (SST) was reinstated to replace the GST.

In 2020-21, similar to most, Malaysia was severely impacted by the impact of the COVID-19 pandemic. The crisis necessitated extensive fiscal support resulting in the widening of fiscal deficit from -3.4% of GDP in 2019 to -6.4% of GDP in 2021 to partly finance eight stimulus and assistance packages comprising both fiscal and non-fiscal measures with a total value of RM530.0 billion[17]. Consequently, the Federal Government debt experienced a sharp increase from 52.4% in 2019 to 63.4% in 2021.

[13] Stimulus packages in 2008 & 2009 amounted to RM7 billion and RM50 billion respectively. In addition, RM14.7 billion was disbursed under National Food Security as part of counter-cyclical measures.
[14] The price of RON95 and Diesel were both raised by RM0.10 per litre cumulatively whilst the price of RON97 was floated. The price of cooking gas and sugar were increased by RM0.10 per kg and RM0.25 per kg respectively.
[15] Despite fuel subsidy reforms being implemented in 2010, the subsidy bill only began to decline later due to elevated Brent oil prices between 2010 and 2014 averaging USD102. (2015-2019: USD57.9).
[16] A portion of the Housing Loan Fund debt amounting to RM21.9 billion (1.8% of estimated 2016 GDP) were transferred to the LPPSA.
[17] Examples include targeted cash transfers, wage subsidy programmes, reskilling and upskilling programmes, as well as the provision of grants and microcredit to eligible businesses among others.

This lays down the importance and urgency of examining the optimal growth-maximising as well as the threshold of government debt ratio in Malaysia.

5. Data description and methodology

5.1 Threshold Autoregressive (TAR) model

In estimating the growth-maximising debt threshold for Malaysia, this paper employed the threshold regression model, as in Hansen (1999, 2000). The government debt was used as the threshold variable to search for the threshold effect in the debt-growth nexus. To this end, the following model was estimated:

$$\Delta \ln GDP_t = \theta_1 Debt_t I(Debt_t \leq \gamma) + \theta_2 Debt_t I(\gamma < Debt_t < \gamma) + \theta_3 Debt_t I(\gamma > Debt_t) + \sigma w_t + \upsilon_t, \quad (1)$$

where the dependent variable is the GDP_t at time t=1…, T. The debt level serves as a regime-dependent regressor. I(.) is the indicator function and γ represents the debt threshold. In short, the two regimes are distinguished by the threshold variable $Debt_t$ for a regime above or below the threshold value of γ and by different regression slopes, denoted θ_1, θ_2 and θ_3. The set of control variables (w) consists of inflation (INF), population (POP) and net export (NETE). The threshold estimation proposed by Hansen (1999, 2000, 2011) was used to figure out the marginal impact of debt on economic growth in high- and low-debt regimes. One of the advantages of the threshold models proposed by Hansen (1999, 2000) over the others is that it allows testing of the validity of different numbers of thresholds using bootstrapping method (i.e., the null hypothesis of a one-regime model can be tested against the alternative of a two-regime model). In this regard, Hansen (1999) considers two sequential tests for models with zero, one, and two thresholds. If the null hypothesis of no threshold is not rejected, there is no support for asymmetry. If the null hypothesis of no threshold and the null of a single threshold are easily rejected, this indicates the existence of a two-regime.

5.2 Debt-augmented growth model

Another approach was also used to investigate the presence of a government debt threshold, following the studies by Mencinger et al. (2014, 2015), Kjosev et al. (2021) and Lau et al. (2022*)*. Firstly, the variables were tested for stationarity using the augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979) and the Kwiatkowski–Phillips–Schmidt–Shin test (Kwaitkowski et al., 1992). This was followed by tests for cointegration using the Johansen (Johansen and Juselius, 1990) and the Engle-Granger (Engle and Granger, 1987) tests. Then, an error correction model (ECM) was estimated to confirm the long-run relationship between government debt and economic growth.

$$GDP_t = \beta_0 + \beta_1 GDEBT_t + \beta_2 INF_t + \beta_3 POP_t + \beta_4 NETE_t + \varepsilon_t \quad (2)$$

where GDP_t refers to gross domestic product, $GDEBT_t$ refers to government debt; POP_t represents population, $NETE_t$ is net export, INF_t refers to inflation, β's represents slope coefficients, and ε is the error term.

