IMPACT OF BELT AND ROAD INITIATIVE (BRI) TOWARDS DEBT SUSTAINABILITY OF BRI RECIPIENT COUNTRIES

HOONG JOANA
KELLY CHAN YUN JIE
LOW KE MEI
YEOH YI NENG

BACHELOR OF FINANCE (HONS)

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF BUSINESS AND FINANCE
DEPARTMENT OF FINANCE

APRIL 2024

IMPACT OF BELT AND ROAD INITIATIVE (BRI) TOWARDS DEBT SUSTAINABILITY OF BRI RECIPIENT COUNTRIES

BY

HOONG JOANA
KELLY CHAN YUN JIE
LOW KE MEI
YEOH YI NENG

A final year project submitted in partial fulfilment of the requirement for the degree of

BACHELOR OF FINANCE (HONS)

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF BUSINESS AND FINANCE
DEPARTMENT OF FINANCE

APRIL 2024

DECLARATION

We hereby declare that:

(1) This undergraduate FYP is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the FYP.

(4) The word count of this research report is 20185.

	Name of Student:	Student ID:	Signature:
1.	Hoong Joana	20ABB01974	
2.	Kelly Chan Yun Jie	20ABB03076	
3.	Low Ke Mei	20ABB02295	
4.	Yeoh Yi Neng	20ABB04196	

Date: 21 April 2024

ACKNOWLEDGEMENT

We extend our heartfelt appreciation to Dr. Lee Chee Loong, our esteemed research supervisor, whose unwavering guidance and support have been instrumental in steering us through this research endeavor. His dedicated mentorship, astute insights, and invaluable assistance have been indispensable in shaping the trajectory of our work. We are immensely grateful for her continuous feedback, constructive criticism, and insightful suggestions, which have significantly contributed to the refinement of our research methodology and outcomes.

Additionally, we express our gratitude to Dr. Tan Ai Lian, our second examiner, for her invaluable advice and guidance in refining our research through constructive feedback.

Furthermore, we would like to extend our gratitude to UTAR for providing the necessary infrastructure and facilities that facilitated seamless data collection, access to relevant journal articles, and other essential resources crucial for the successful completion of our research. Without these resources, our endeavors would have been significantly hindered.

Lastly, we would like to acknowledge and thank each member of our team for their unwavering dedication, tireless efforts, and invaluable contributions throughout this journey. Their collective commitment, perseverance, and collaborative spirit have greatly enriched the depth and quality of our research.

In conclusion, we express our deepest gratitude to all parties involved for their invaluable support and assistance throughout this research endeavor.

TABLE OF CONTENTS

Copyright @ 2024 ii

DECLARATION iii

ACKNOWLEDGEMENT iv

LIST OF TABLES viii

LIST OF FIGURES ix

LIST OF ABBREVIATIONS x

LIST OF APPENDICES xi

PREFACE xiv

ABSTRACT xv

CHAPTER 1 RESEARCH OVERVIEW 1

1.0 Introduction 1

1.1 Research Background 1

1.2 Problem Statement 4

1.3 Research Objectives 11

1.3.1 General Objectives 11

1.3.2 Specific Objectives 11

1.4 Research Questions 11

1.5 Significance of Study 11

CHAPTER 2 LITERATURE REVIEW 13

2.0 Introduction 13

2.1 Review of Literature 13

2.1.1 Debt Sustainability 13

2.1.2 Primary Balance 16

2.1.3 Inflation 19
2.1.4 GDP 21
2.1.5 Exchange Rate 23
2.1.6 The Belt and Road Initiative (BRI) 26
2.2 Theoretical Framework 28
2.3 Conceptual Framework 29
2.4 Hypothesis Development 30
CHAPTER 3 METHODOLOGY 32
3.0 Introduction 32
3.1 Data Description 32
3.2 Methodology 35
3.2.1 Panel Unit Root Test 35
3.2.2 Pooled Mean Group (PMG) 36
3.3 Diagnostic Checking 39
3.3.1 Normality Test 39
3.3.2 Correlation Analysis 40
3.3.3 Robustness Test 41
CHAPTER 4 DATA ANALYSIS 43
4.0 Introduction 43
4.1 Panel Unit Root Test 43
4.2 Pooled Mean Group (PMG) 45
4.2.1 Lag-length Selection for Pooled Mean Group (PMG) Analysis 45
4.2.2 Pooled Mean Group (PMG) Analysis 46
4.2.3 Short-run Cross Sectional Result of PMG 48
4.3 Diagnosis Checking 54
4.3.1 Normality Test 54
4.3.2 Correlation Analysis 55

4.3.3 Robustness Test 56
CHAPTER 5 DISCUSSION, CONCLUSION AND IMPLICATIONS 58
5.0 Introduction 58
5.1 Summary of Statistical Analysis 58
5.2 Discussions of Major Findings 59
5.2.1 Primary Balance 59
5.2.2 Inflation 61
5.2.3 GDP 63
5.2.4 Exchange Rate 65
5.2.5 BRI 67
5.3 Implication of Study 70
5.3.1 Policymakers 70
5.3.2 Investors 71
5.3.3 Academic Researchers 72
5.4 Limitation of Study 72
5.4.1 Lack of Data 72
5.4.2 Inadequate Access to Software Resources 73
5.5 Recommendation for Future Research 74
5.6 Conclusion 75
REFERENCES 76
APPENDICES 83

LIST OF TABLES

		Page
Table 1.2	General Government Gross Debt (LCU) and China's BRI investment in nine BRI recipient countries before and after 2013	6
Table 2.4	Hypothesis	30
Table 3.1.1	Source of Data for Variables	32
Table 3.1.2	Data Description for Variables	33
Table 3.2.1	Hypotheses and Decision Rule of Unit Root Tests	36
Table 4.1.1	LLC Test Output	42
Table 4.1.2	IPS Test Output	43
Table 4.1.3	ADF Test Output	43
Table 4.2.2	PMG Result	45
Table 4.2.3.1	Overall Short-Run PMG Result	47
Table 4.2.3.2	Indonesia Short-Run PMG Result	47
Table 4.2.3.3	Malaysia Short-Run PMG Result	48
Table 4.2.3.4	Philippines Short-Run PMG Result	48
Table 4.2.3.5	Singapore Short-Run PMG Result	49
Table 4.2.3.6	Thailand Short-Run PMG Result	49
Table 4.2.3.7	Vietnam Short-Run PMG Result	49
Table 4.2.3.8	South Korea Short-Run PMG Result	50
Table 4.2.3.9	Bangladesh Short-Run PMG Result	50
Table 4.2.3.10	Nepal Short-Run PMG Result	51
Table 4.3.1	Jarque-Bera Test	54
Table 4.3.2	Correlation Analysis	54
Table 4.3.3	Robustness Test Output	56
Table 5.1	Summary of PMG output	57

LIST OF FIGURES

		Page
Figure 1.2	BRI recipient countries' General Government Debt (Percent of GDP)	5
Figure 2.1	Proposed Theoretical Framework	29
Figure 4.2.1	Eview lag-length selection under Schward Criteria	44

LIST OF ABBREVIATIONS

ARDL	Autoregressive Distributed Lag
BRI	Belt and Road Initiative
DSA	Debt Sustainability Analysis
ECM	Error Correction Model
EM	Emerging Market
FDI	Foreign Direct Investment
FRF	Fiscal Responsibility Framework
GDP	Gross Domestic Product
IMF	International Monetary Fund
LCU	Local Currency Unit
LIDCs	Low-Income Developing Countries
MG	Mean Group
PMG	Pooled Mean Group

LIST OF APPENDICES

		Page
Appendix 4.1:	E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – Level & Trend and Intercept for D01 (Debt-to-GDP ratio)	82
Appendix 4.2:	E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – 1st Difference & Trend and Intercept for D01 (Debt-to-GDP ratio)	83
Appendix 4.3:	E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – Level & Trend and Intercept for PB (Primary Balance)	84
Appendix 4.4:	E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – 1st Difference & Trend and Intercept for PB (Primary Balance)	85
Appendix 4.5:	E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – Level & Trend and Intercept for I (Inflation)	86
Appendix 4.6:	E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – 1st Difference & Trend and Intercept for I (Inflation)	87
Appendix 4.7:	E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – Level & Trend and Intercept for G (GDP)	88