Once the relationship is confirmed, the following debt-augmented growth model was estimated to compute the debt threshold:

$$\mathrm{LGDP_t} = \alpha_\mathrm{i} + \beta \mathrm{L(GDP)_{t-1}} + \gamma_1 \mathrm{GDEBT_t} + \gamma_2 GDEBT_t^2 + \sum_1^\mathrm{n} \mathrm{x_t} + \varepsilon_\mathrm{t} \quad (3)$$

In equation 3, $LGDP_t$ is the natural logarithm of gross domestic product. GDP_t refers to the gross domestic product, meanwhile x_t refers to the set of controls as in equation 2. Meanwhile, γ_1 and γ_2 are coefficients of $GDEBT_t$ and $GDEBT_t^2$, respectively and ε_t is the unobservable error term. The existence of a non-linear and concave relationship can be confirmed if the coefficients for the debt term are statistically significant, where γ_1 is positive and γ_2 is negative. Once the non-linear relationship is confirmed, the threshold indicated by the turning point can be estimated using equation following Lind and Mehlum (2007):

The debt threshold value, $dtv = -\frac{\gamma_1}{2\gamma_2}$ (4)

In this regard, the coefficient of debt and debt squared variable will be negative when the debt-to-growth ratio exceeds the turning point. This situation implies that public debt up to a certain level has a positive impact on economic growth. Meanwhile, public debt above the turning point has deleterious effects on economic growth.

5.3 Data description

The sample spans from 1980 to 2022 consisting annual growth rate data for selected variables, as listed below with its respective description and source summarised in Table 6. The selected variables align with the established determinants of growth identified in relevant literature e.g., Kumar and Woo (2010) and Checherita and Rother (2010).

Table 6: Summary of variables

Variable	Description	Source
Nominal GDP	Measures the total value of production of all residents in a country for a specified period which captures the level of economic development.	DOSM
Federal Government debt	Refers to the outstanding obligations of the Malaysian federal government used for the purposes of deficit financing and rolling over maturing debt	MOF
Net exports	Captures the trade balance of an economy as a proxy for an economy's competitiveness, measured by the difference in the value of a country's total exports and total imports	DOSM
Inflation rate	Captures the general price increase in the economy	DOSM
Population growth rate	Captures the structural feature of an economy that determines future availability of labour force, human capital and productivity.	DOSM

Note: MOF refers to the Ministry of Finance & DOSM refers to Department of Statistics

6. Empirical results

In estimating the growth-maximising debt threshold, this study primarily investigated the impact of government debt on Malaysia's GDP, with the results reported in Table 7. When comparing the null hypothesis of no threshold to the alternative hypothesis of a single threshold, the null hypothesis is rejected, indicating the presence of a threshold. The analysis then tested a single threshold against a dual threshold model. Based on the likelihood ratio statistic of 41.3, the dual threshold model is preferred.

This model reported a statistically significant lower and upper threshold of 74% and 97% of GDP, respectively. This can be interpreted as when government debt is below 74% of GDP, the additional debt impacts growth positively. However, this effect turns negative once government debt escalates beyond 97% of GDP. Within the ranges of 74% and 97% of GDP, the impact of government debt is still positive albeit being smaller in magnitude, though the reported result is not statistically significant.

Table 7: Threshold Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDEBT < 74				
GDEBT	0.0130*	0.006	2.094	0.044
POP	-0.0307	0.129	-0.237	0.813
INF	0.008	0.009	0.988	0.331
C	4.014*	1.666	2.409	0.022
74 <= GDEBT < 97				
GDEBT	0.003	0.003	0.083	0.934
POP	0.243*	0.008	30.794	0.000
INF	0.025	0.022	1.162	0.254
C	0.250	0.315	0.792	0.434
97 <= GDEBT				
GDEBT	-0.003*	0.000	-4.653	0.000
POP	0.178*	0.003	46.432	0.000
INF	0.017*	0.004	3.755	0.000
C	1.555*	0.090	17.107	0.000
Non-Threshold Variables				
NETE	0.0010*	0.000	5.678	0.000
Threshold Test				
H_0 : No threshold			53.208*	
H_0 : At most one threshold			41.296*	
H_0 : At most two threshold			12.596	

Notes: GDEBT = federal government debt, Population = population, INF = inflation and NETE= Net Exports. (*) Significant at the 0.05 level.

Table 7 reports the non-threshold specification, which corroborates the impact of government debt observed in the earlier analysis. In the long run, there emerges a discernible and statistically significant inverse relationship between government debt and growth. Specifically, government debt correlates positively with GDP when the government debt remains under 74% of GDP but the impact turns negative when government debt increases beyond 103%. Notably, an affirmative positive impact is

registered within the debt ranges of 74% to 97% of GDP (as per Table 7) and 74% to 103% of GDP (as indicated in Table 8). Focusing on the regime-independent coefficients, government debt tended to impact positively on GDP. While most coefficients of the explanatory variables align with economic theory, the coefficients for inflation deviates.

Our findings indicate a positive correlation between inflation and GDP across all models examined. Of note, for the model where government debt exceeds 97% of GDP, the positive correlation is statistically significant. There are two potential explanations for this. Firstly, when government debt ratio is high, inflation can improve the fiscal balance as nominal revenue collection tend to rise faster than nominal expenditures. The improvement in fiscal balance alongside the denominator effect would reduce the government debt ratio, thus providing the fiscal policy space for the government (Garcia-Macia, 2023). This would allow the Government to temporarily undertake spending aimed at supporting growth.

Alternatively, this could potentially be explained by the inflation-growth threshold effect, which stipulates that inflation has a non-linear relationship to growth, only affecting it negatively beyond a certain threshold (Fischer, 1993). Thanh (2015) found the threshold estimate to be around 8% for the ASEAN-5 economies. Similarly, Vinayagathasan (2013) investigated the threshold effect for 32 Asian economies and found the estimate to be 5%. Considering Malaysia's low inflation rate, averaging 2.9% within the sample from 1960 to 2022, it is conceivable that a potential increase in inflation could have a positive impact on economic growth, when government debt remains above the threshold of 97% of GDP. This is because the negative effects of inflation on growth, if any, has yet to significantly materialise at the threshold debt ratio. While these explanations hold potential merit, the paper does not delve further into it due to scope limitations. However, they could be valuable avenues for further research in future investigations.

Table 8: Debt Threshold: Non-Threshold Variables

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDEBT < 74				
GDEBT	0.004	0.000	4.519	0.000
74 <= GDEBT < 103				
GDEBT	0.0016	0.000	4.607	0.000
103 <= GDEBT				
GDEBT	-0.0007	0.000	-8.271	0.000
Non-Threshold Variables				
C	0.660	0.121	5.452	0.000
POP	0.215	0.004	43.339	0.000
NETE	0.001	0.0003	4.559	0.000
INF	0.023	0.004	4.905	0.000
Threshold Test				
H_0 : No threshold			75.368*	
H_0 : At most one threshold			25.953	
H_0 : At most two threshold			15.900	

Notes: GDEBT = federal government debt, Population = population, INF = inflation and NETE= Net Exports. (*) Significant at the 0.05 level.

Further analysis was conducted using the debt-augmented growth model. The results of the ADF and KPSS tests conducted indicated that all variables are non-stationary at the level form but are stationary in their first difference for all the variables.[18] Therefore, the results suggest that all the variables have the same order of integration, that is I(1). Since it has been determined that all the variables are integrated to the order of 1, then the cointegration test is implemented. Table 9 presents the summary of the cointegration results. It is observed that both the trace and maximum eigenvalue tests yielded contradicting conclusions. In this scenario, we followed the results from the maximum eigenvalue[19] of rejecting the null hypothesis of

[18] Results for unit root tests with variables in Equation 2 are not provided in this paper for brevity but can be made available upon request.
[19] Johansen and Juselius (1990) indicate that maximum eigenvalue is more powerful compared to trace statistics.

no cointegration implies that the six variables do not drift apart and share at least a common stochastic trend in the long run.