Appendix 4.8:	E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – 1st Difference & Trend and Intercept for G (GDP)	89
Appendix 4.9:	E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – Level & Trend and Intercept for ER (Exchange Rate)	90
Appendix 4.10:	E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – 1st Difference & Trend and Intercept for ER (Exchange Rate)	91
Appendix 4.11:	E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – Level & Trend and Intercept for BRI_FDI (Belt-road Initiatives Investment)	92
Appendix 4.12:	E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – 1st Difference & Trend and Intercept for BRI_FDI (Belt-road Initiatives Investment)	93
Appendix 4.13:	E-views Results - Pooled Mean Group / Autoregressive Distributed Lag Model (PMG/ARDL) Analysis (Short-run & Long-run)	94
Appendix 4.14:	E-views Results – Short-run Cross Sectional Results for Pooled Mean Group/Autoregressive Distributed Lag Model (PMG/ARDL) Analysis	95
Appendix 4.15:	Model Selection Criteria (Lag-length Selection) – Schwarz Information Criterion (SIC) for Pooled Mean Group/Autoregressive Distributed Lag Model (PMG/ARDL) Analysis	98
Appendix 4.16:	E-views Results – Normality Test (Jarque-Bera Test) for PMG/ARDL Model	99

Appendix 4.17: E-views Results – Correlation Analysis for PMG/ARDL Model 100
Appendix 4.18: E-views Results – Robustness Test for PMG/ARDL Model (Replace G to GDP__R_, Replace ER to ER_R_) 101
Appendix 4.19: E-views Results – Interpolation for Philippines 2015 BRI (Cardinal Spline) 102

PREFACE

As students pursuing a Bachelor of Finance degree, our academic voyage has been characterized by an unquenchable thirst for comprehending the intricate mechanisms of global financial dynamics. It is within this framework that our exploration began, fueled by the profound implications of the Belt and Road Initiative (BRI) on the fiscal stability of recipient nations.

Our quest originated from a desire to dissect the multifaceted dialogue surrounding the BRI—an extensive infrastructure and economic development initiative launched by China with far-reaching consequences. Amidst passionate discussions in academic and broader spheres, one recurring concern seized our attention: the potential for the BRI to ensnare recipient countries in a web of debt diplomacy.

Motivated by a sincere dedication to unraveling intricate financial phenomena, we embarked on this research mission with a twofold objective. Firstly, to determine whether the BRI offers a sustainable financing option for participating countries. Secondly, to critically evaluate the impact of the BRI's substantial investments on the debt sustainability of recipient nations.

Traversing through a plethora of scholarly literature, statistical analyses, and empirical data, we endeavored to illuminate the nuanced correlation between the BRI and debt sustainability. Armed with financial analysis tools and guided by a rigorous methodological approach, our journey was one of exploration and revelation.

ABSTRACT

The Belt and Road Initiative (BRI) has sparked widespread debates, with concerns raised regarding its potential to foster debt trap diplomacy. This study delves into the apprehensions surrounding the BRI-induced debt issues in Asia and empirically investigates the matter. By examining the debt levels of nine Asian countries post the BRI's initiation, employing the Panel Mean Group Autoregressive Distributed Lag (PMG-ARDL) model, this research assesses the short and long-term effects of the BRI on debt sustainability. Utilizing historical data spanning from 2003 to 2022, our findings reveal a nuanced picture. In the long run, the BRI demonstrates a significant tendency to reduce the government debt-to-GDP ratio. However, in the short run, outcomes vary across countries. Notably, Malaysia and Bangladesh exhibit a positive and significant impact, while Nepal experiences a considerable negative effect. This disparity underscores the influence of governmental efficacy on short-term outcomes. Consequently, our study advocates for the implementation of transparent and accountable governance mechanisms to ensure the efficient allocation of BRI funds. Such measures hold the potential to leverage the BRI for bolstering economic prospects in participating countries.

CHAPTER 1 RESEARCH OVERVIEW

1.0 Introduction

The Belt and Road Initiative (BRI) launched by China in 2013 has sparked global interest and scrutiny due to its far-reaching implications, particularly in the area of debt sustainability. While the Belt and Road Initiative offers opportunities for greater connectivity, trade and investment, concerns have also been raised about the potential impact on its debt levels. Understanding the complex dynamics of how the BRI influences debt sustainability is imperative for policymakers, economists, and stakeholders, given its profound implications on the economic development and financial stability of the countries concerned. Specifically, our study will delve into this global issue with a focus on the 9 Asia BRI-recipient countries. Finally, this chapter outlines the background of the study, the research problem, the objectives and questions of the study, and the significance of the study.

1.1 Research Background

Debt has been an intricate financial concept and a dynamic force in the modern world in shaping the trajectory of economies, businesses and individual finances. At its essence, debt encapsulates the concept of borrowing and lending and embodies the dynamic exchange of resources and capital between entities. Whether it is used by individuals to fulfil their dreams of home ownership, by businesses to grow and develop, or by Governments to finance critical infrastructure projects, debt is a powerful mechanism for a country's growth and economy (Chen, 2023). Specifically, it is broadly divided into two categories, comprising public debt and private debt. Public debt is the debt owed by national, state, and local governments to domestic and foreign creditors to finance a variety of government expenditures. Meanwhile, private debt refers to debt incurred by individuals, businesses, and non-profit organisations (Perkis, 2020). Of the different forms of debt, government debt stands out as a pivotal factor, and governments frequently turn to external

borrowing to fund their public expenditure needs. Nonetheless, this strategy brings about specific pros and cons. While external debt enables governments to finance major public projects and investments that may be difficult to pay for from domestic resources, it also exposes governments to currency risk. Unlike domestic debt, which can be mitigated by increasing the money supply, external debt must be repaid irrespective of currency devaluation.

In light of its significance, policymakers, economists, and financial experts have recently been focusing on challenging concerns surrounding the mounting debt, especially external debt. This focus is underscored by data from the Debt Report 2021, revealing a consistent increase in external debt across various from 2010 to 2019. These include Europe and Central Asia (27.61% increase), Latin America and the Caribbean (81.11% increase), the Middle East and North Africa (78.01% increase), South Asia (92.44% increase) and Sub-Saharan Africa (111.15% increase).On the other hand, based on the portion of a country's economic output devoted to debt servicing, the IMF Global Debt Monitor (2022) shows that global public debt in 2021 will be 95.7 percent of GDP, indicating a very high debt burden as compared to overall country's economic output. In this context, the escalation of external debt levels often triggers concerns about the sustainability of debt, the ability of a country to meet its debt obligations without claiming debt relief or accumulating arrears (Development Finance International, n.d.). This arises from the apprehension that if a country accumulates too much external debt, it may encounter difficulties in meeting its debt obligations, as the rate of debt servicing could surpass the country's ability to generate sufficient income or revenue to service the debt (Chandia & Javid, 2013). In such a case, a country could find itself in a cycle of borrowing to service its debt, resulting in an ever-increasing burden that could hamper economic development, increase financial vulnerability and limit the ability of the Government to invest in critical public services.

Over time, it has become increasingly evident that many countries that participated in BRI are facing difficulties related to being caught in a debt trap. Since 2013, the proportion of low-income countries at high risk of or already in debt distress has increased to about 50 percent (International Monetary Fund, 2020). Moreover, as

noted by Al-Fadhat & Prasetio (2022), about 40 percent of African countries are currently facing a significant threat of debt distress. Notably, the vast majority of these countries are involved in projects under the Belt and Road Initiative, a massive infrastructure and economic development programme launched by China in 2013 through a loan initiative. In this context, these countries have implied that China's capital expansion in Africa through the Belt and Road Initiative has led to the challenge of debt distress for African countries. This lends support to the observation that the launch of the Belt and Road Initiative in 2013 coincided with a period when the debt levels of African countries had experienced a substantial increase.

Henceforth, this sequence of events raises the hypothesis that the introduction of the Belt and Road Initiative may have contributed to the emergence of debt sustainability issues (Bandiera & Tsiropoulos, 2020). This is because the expansive scope and grand infrastructure projects often necessitate significant and ongoing financial loans from international sources, including Chinese banks and financial institutions. Undoubtedly, as the BRI could significantly accelerate economic integration and development in a wide range of countries, the BRI participant countries also face significant economic challenges, notably rapidly rising levels of public and corporate debt.

While the matter is global in scope, our study aims to specifically examine its impact on the nine Asia countries. This is because the countries selected represent a diverse range of economic situations, including developed economies like Singapore and South Korea, emerging markets like Malaysia and Indonesia, and low-income countries like Nepal and Bangladesh. This diversity helps to fully analyse the impact of the BRI in different economic contexts. In particular, these countries span different regions, providing a geographically diverse sample. This diversity is crucial because the impact of the BRI may vary according to regional characteristics, geopolitical factors and economic structures. Moreover, our attention remains focussed on the nine Asia countries given the rising trend of Chinese capital investment in these countries. According to statistics, the average growth rate of BRI investment in the nine BRI recipient countries is 468.67 percent.

In the meantime, the average growth rate of total government debt of the nine BRI recipient countries was 168.82 per cent. Thus, all these observations further stimulate curiosity about the potential impact of the Belt and Road Initiative on the ability of these countries to maintain sustainable debt levels.

All in all, this situation has garnered international recognition whereby the International Monetary Fund (IMF) has warned that rising debt in Asia puts the region at risk, noting that Sri Lanka has defaulted on its debts (Buddhavarapu, 2022). 9 Asia countries' governments burdened with unsustainable debt face restricted fiscal options, impaired public services and increased vulnerability to economic shocks. With that, we need to know if it has anything to do with debt sustainability. This is a crucial matter as we need to understand whether it is contributing to economic progress or placing a financial burden on future generations, as the initiative has the potential to increase the debt burden of the participating countries concerned through large infrastructure projects financed by Chinese banks. Hence, it is important to examine in depth the factors underpinning debt sustainability of nine Asia countries that actively participated in the BRI.

1.2 Problem Statement

Debt financing plays a crucial role for individual, business, and government. Nevertheless, it also presents as a double-edged sword to its borrowers. In an ideal situation, public debt financing will empower governments to finance its essential programs and projects while ensuring the debt sustainability (Dalia, 2020). This signifies that a good public debt should support national and infrastructure development without creating the possibility of debt vulnerabilities that could jeopardize country's growth and stability. To achieve these ideal situations, the debt carrying capacity in term of debt-to-GDP ratio should be maintained at a controllable range of below 77% and should not keep increasing throughout the year. Otherwise, it may cause the borrowers to lose market access, suffer from high borrowing costs, and experienced detrimental impacts on growth and investment (Dalia, 2020).

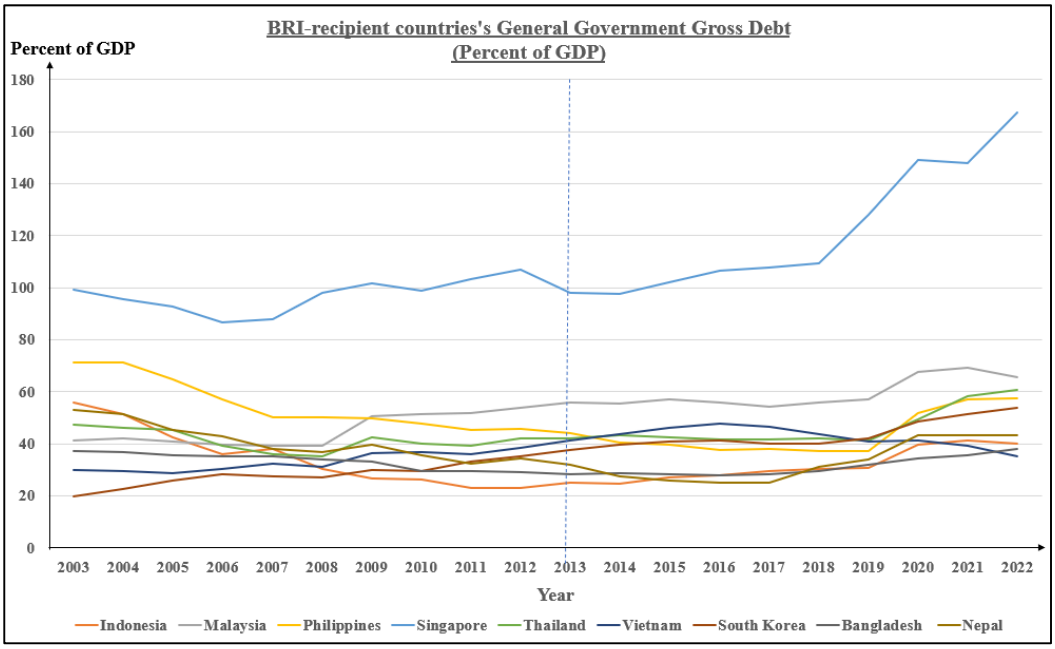


*Figure 1.2.*BRI recipient countries' General Government Debt (Percent of GDP). Adapted from Refinitiv (London Stock Exchange Group)

However, according to Figures 1.2, the nine BRI recipient countries have experienced a substantial upward trend for their general gross debt-to-GDP level (Adrain & Prachi, 2023). It is clearly shown that countries especially Singapore and Malaysia have exceeded the standard 77% and increased significantly starting from year 2013. Meanwhile, other countries such as Thailand and the Philippine, though they have not yet reached the 77% threshold, are steadily progressing towards it. In this regard, it is to be suspected that the increment of debt level is caused by the introduction of Belt and Road Initiative (BRI) in year 2013. The following evidence shown the BRI has a strong connection with the debt level. According to OECD (2018), BRI is global infrastructure development strategy initiated by the People's Republic of China to bridge the huge infrastructure gap that constraining international trade, openness, and future prosperity with other countries (OECD, 2018). The China's BRI is likely to increase the debt level of participating countries through its financing arrangement for overseas infrastructure projects in terms of ports, roads, telecommunications network and many more (European Bank, n.d.). For instance, China government and its financial institutions has providing tied aid, long-term infrastructure-for-loans as well as loans at concessional rates to the recipients countries.

Table 1.2

General Government Gross Debt (LCU) and China's BRI investment in nine BRI recipient countries before and after 2013. Adapted from Refinitiv (London Stock Exchange Group)

	Debt & BRI	Before (2003-2012)	After (2013-2022)	Increment (%)
Bangladesh	**General Government Gross Debt**	BDT 24,459.65 B	BDT 81,924.08 B	234.94
	BRI Investment	USD 2.41 B	USD 28.36 B	1076.76
Indonesia	**General Government Gross Debt**	IDR 15,553,120.55 B	IDR 45,898,542.42B	195.11
	BRI Investment	USD 14.62 B	USD 51.98 B	255.54
Malaysia	**General Government Gross Debt**	MYR 3,289.96 B	MYR 8,185.98	148.82
	BRI Investment	USD 10.85 B	USD 35.49 B	227.10
Nepal	**General Government Gross Debt**	NPR 3,930.27 B	NPR 11,362.55 B	189.10
	BRI Investment	USD 0.32 B	USD 3.52 B	1000
Philippines	**General Government Gross Debt**	PHP 40,677.23 B	PHP 75,114.55	84.66

	BRI Investment	USD 3.22 B	USD 14.43B	348.14
Singapore	**General Government Gross Debt**	SGD 2,679.35 B	SGD 6,111.68	128.10
	BRI Investment	USD 10.6 B	USD 47.24 B	345.66
South Korea	**General Government Gross Debt**	KRW3,225,461.50 B	KRW8,059,406.43 B	149.87
	BRI Investment	USD 1.99 B	USD 9.72 B	388.44
Thailand	**General Government Gross Debt**	THB 36,888.14 B	THB 70,504.80 B	91.13
	BRI Investment	USD 1.67 B	USD 11.11 B	565.27
Vietnam	**General Government Gross Debt**	VND 7,082,769.82 B	VND28,164,254.29 B	297.64
	BRI Investment	USD 15.31 B	USD 16.94B	10.65
Average increment for general government gross debt of nine BRI recipient countries				168.82%
Average increment for BRI investment of nine BRI recipient country				468.67%

Apart from that, Table 1.2 clearly shown that the nine BRI recipient countries have experienced a noticeable average increase of 168.82 percent on their general government gross debt after year 2013. Concurrently, there was also a substantial average rise of 468.67 percent for the China's BRI investment in the nine BRI recipient countries. The upward trajectory in both general government gross debt and BRI investments following the initiation of the BRI prompts inquiry into a potential significance relationship between them and the debt sustainability of BRI recipient countries. This inquiry is further supported when the surge of BRI investment amount from China has brings to the concerns of China's 'debt trap' diplomacy and criticism of predatory lending practices towards the participating countries. For instance, some researchers have claimed that a significant portion of Chinese loans may be collateralized with strategic assets. As in the case of Sri Lanka, the government received much of the BRI investment to build international airport in Hambantota and the seaport. However, they did not generate the profit as per expectations and cause government struggle in service the port and in turn handed over the control of the port to China for a 99-year lease in 2017 (The Economist, 2022). Therefore, BRI recipient countries without sufficient ability to repay the loan might face consequences of loss of important landmarks or even lost control of their economy (Al-Fadhat & Prasetio, 2022).