Table 9: Cointegration Test

Null	Alternative	k=1 r=1			
		λ max		Trace	
		95% C.V.		95% C.V.	
r = 0	r = 1	51.044*	44.497	158.674*	117.708
r<= 1	r = 2	33.679	38.331	107.630*	88.803
r<=2	r = 3	26.958	32.118	73.951*	63.876
r <=3	r = 4	21.198	25.853	46.992*	42.915
r<= 4	r = 5	14.943	19.387	25.793	25.872
r<=5	r = 6	10.850	12.517	10.850	12.517

Notes: Asterisks (*) denote statistically significant at 5 percent level. The *k* is the lag length and *r* is the cointegrating vector(s).

Following the cointegration test, the estimated Error Correction Model (ECM) reported a significant negative error correction term (ECT), which affirms the long-term relationship highlighted in the cointegration test. The reported ECT magnitude of -0.44 indicates an adjustment of approximately 44% annually towards the long-term equilibrium for Malaysia, as detailed in Table 10. More importantly however, the ECM yields the coefficients of GDEBT and $GDEBT^2$ to be positive and negative respectively and significant at the 5% level. This supports the conclusion of an inverted U-shaped relationship between government debt and GDP, as noted by Kjosev et al. (2021). The estimated debt threshold stands approximately at 71.0%, as reported in Table 10.

Table 10: Long Run Estimates, ECT and Threshold Computation

Variables	Coefficients
GDEBT	0.446*
$GDEBT^2$	-0.0031*
INF	-0.080*
POP	-0.251*
NETE	0.346*
Constant	4.794
ECT Coefficient: -0.440 (-2.863)	
Threshold (%): 70.7	

Note: The asterisk (*) denotes significance at 5% levels.

From both empirical approaches employed in this paper, it can be concluded that the estimated threshold ranges between 70% and 74% of GDP at the lower bound whereas the upper bound estimates range between 97% and 103% of GDP. Conservative interpretations of the finding would suggest that government debt acts as a growth catalyst below the threshold of 70% of GDP but may potentially dampen economic growth above 70% of GDP, based on the lower bound estimate. The range between the lower and upper bound estimates can be considered as a grey area, which reflects the difficulty in mapping the concept of 'high debt' to a workable definition to identify the theoretical notions of vulnerable regions[20] as noted in Reinhart and Rogoff (2011). Thus, when government debt elevates within those ranges, it can act as warning triggers that further increase in debt will yield marginal additional benefit to economic growth, before dampening it at levels above the upper bound threshold.

[20] "We do not pretend to argue that growth will be normal at 89 percent and subpar (about one percent lower) at 91 percent debt/GDP any more than a car crash is unlikely at 54mph and near certain at 56mph. However, mapping the theoretical notion of —vulnerability regions to bad outcomes by necessity involves defining thresholds, just as traffic signs in the U.S. specify 55mph." (Reinhart and Rogoff, 2011, pp. 3–4)

7. Policy implication

The findings presented above broadly aligns with the wealth of literature on this topic, which underscores the similar interplay between government debt and economic growth, and it lays out several key policy implications.

As outlined previously, Malaysia's government debt ratio stood at 60.4% of GDP as at end 2022, below the estimated lower bound of growth-maximising debt threshold at 70% of GDP Malaysia's estimated debt threshold is higher than the typical range of 45%-65% of GDP for emerging and developing market economies (EMDEs). This could potentially be explained by Malaysia's robust growth performance and deep financial markets with strong investor base, though the relationship between these variables have not been included in this study. Crucially, this provides ample policy space for fiscal expansion during crisis management period, if needed. The newly consolidated debt limit of 60% of GDP under the Public Finance and Fiscal Responsibility Act (FRA) aligns with our findings of the growth-maximising debt threshold.

While a government debt ratio below the estimated growth-maximising debt threshold implies the absence of negative impact to growth, risks to growth may persist via fiscal sustainability concerns due to rapidly changing market dynamics and investor confidence (Pradhan, 2019). To avert the risk of fiscal sustainability, emphasis could be accorded on measures to diversify and broad tax base as well as optimising expenditure with focus on high multiplier spending. In particular, addressing the declining tax buoyancy[21] which has exhibited a downward trend, from 15.4% of GDP in 2012 to 11.2% of GDP in 2021[22] should be a priority. The low revenue collection constrains discretionary spending on operating expenditure (OE) as Malaysia's fiscal rule requires OE to be fully financed by revenue. This is further exacerbated by the fact that about 50% of OE consisted of locked in expenditure such as emoluments, pensions and debt service charges. Limited room for OE spending constraint the government ability to support economic growth particularly during period of economic downturn.