Delving deeper into the matter, it becomes imperative to explore BRI's short-term and long-term impact if significance between the BRI and debt sustainability of BRI recipient countries holds. This is because Table 1.2 illustrates an undeniably upward trajectory in the general government gross debt and the corresponding BRI investment. However, these trends exhibit different magnitudes and proportions. For instance, China's BRI investment in Singapore surged by 345.66 percent, while the general government gross debt increased by a comparatively lower 128.10 percent. Meanwhile. Vietnam experienced a 10.65 percent rise in China's BRI investment but witnessed general government gross debt grow by 297.64 percent. This disparity suggests that each BRI recipient countries have distinct short-term impact. Yet, it raises the question of whether their long-term impacts different as well. This is because in the short run, the nine BRI recipient countries might suffer from the debt burden that arise from BRI investment. However, over the long run,

the impacts of China's BRI investments remain uncertain. It might potentially offer fundamental improvements to the recipient countries' infrastructure by assist them to generate income that able to offset the debt or, conversely, leading to financial distress in the nine BRI recipient countries. Hence, this research endeavours to investigate BRI's short-term and long-term impact as well as whether it has different impact on the debt sustainability of each of the BRI recipient countries.

This is mainly due to the reason that if the surge of BRI recipient countries' debt level, root cause and impact continue being neglected, it is undoubtedly that those countries will face the potential of falling into China 'debt trap' diplomacy by losing their important landmarks and control of their economy like in the case of Sri Lanka, Kenya, Laos and many more. From other perspective, the surge of debt level without knowing the root cause will also jeopardize country's growth and put country in a danger level. This is because when the debt burdens soar, government will lose the capacity to manage and control it, which ultimately hinder nation's development and economy. Besides that, it may also discourage foreign direct investment (FDI) from other countries. This is because the high level debt has built a negative business environment in the country. For instance, investor may worry that the government transfer the cost of borrowing to the business and company by increasing the tax. With such concerns, it will then negatively affect exports, liquidity, inflation, unemployment, and economic growth of the country. To a greater extent, when country fail to maintain its debt sustainability, debt defaults can lead to a loss of market access and higher borrowing costs for borrowing countries, in addition to undermining growth and investment (Hakura, 2020).

Hence, this research endeavours to close the research gap for region and country-specific publications by investigate whether the BRI will affect the debt sustainability of nine Asia BRI recipient countries. Apart from that, it strives to examine the short-term and long-term impact of BRI on the debt sustainability of BRI recipient countries, and whether there is a different impact for BRI on the debt sustainability of each of the BRI recipient countries. It is evident to us that in actuality, a country's debt level and its debt sustainability is undoubtedly influenced by numerous factors. However, our research primarily concentrates on assessing

the impact of BRI investment while also incorporating several critical control variables to reduce bias and increase accuracy as well as validity. Furthermore, our dependent variable focuses on debt sustainability rather than debt level. This choice is deliberate because a country's debt level is primarily correlated with its income level. Typically, higher-income countries tend to have higher debt levels. Therefore, utilizing debt level alone as a measure of a country's debt sustainability would be unfair and inadequate, as it fails to account for variations across countries.

Apart from that, the target countries in this study are chosen from the nine BRI recipient countries in Asia. These specific nations were selected due to their diverse economic situations, particularly in terms of income levels. This deliberate selection enhances the accessibility of our research data, allowing us to analyse the varied impacts of the BRI on the economies of these countries. Also, these nine countries collectively represented a substantial economic force in Asia region. They located nearby the six economic cooperation corridors and have combined economic output, population, growth rates that contributed significantly to the global economy. Additionally, among these countries, Indonesia, Malaysia, and Singapore have even prioritised receiving most of the China's outward direct investment (ODI) due to their strategic locations (Alex, 2020). Nevertheless, to the best of our knowledge, we found that there is rarely research on the relationship between BRI investment and Asia BRI recipient countries' debt sustainability. Majority of study has been done by researchers on those lower-income BRI-receiving countries like Kenya, Ethiopia, Myanmar, Loas and many (Carmody et al., 2022; Sundus et al., 2022). Hence, this research would like to address the research gap and assist the nine Asia BRI recipient countries' government authorities to have a better decision making and strategic development after having a better understanding towards the impact of BRI towards country's debt sustainability.

1.3 Research Objectives

1.3.1 General Objectives

This research aims to examine the impact of BRI towards debt-to-GDP ratio and debt sustainability of nine Asia BRI recipient countries.

1.3.2 Specific Objectives

1. To examine whether there is a significant relationship between BRI and debt sustainability of the BRI recipient countries.
2. To examine the long-term impact of BRI on the debt sustainability of BRI recipient countries.
3. To examine the short-term impact of BRI on the debt sustainability of each of the BRI recipient countries.

1.4 Research Questions

1. Is there a significant relationship between BRI and debt sustainability of the BRI recipient countries?
2. What is the long-term impact of BRI on the debt sustainability of BRI recipient countries.
3. What is the short-term impact of BRI on the debt sustainability of each of the BRI recipient countries?

1.5 Significance of Study

Firstly, the research findings may assist policymakers of the nine Asia BRI recipient countries to assess the impact of BRI towards their country debt level and debt

sustainability. By gaining a deeper understanding of its impact, those policymakers can clearly classify whether the BRI's borrowing serves as a catalyst for sustainable economic growth or, conversely, acts as an impetus for over-indebtedness. With this, they may be able to formulate a comprehensive and well-planned policies and intervention plan to tackle the high debt level. For instance, if the findings suggest that BRI has positive relationship towards Malaysia's debt level and has cause debt unsustainability, Malaysian policymakers may take proactive measures to control its acceptance of BRI investment and endeavour to find suitable solutions for the identified issues.

Besides, this research is essential for both individual and institutional investors, both domestic and international. This is because obtaining insights towards the BRI and its impact towards the nine BRI recipient countries' debt level and debt sustainability may affect investor's confidence level, decision-making and risk assessment. For instance, if the findings suggest there is no significant relationship between BRI and country's debt level, it may enhance investor confidence and make them to invest more in particular countries. However, if the relationship holds, investors may take BRI investment as an indicator prior compared to debt-to-GDP ratio. For instance, they may take the BRI investment as a reference to make investment decision and exit strategy. If the BRI investment reached a peak and exceed their risk tolerance level, they may quickly exit the market and prior to the debt-to-GDP ratio released.

Lastly, this study is important for researchers as it can further improve their understanding on BRI topic through the effort of tackling the unexplored area and perspective, which is the nine Asia BRI recipient countries and its long and short run response. In other words, this research contributes to the findings of literature for BRI subject, as there are limited studies on the BRI's impact on debt level and debt sustainability in Asia BRI recipient countries. Most studies have focused on lower-income countries like Djibouti, Ethiopia, Kenya and many more. Furthermore, this research is believed to aid and serve as a valuable reference for future researchers who wish to delve deeper into and further investigate the BRI topic. In short, it offers insight and foundation for future researchers.

CHAPTER 2 LITERATURE REVIEW

2.0 Introduction

In this chapter, we explore key concepts integral to our study, such as debt sustainability and the Belt and Road Initiative (BRI). Additionally, we review previous research on our control variables, identify research gaps, and develop our theoretical and conceptual framework accordingly. Finally, we develop our hypotheses pertaining to the variables under investigation.

2.1 Review of Literature

2.1.1 Debt Sustainability

Debt sustainability can be defined as a nation's capacity to fulfil its current and future debt obligations without resorting to debt relief measures or accumulating overdue payments (Cahyadin, 2021; Development Finance International, n.d.; Hakura, 2020). However, in recent decades, a heated debate has unfolded surrounding the correlation between indebtedness and economic growth. This discourse holds significant weight, as it illuminates a country's capacity to finance crucial development projects. It highlights the delicate balance between the level of debt an economy can withstand and the potential consequences of failing to meet existing obligations. Neoclassical Growth Theory provides one perspective, suggesting that sustainable debt hinges on the economic growth rate surpassing the interest rate imposed on debt. This dynamic allows countries to utilize generated revenue to service their debt, ensuring its sustainability. Meanwhile, alternative viewpoints argue that debt sustainability should be evaluated through mechanisms such as debt dynamic models, debt sustainability analysis, and the Fiscal Responsibility Framework (FRF).

To assess the debt sustainability, our study employs the debt dynamic model, a tool which illustrates the progression of debt influenced by existing policies and economic circumstances (Ogbeifun & Shobande, 2020). There are also several other studies that utilize the debt dynamic model for their analyses (Chandia et al., 2019; Sundus et al., 2022). Sundus et al. (2022) emphasized by utilizing a debt dynamic model, it could determine factors contributing to escalating debt levels, paving the way for an expanded discussion on the determinants influencing a country's debt sustainability. Furthermore, Chandia et al. (2019) endorse the debt dynamic model for its explicit utility in evaluating debt sustainability, given its consideration of the collective impact of macroeconomic variables including interest rates, exchange rates, budget deficits, and GDP growth. Moreover, the study also notes the debt dynamic model is advantageous as it not only tracks debt trends but also identifies emerging domestic and external vulnerabilities, as well as systematic risks, that jeopardize debt sustainability.

Alternatively, the debt sustainability analysis (DSA) serves as a cornerstone method employed by the International Monetary Fund (IMF) and the World Bank in evaluating debt sustainability within low-income countries and emerging markets. Extending beyond a narrow scope of public debt, the DSA incorporates the examination of all debt types posing potential risks to a country's public finance, thus considering unforeseen scenarios that could compromise debt sustainability (Hakura, 2020). However, Jost & Alice (2018) caution that DSA's accuracy hinges ultimately on parameter assumptions, potentially leading to misleading outcomes in economies with unique circumstances. Divergent directions of DSA indicators further complicate the derivation of a definitive conclusion. While the study acknowledges that DSA integrates various indicators capable of quantifying exceptional events, it contends that debt limits should be tailored to individual countries and evolve.

On the other hand, the Fiscal Responsibility Framework (FRF) claims that theoretically, governments can raise money by printing more money or issuing bonds to meet their debt obligations. Nonetheless, the extent to which money is printed and bonds are issued requires careful consideration, as imbalance may lead

to significant implications. Excessive money supply can fuel inflation, while an overabundance of bonds can escalate government debt and future fiscal obligations. Therefore, the fiscal reaction function offers valuable insights into how governments adjust their fiscal policies in response to changes in debt levels. It offers a perspective on government commitment to maintaining fiscal discipline and evaluates its capacity to manage debt servicing obligations. While the fiscal reaction function illustrates potential policy adjustments in response to shifts in debt levels, its heavy reliance on government fiscal policy, and lack of consideration on of broader economic interactions like interest and exchange rates, pose limitations.

In addition to the conventional methods used to evaluate debt sustainability, literature review revealed that some researchers also employ a combination of theoretical and empirical approaches, along with alternative models, to assess debt sustainability. For instance, Cahyadin (2021) employed the indicator-based model to assess the debt sustainability of seven ASEAN countries and found that GDP growth, inflation, high quality of government effectiveness, political stability, and control of corruption can significantly control the growth of external debt to be lower than the growth of GDP. It also argues that debt sustainability could be achieved while the GDP growth rate surpasses real interest rates, given that it is affected by GDP growth, inflation, FDI inflow, and government effectiveness. Diving into the debt sustainability of the BRI recipient countries, a recent study by Cahyadin (2021) employed both theoretical and empirical methodologies and found if the BRI has only a limited effect on overall growth, it is estimated that over 50 percent of evaluated BRI-recipient countries could encounter heightened debt vulnerabilities following their involvement in the initiative. The study utilizes the dynamic panel data models with data from 2016 to 2018, and accounting for country-specific characteristics. However, it also highlights the necessity for deeper analysis of country-specific factors and monitoring the real composition of financing.

2.1.2 Primary Balance

According to Islam et al. (2023), the primary balance refers to the difference between a government's total revenue and its total non-interest expenditures, and it is often used to assess a government's fiscal or debt sustainability. On the other hand, Bandiera & Tsiropoulos (2020) defined the primary balance gap as the additional effort needed to stabilize the debt-to-GDP ratio under the BRI compared to a scenario without BRI involvement. Based on Georgescu (2014), a surplus in the primary balance suggests that the government generates sufficient revenue to cover its present expenditures, exclusive of debt interest payments. Conversely, a deficit in the primary balance indicates that the government resorts to borrowing to fulfil its current spending requirements, posing potential long-term sustainability challenges.

Previous studies have yielded varied findings regarding the impact of the primary balance on a country's debt sustainability. Nevertheless, the majority of these results assert the significance of the primary balance in influencing a country's ability to sustain its debt. For instance, Georgescu (2014) identified the significant impact of Romania's primary balance on its debt sustainability, suggesting that achieving a surplus in the primary balance was crucial for reducing the country's debt burden and facilitating macroeconomic and financial recovery. The analysis noted that the Romania's escalating public debt distress is attributed to economic vulnerabilities and policy failures, particularly International Monetary Fund (IMF)-EU loans that failed to address underlying imbalances. Georgescu (2014) recommended that Romania take measures, including increasing budgetary revenues, enforcing strict budgetary discipline and combating tax evasion, in order to ensure the sustainability of achieving primary surpluses, which is essential for reducing the debt burden.

Similarly, Chandia et al. (2019) argued that to positively impact the accumulation of public debt in Pakistan and India, there must be a reduction in primary balance deficits to ensure debt sustainability. The study reveals that while the interest rate-growth rate differential does not positively influence public debt growth, the primary budget balance significantly contributes to increasing the debt burden in both nations. It found that, despite the different rates of economic growth in the two

countries, unsustainable levels of external debt were further exacerbated by high current-account deficits and weak export growth, which posing similar challenges for both countries. Chandia et al. (2019) suggested policy measures for India and Pakistan, including controlling interest rates, reducing primary balance deficits through expenditure rationalization, promoting exports, and coordinating fiscal and monetary policies. They emphasized the importance of prioritizing fiscal reforms such as increasing direct taxes and boosting exports to alleviate balance deficits.

Likewise, Islam et al. (2023) contended that the primary balance significantly influences Pakistan's debt sustainability, suggesting that improving the primary balance could enhance the country's debt sustainability. The study had examined this relationship, finding that while the primary balance coefficient remains consistently significant and positive across all specifications, indicating persistent fiscal policy, the lagged public debt coefficient is statistically insignificant, suggesting a lack of compelling empirical evidence of debt sustainability and limited responsiveness of fiscal policy to increased debt levels. Additionally, the output gap variable is consistently insignificant, indicating weak evidence that fiscal policy is utilized for stabilization purposes. Yet, the current account balance is found to be positively significant, suggesting that improvements in the current account balance contribute to enhancing the primary balance. Overall, Islam et al. (2023) underscored the importance of sustainable growth, transforming primary deficits into surpluses, and preparing for unforeseen shocks to ensure debt sustainability in Pakistan.

However, some journals have argued that the primary balance may not consistently impact a country's debt sustainability in certain contexts. For instance, Bandiera & Tsiropoulos (2020) found that most countries do not necessarily need to raise their primary balance to stabilize their debt burdens, even under the higher growth scenarios projected by initiatives such as the Belt and Road Initiative (BRI). From their research, while over 50% of BRI investment recipients are likely to face increased debt vulnerability in the medium term, only a few need to improve their primary balance of payments to maintain debt sustainability. If under a lower growth scenario resulting from the BRI, about 51 per cent of the 41 countries are

projected to experience increased indebtedness due to BRI investments, requiring a boost in their primary balance to maintain debt sustainability.

Additionally, Owusu et al. (2023) discovered that the relationship between the primary balance and debt sustainability varies across different debt regimes. The research employed the PSTR method to analyze debt sustainability in euro area economies, identifying two regimes based on a threshold around a 60% debt-to-GDP ratio. In high debt regimes, a positive reaction coefficient suggests sustainability, while in low debt regimes, the coefficient is inconsequential, indicating that the primary balance significantly influences debt sustainability in high debt regimes but appears insignificant in low debt regimes.

In conclusion, the relationship between the primary balance and debt sustainability is complex and context dependent. While some studies such as Georgescu (2014), Chandia et al. (2019), and Islam et al. (2023) emphasized the significance of achieving a surplus in the primary balance to reduce debt burdens and ensure sustainability, others like Bandiera & Tsiropoulos (2020) and Owusu et al. (2023) argued that the impact of the primary balance on debt sustainability varies across different economic contexts. Chandia et al. (2019), and Islam et al. (2023) stated that factors such as economic growth rates, external debt levels, fiscal policies, and the effectiveness of policy measures play crucial roles in determining the influence of the primary balance on debt sustainability. Plus, based on the research of Bandiera & Tsiropoulos (2020) and Owusu et al. (2023), the presence of initiatives like the Belt and Road Initiative (BRI) and the existence of different debt regimes further complicate this relationship. Overall, focusing on the primary balance alone may not be sufficient, as achieving debt sustainability requires a multifaceted approach that considers various economic factors and context-specific policy interventions.

2.1.3 Inflation

In the light of O'Neill et al. (2017), inflation can be defined as a general increase in price levels and a fall in the purchasing value of money. They highlighted that inflation is significant in various economic contexts as it can affect the purchasing power of wages, benefits, and the overall economy. Meanwhile, Garcia-Macia (2023) stated that inflation can affect various aspects of public finances such as tax revenues, government expenditures, and debt dynamics.