[21] Refer to tax elasticity of GDP.
[22] This figure is comparatively lower to regional and rating peers with an average of 15.2% and 33.1% of GDP respectively (OECD, 2022).

This underscores the significance of the FRA as a cornerstone of fiscal reform, which establish a robust framework that prioritises fiscal sustainability considerations. This framework serves as a foundation upon which subsequent reforms, targeting both enhancement in revenue generation capacity and expenditure optimisation, can be built to solidify public finances. To this end, the implementation of domestic policies such as the targeted fuel subsidies and the medium-term revenue strategy represent crucial elements in this endeavour, thus should be expedited.

With the advent of literature that has been more critical of the concept of debt threshold, policy focus has also shifted towards government debt sustainability analysis which scrutinise factors affecting debt trajectory and affordability. More significantly, while debt levels are important, studies demonstrate that debt trajectory is also a key factor in determining the ability of a country to repay its debt. In particular, Pescatori *et al.* (2014), shows that although growth tends to decline when government debt-GDP ratio is above 90%, there is a wide interquartile range of growth performance between economies. Furthermore, the paper also shows that countries that were experiencing high government debt-to-GDP ratio, but on a declining path, can still enjoy sustained economic growth. Conversely, the research also shows that countries with high government debt and at the same time experiencing rising debt trajectory tend to experience deteriorating growth performance. These findings illustrate the importance of debt trajectory rather than debt threshold in assessing fiscal risks.

The shift towards debt sustainability is also highlighted in the ongoing initiative and policy advisory by multilateral agencies such as the IMF and World Bank. An important example is the Debt Sustainability Analysis (DSA) framework that has been developed by the IMF and World Bank to assess a country's government debt position and prospects, as well as to identify vulnerabilities in the debt structure. Further, it is crucial to extend the lens of analysis to the intrinsic sustainability of government debt itself by evaluating the composition and level of debt for assessing fiscal sustainability risks. This composition encompasses aspects such as the proportion of foreign currency debt, the average maturity of outstanding debt, gross financing requirements, and the distribution of government debt holdings between residents and non-residents.

The DSA could be used to illustrate the pockets of vulnerability that may pose risks to the government's debt sustainability. The 2023 IMF Article IV Report for Malaysia pinpoints existing challenges, including sizable external financing requirements and substantial contingent liabilities. However, these risks are partially mitigated by the favourable composition of debt, characterised by a high proportion of long-term maturities and local currency holdings, as well as the robustness of domestic institutional investor base (IMF, 2023e). That said, effective debt management remains crucial, as mismanagement can lead to a detrimental impact on the domestic markets, and ultimately hinder economic growth.

8. Conclusion

This paper set out to study the relationship between government debt and economic growth in the Malaysian context and to estimate the growth-maximising debt threshold using a combination of threshold autoregression (TAR) and debt-augmented growth model. Our research yielded a lower bound estimate range for the debt threshold of between 70% and 74% of GDP, and an upper bound estimate range between 97% and 103% of GDP. Taking a conservative stance, based on the lower bound estimate, at a level below 70% of GDP government debt acts as a growth catalyst, while economic dynamism may be undermined at a government debt level above 70% of GDP for Malaysia. These findings align with a substantial body of existing literature that articulates similar debt-growth dynamics whereby growth can be adversely impacted above a certain government debt ratio threshold. The estimated debt threshold for Malaysia deviates slightly upwards from the typical range of 45% to 65% of GDP observed in emerging and developing market economies. This divergence, however, may potentially be explained by Malaysia's robust economic growth performance and the advantage of a deep and globally integrated financial market, underpinned by a strong investor base. These findings lend further credence to the newly established government debt limit under the FRA, which remains below the estimated threshold. It is crucial to acknowledge, however, that the challenges pertaining to fiscal sustainability are demonstrably distinct from those associated with growth. Consequently, broader reforms encompassing the entirety of the fiscal landscape are necessary to solidify the nation's public finances.

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