According to Oyadeyi et al. (2024), inflation significantly influences the dynamics of debt sustainability in Nigeria. They explained that this is because price increases caused by inflation can lead to a reduction in the purchasing power of the domestic currency, and negatively affecting savings and investment levels. As an illustration, inflation inhibits saving and investment, may impede capital formation and long-term economic development. With this, it can exacerbate challenges in servicing debt obligations for a country. Also, Oyadeyi et al. (2024) mentioned that the increase in production costs caused by inflation can strain fiscal resources and make it more difficult for the government to effectively manage its debt burden. In short, their research shows that inflation is intricately linked to debt sustainability.

Moreover, Garcia-Macia (2023) also contended that the inflation significantly affects debt sustainability and fiscal balances. From his study, inflation shocks temporarily improving fiscal balances due to nominal revenues rising faster than nominal expenditures. This leads to a persistent reduction in debt-to-GDP ratios over time, but only with inflation surges that come as a surprise, while rises in inflation expectations do not improve debt dynamics. Additionally, Garcia-Macia (2023) argued that fiscal policies may react to inflation but attempts to keep surprising bondholders and the public are generally ineffective or harmful in the long run. This is because, within tax revenue categories, some items like profit and income taxes rise more than one-to-one with inflation, while on the expenditure side, some categories initially show stickiness but eventually adjust back to their initial levels in real terms. Plus, he also found that spikes in inflation measured as GDP deflator growth tend to improve the overall fiscal balance temporarily and lower the debt-to-GDP ratio persistently, with similar responses observed between advanced

and emerging market economies. However, only unanticipated inflation spikes reduce the debt ratio, while oscillations in inflation expectations do not, highlighting the importance of distinguishing between anticipated and unanticipated inflation effects for fiscal planning and debt management.

In addition, Assibey-Yeboah & Mohsin (2014) suggested that the relationship between inflation and debt sustainability is significant. They found that the increase in inflation leads to various effects on the economy, including a decrease in the stock of foreign debt in the long run. Nevertheless, this decrease in debt is accompanied by adverse effects such as decreased consumption, employment, capital accumulation, and output in the long term. The adjustment of major variables, including debt, consumption, and investment, is non-monotonic in nature, and the initial increase in inflation results in a current account surplus followed by a deficit. Despite these dynamics, Assibey-Yeboah & Mohsin (2014) mentioned that there is a positive correlation between savings and investment during the transitional periods, known as the Feldstein–Horioka puzzle. Therefore, inflation does significantly affect debt sustainability in the context of their discussed model of a developing economy.

Likewise, Aizenman & Marion (2011) stated that inflation has historically played a significant role in reducing public debt's real value, notably during periods of high debt overhang like post-World War II. Based on their research, a moderate inflation increases, around 6%, could potentially decrease the debt-to-GDP ratio by up to 20% within four years. However, its effectiveness depends on factors such as debt maturity, the share held by foreign creditors, and indexation to inflation. Besides that, Aizenman & Marion (2011) also mentioned that, in the long term, inflation may have less impact, especially if debt maturity is short or held by foreign entities. Using inflation for debt reduction entails trade-offs, including potential negative impacts on real wealth and investor confidence. Ultimately, the decision to inflate away debt is influenced by globalization and economic stability. Hence, while inflation can offer short-term relief, its sustainability depends on various economic factors and policy decisions.

In summary, inflation significantly affects debt sustainability by impacting public finances and fiscal balances. Oyadeyi et al. (2024) found it strains fiscal resources, hindering economic development and servicing debt. At the same time,Garcia-Macia (2023) showed inflation shocks can briefly improve fiscal balances, but only if unexpected. For Assibey-Yeboah & Mohsin (2014), they noted the complex relationship between inflation and debt sustainability, highlighting both adverse effects and potential benefits. Also, Aizenman & Marion (2011) stressed the historical role of inflation in reducing public debt, but caution about trade-offs and policy considerations, emphasizing the need for comprehensive debt management strategies.

2.1.4 GDP

According to Jacobs et al. (2020), the GDP refers to the inflation-adjusted value of the total output of goods and services produced by an economy in each period such as consumer spending, business investments, government spending, and net exports. It usually measured annually or quarterly. A positive GDP growth indicates economic expansion, while a negative GDP growth indicates economic contraction. Besides, Islam et al. (2023) also mentioned that the GDP is a key indicator of economic performance and is used to assess the overall health and growth of an economy.

Based on Islam et al. (2023), the GDP is significant in influencing debt sustainability. The study acknowledged the importance of GDP growth for debt sustainability, particularly in the context of Pakistan's economic challenges. It mentioned that achieving a 10% growth rate with a real interest rate lower than 10% could potentially bring Pakistan's public debt level under the 60% standard sustainable limit by the year 2030. This indicates that higher GDP growth rates can help in managing and reducing public debt levels over time. However, Islam et al. (2023) also argued that the GDP growth alone may not be sufficient to address Pakistan's mounting debt burden. Despite the potential positive impact of high growth rates, the study found no evidence of debt sustainability based on estimates

of the fiscal reaction function. This implies that while GDP growth is essential, other factors and policy measures are also crucial in ensuring debt sustainability.

Oyadeyi et al. (2024) also suggested that the GDP is significant in influencing debt sustainability in Nigeria. Their study revealed that debt levels have a threshold effect on economic growth, with certain debt ratios positively impacting growth below specific thresholds, while ratios exceeding these thresholds have a negative effect. Notably, the study identified optimal thresholds for various debt ratios as percentages of GDP, GNI, revenue, and exports. While domestic debt is deemed sustainable in both the short and long run, external debt and total debt are only sustainable in the long run. Yet, when expressed as ratios of GDP and GNI, Nigeria's debt is found to be unsustainable. With this, Oyadeyi et al. (2024) highlighted the importance of GDP in understanding debt sustainability, as it reflects the country's economic growth potential and its capacity to service its debts.

Furthermore, Jacobs et al. (2020) discovered that Ghana's debt sustainability is significantly influenced by the GDP. Their analysis of the causal connection between the ratio of public debt to GDP and economic growth across 31 EU and OECD nations from 1995 to 2013 unveiled valuable insights. Although no direct causal relationship is found from public debt to GDP growth rate, there is evidence of a causal link from GDP growth rate to the ratio of public debt to GDP. Especially in countries with high levels of debt, the adverse impact of economic growth on public debt is intensified by an increase in the long-term real interest rate, resulting in further escalation of the debt ratio. Besides, Jacobs et al. (2020) highlighted the importance of considering transmission mechanisms like long-term real interest rates in understanding the public debt-economic growth relationship. Although no reverse causality is found from public debt to economic growth, the study underscores economic growth's crucial role in influencing debt sustainability, especially in high-debt scenarios. Therefore, GDP remains important in assessing and managing debt sustainability, particularly in complex high-debt contexts.

Next, Kofi Asravor et al. (2023) also found that the GDP has significant impact on Ghana’s debt sustainability. Their study delved into how domestic debt influences

private sector growth, the economic growth rate, and overall debt sustainability in Ghana. It revealed that increasing domestic debt can spur growth, indicating a positive correlation between domestic debt and economic expansion. Additionally, Kofi Asravor et al. (2023) suggested that Ghana's domestic debt is moderately sustainable, implying manageable debt levels but with some risks. GDP emerges as a critical factor in shaping debt sustainability, as the study indicated that enhancing GDP or revenue generation could bolster domestic debt sustainability, showcasing the importance of a robust economy in managing debt obligations effectively.

In conclusion, the studies above indicated that GDP significantly influences debt sustainability in various contexts, such as Pakistan, Nigeria, and Ghana. Jacobs et al. (2020) and Kofi Asravor et al. (2023) found that higher GDP growth rates correlate with improved debt sustainability by helping manage and reduce public debt levels. However, relying solely on GDP growth may not suffice to address escalating debt burdens, necessitating comprehensive strategies and policy measures Islam et al. (2023). Oyadeyi et al. (2024) also stressed understanding the threshold effects of debt levels on economic growth and the role of transmission mechanisms like long-term real interest rates in shaping the debt-economic growth relationship. Overall, GDP remains critical in evaluating and managing debt sustainability, highlighting the necessity of fostering robust economic growth to handle debt obligations effectively.

2.1.5 Exchange Rate

Islam et al. (2023) defined the exchange rate as the value of one currency in terms of another currency and is often used as an instrument in estimation. In other words, it represents the rate at which one currency can be exchanged for another. Meanwhile, according to Neaime (2015), exchange rate crises are strongly linked in emerging economies. This is because exchange rates play a crucial role in international trade, investment, and financial transactions.

In the light of Togan Eğrican et al. (2022), the exchange rate's role in debt sustainability is significant and intricate, particularly in countries where real interest

rates exceed real growth rates. The study emphasized that achieving sustainability in such scenarios is challenging, demanding fulfilment of solvency and liquidity conditions. The real interest rates relative to growth rates are key in assessing fiscal sustainability. Exchange rate dynamics must be considered in evaluating public debt sustainability as they significantly affect debt dynamics,Carrera & Vergara (2012) including the debt-to-GDP ratio. This is because failure to account for exchange rate depreciation can lead to miscalculations of fiscal sustainability. In short, exchange rates are pivotal in influencing debt sustainability, especially in open economies like Turkey's, impacting a country's ability to maintain fiscal stability. Hence, accurate assessment and consideration of exchange rate dynamics are essential for effective fiscal policies and long-term debt sustainability.

In addition, Carrera & Vergara (2012) stated that the exchange rate is significant in influencing debt sustainability. The study found that exchange rate movements, especially devaluations, can profoundly impact fiscal policy sustainability. This is because these movements affect not only the value of foreign-currency-denominated debt but also interest rates and economic growth. Meanwhile, devaluations can lead to higher interest rates and lower GDP growth, changing the trajectory of primary balances necessary for fiscal sustainability. Plus, Carrera & Vergara (2012) mentioned that the significance of the exchange rate lies in its role in determining the required fiscal adjustments following a devaluation, which depend on factors like the devaluation's size, duration, impact on interest rates and growth, and the proportion of public debt denominated in foreign currency. Neglecting the effects of exchange rate changes on interest rates and growth may underestimate the fiscal costs of devaluation.

Neaime (2015) also noted that the exchange rate is significant in influencing debt sustainability in Lebanon. Lebanon's adoption of a fixed exchange rate regime aimed at controlling debt service costs and attracting foreign capital inflow underscored the importance of exchange rate policies in managing debt. Studies such as Reinhart (2002) indicated a strong connection between foreign debt and exchange rate crises, highlighting the role of exchange rate dynamics in debt management. Plus, based on Neaime (2015), chronic current account deficits,

recurring budget deficits, and a substantial rise in external debt in Lebanon pose challenges to both fiscal and exchange rate stability, illustrating the intricate relationship between exchange rates and debt sustainability. The consideration of abandoning the fixed exchange rate peg as part of fiscal adjustments further demonstrates the critical role of exchange rate policies in addressing debt sustainability challenges and preparing for potential exchange rate depreciation amid declining international financing options.

Furthermore, Oyadeyi et al. (2024) indicated that the exchange rate is significant in influencing debt sustainability in Nigeria. The research explained that when debt ratios are below a certain threshold, currency devaluation (exchange rate depreciation) can stimulate economic expansion. Nonetheless, at higher debt levels, the impact of the exchange rate on growth becomes less significant or even negative. This suggests that while exchange rate movements can positively influence debt sustainability under certain conditions, they may have diminishing returns or adverse effects as debt levels increase. Thus, understanding the interaction between exchange rates and debt levels is crucial for effectively managing debt sustainability in Nigeria.

In summary, based on the studies above, exchange rates significantly impact debt sustainability in countries like Turkey, Lebanon, and Nigeria. Togan Eğrican et al. (2022) noted their influence on debt metrics like the debt-to-GDP ratio, emphasizing the risks of overlooking exchange rate depreciation in fiscal sustainability assessments. Meanwhile, Carrera & Vergara (2012) highlighted the profound effects of exchange rate movements, especially devaluations on fiscal policy, interest rates, and economic growth. For Neaime (2015), his research demonstrated how chronic deficits and rising external debt challenge both fiscal and exchange rate stability. Additionally, Oyadeyi et al. (2024) underscored the necessity of understanding exchange rate-debt dynamics for effective debt management amid international financial shifts. Hence, accurate assessment and consideration of exchange rate fluctuations are vital for sound fiscal policies and long-term debt sustainability.

2.1.6 The Belt and Road Initiative (BRI)

The Belt and Road Initiative (BRI) initiated by Chinese President Xi Jinping in 2013, is a comprehensive endeavour led by China aimed at enhancing connectivity and fostering regional cooperation through substantial investments on a trans-continental scale. It is primarily established with the purpose of bridging the substantial infrastructure gap that constraining international trade, openness, and future prosperity with other countries. Within a decade of the launch of the Belt and Road Initiative (BRI), the investment volume has surpassed USD 1 trillion, with a significant portion of financing allocated to lower and middle-income countries, as indicated by studies (Bandiera & Tsiropoulos, 2020; Nedopil, 2023). This large-scale investment targeting infrastructure projects in Asia, Europe, and Africa sparked extensive debate among scholars over debt sustainability.

There are concerns that these investments might result in heightened debt burdens for the BRI recipient countries particularly if the project could not yield sufficient economic returns to offset their costs (Wang et al., 2019). It is further supported by Capital Inflow Theory, which provides an outstanding point that raises the relationship between foreign investments and economies. According to the Capital Inflow Theory, foreign investment particularly in the form of debt financing, may contribute to a country's rising debt burden. This statement is also supported by studies of Bandiera & Tsiropoulos (2020) which further emphasize that substantial debt financing, especially in foreign currencies and without concessional terms, could accelerate the deterioration of already precarious debt vulnerabilities in the medium run. Apart from that, several studies have presented similar perspectives on the impact of the BRI on national debt levels, with suggesting a tendency towards increased indebtedness. Alex (2020) highlighted the adverse effects of BRI investments in Venezuela and Sri Lanka, revealing how overestimations of repayment capabilities led to debt levels surpassing IMF sustainability thresholds in Venezuela, while the failure of the Hambantota Port project in Sri Lanka exacerbated debt crises. Moreover, researchers have identified pre-existing debt vulnerabilities, lack of project profitability, and political factors as contributing to the potential debt sustainability challenges posed by the BRI (Bandiera &

Tsiropoulos, 2020; Carmody et al., 2022; Hurley et al., 2019). Observations from an overarching analysis of BRI recipient countries by Bandiera & Tsiropoulos (2020) indicate that over 50% of assessed nations faced debt vulnerability issues, often predating BRI investments.

Nevertheless, there are some studies appears to contradict this assertion. For instance, theory like Neoclassical Growth Theory contradict with Capital Inflow Theory when offering perspectives on the impact of foreign investment on economies. According to the Neoclassical Growth Theory, foreign investment is viewed as a catalyst for economic expansion, potentially enhancing a nation's debt sustainability by fostering growth, given that the returns on investment exceed the costs of debt (Yue et al., 2016). Moreover, Wang et al. (2019) further supported this notion by indicating that investments in equity financing, such as FDI, do not add to the national debt. However, this statement is refuted by Bandiera & Tsiropoulos (2020) where much of the financing under the BRI constitutes debt financing, which oppose with this perspective.

Previous research on the impact of BRI on debt sustainability in BRI-receiving countries has provided valuable insights and results (Alex, 2020; Bandiera & Tsiropoulos, 2020; Hurley et al., 2019). However, notable gaps still persist. While Hurley et al. (2019) identifies a mixed relationship between BRI investment and economic growth in countries including Laos, the Maldives, Mongolia, Montenegro, Pakistan, and Tajikistan, there remains a need for further investigation to comprehend the precise effects of BRI infrastructure investments in other regions such as Asia. Furthermore, Bandiera & Tsiropoulos (2020) findings suggest that over 50% of assessed countries are vulnerable to medium-term debt as a consequence of BRI, yet it is crucial to delve deeper into how such robust economic growth may impact debt-to-GDP ratios in these nations. Additionally, although Sufian (2018) suggests that BRI infrastructure investment may contribute to economic growth in ASEAN, there remains a research gap highlighted by Ashraf et al. (2022), who emphasize the necessity to evaluate the impact of BRI on economic growth in Asia. These insights underscore the necessity for additional research to elucidate the multifaceted impacts of BRI on debt sustainability in Asia

countries and to identify effective policy measures to address potential challenges. Therefore, our research addresses the existing gap in the literature by examining the impact of the BRI on the debt sustainability of the Asia BRI recipient countries by employing the debt dynamic model.

2.2 Theoretical Framework

Government debt is intricately linked to external borrowing, which constitute a significant component of a nations' overall indebtedness. It involves the government acquiring funds from financial institutions and foreign entities, facilitating investment, development, or consumption beyond domestic financial capacities. Nevertheless, an excessive level of external borrowing exposes the country to risks that could undermine its ability to manage its debt effectively (Brkić, 2021). Hence, determining the suitable and acceptable debt level as well as understanding the factors influencing debt levels, remains a subject of ongoing debate among economists, underscoring its significance in economic discourse.

The debt dynamic model uses a mathematical representation of how a country's debt evolves over time. The underlying equation of the model is as follows (Escolano, 2010):

$$D_t = D_{t-1} - OB_t$$

Equation 2.1

D_t denotes the total revenues and grants; D_{t-1} denotes the total expenditures; and OB_t denotes the overall balance.

It proposes that if the interest rate higher than the GDP growth rate, the debt-to-GDP tend to increase. Moreover, the model also indicates if the debt incurs foreign currency, nominal exchange rate should be included in the calculation.

$$D_t = D_t^N + e_t D_t^F$$

Equation 2.2

2.3 Conceptual Framework

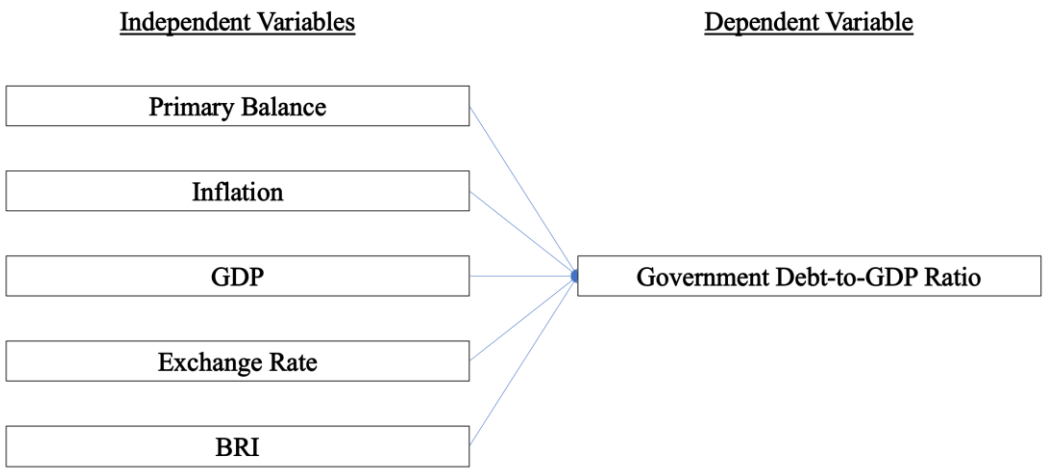


Figure 2.1 Proposed Theoretical Framework

In investigating the influence of the BRI on debt sustainability of BRI recipient countries, our research constructs a model grounded in the Debt Dynamic Equation, similar to (Sundus et al., 2022). This conceptual framework comprises five distinct independent variables, including four control variables sourced from the Debt Dynamic Equation: primary balance, inflation, GDP, and exchange rate (USD/LCU). Additionally, one supplementary independent variable, BRI, is incorporated in this analysis to elucidate its impact on the debt levels of the Asia.

The relationship between the independent variables and the dependent variable, the government debt to GDP ratio, is intricate and multifaceted. Firstly, the increase in BRI investments aimed at infrastructure development is anticipated to stimulate economic growth. For instance, improved accessibility to public transport and streamlined logistics can enhance work efficiency, thereby bolstering the economy by generating revenue and offsetting the cost. Concurrently, the primary balance serves as a determinant, as a primary deficit signifies that a country's revenue falls short of covering its expenses. Consequently, governments may resort to raising additional debt to finance their operations, leading to an escalation in debt levels. Moreover, inflation erodes the real value of debt, potentially alleviating the burden

on borrowers but also leading to higher interest rates and borrowing costs for governments. For example, when a government with high levels of debt experiences unexpected inflation, reducing the real value of the debt over time, making it easier to repay. However, this may also lead to increased borrowing costs if lenders anticipate higher inflation and demand higher interest rates. Lastly, changes in the exchange rate can influence external debt levels, which indirectly affect government debt level. When the borrowing country's currency depreciates, the external debt increases due to the weakening of the currency. For instance, if the Malaysian Ringgit depreciates against the USD, debts denominated in the USD will increase correspondingly, accentuating the debt burden.

2.4 Hypothesis Development

Table 2.4:

Hypothesis

Variable	Hypothesis
Primary Balance	H_0: There is an insignificant relationship between primary balance and General government gross debt-to-GDP ratio. H_1: There is a significant relationship between primary balance and General government gross debt-to-GDP ratio.
Inflation	H_0: There is an insignificant relationship between inflation and General government gross debt-to-GDP ratio. H_1: There is a significant relationship between inflation and General government gross debt-to-GDP ratio.
GDP	H_0: There is an insignificant relationship between GDP and General government gross debt-to-GDP ratio. $H_{1:}$ There is a significant relationship between GDP and General government gross debt-to-GDP ratio.
Exchange Rate	H_0: There is an insignificant relationship between exchange rate appreciation and General government gross debt-to-GDP ratio.

	H_1: There is a significant relationship between exchange rate appreciation and General government gross debt-to-GDP ratio.
BRI	H_0: There is an insignificant relationship between BRI and General government gross debt-to-GDP ratio. H_1: There is a significant relationship between BRI and General government gross debt-to-GDP ratio.

CHAPTER 3 METHODOLOGY

3.0 Introduction

This chapter primarily focuses on the research methodology and theoretical framework used to analyse the impact of each variable on the debt-to-GDP ratio for the BRI recipient countries. Firstly, it defines each variable and explains how it is sourced. Following this, the chapter outlines three main steps in the data processing procedures, ranging from unit root tests to Pooled Mean Group (PMG) estimations. Finally, the chapter conducts diagnostic checks, normality test, correlation analysis and robustness checks.

3.1 Data Description

The study analyzed data from nine countries, covering the period from 2003 to 2022, including Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam, South Korea, Bangladesh, and Nepal. The reason we only covered nine BRI recipient countries in our study is because we found during our research that the data transparency was lacking, resulting in incomplete data for many countries. Hence, we selected nine Asian countries with comprehensive and comparable data for our study. The primary focus of the research is to examine the impact of Belt and Road Initiative (BRI) investments on recipient countries in both the short and long term. Consequently, the independent variable in the study is BRI, while the dependent variable is the government debt of recipient countries. To mitigate the risk of omission, four control variables were included in the analysis, namely primary balance, inflation, GDP, and exchange rate.

Table 3.1.1:

Source of Data for Variables

Type of variable	**Variables**	**Unit of measurement**	**Sources of method**
Dependent variable	General government gross debt	% of GDP	Refinitiv (London Stock Exchange Group)
Control variable	Primary balance	% of GDP	International Monetary Fund (IMF)
Control variable	Inflation	%	World bank
Control variable	GDP growth rate	%	World bank
Control variable	Exchange Rate	USD/ LCU (Indirect method)	Refinitiv (London Stock Exchange Group)
Independent variable	BRI investment	Ratio to FDI (%)	American Enterprise Institute

Table 3.1.2:

Data Description for Variables

Variables	Definition
General Government Gross Debt (D)	General government gross debt is the dependent variable of the study. Government debt is the total amount of money a government owes. It includes things like loans, pensions, and other bills, and it typically expressed as a percentage of GDP. It is an important indicator of fiscal sustainability, showing the ability of a government to service its debt without accumulating more debt (OECD, n.d.).
Primary Balance (PB)	Primary balance is one of the control variables. It is the difference between a government's overall revenue and its

	total expenditures excluding interest payments. It helps assess whether a government can manage its finances effectively and sustain its debt (Islam et al., 2023).
Inflation (I)	Inflation is the control variable for the study. It refers to a widespread rise in prices coupled with a decrease in the purchasing power of money. It can impact different parts of public finances like tax income, government spending, and debt changes (Garcia-Macia, 2023).
GDP (G)	GDP is also one of the control variables. It is the value of all goods and services produced within an economy over a specific period and adjusted for inflation. This includes spending by consumers, investments by businesses, government spending, and net exports. Generally, it will be used to measure the overall health and growth of an economy (Jacobs et al., 2020).
Exchange Rate (ER)	Exchange rate is a control variable for debt. It is the relative value of one currency compared to another currency. It holds significant importance in international trade, investment, and financial dealings (Islam et al., 2023).
Belt-Road Initiatives Investment (BRI)	BRI investment is the independent variable and the focus of this study. It is a broad initiative led by China to boost connectivity and encourage regional cooperation through significant investments spanning continents. However, there are worries that these investments may lead to increased debt obligations for the countries receiving funding under the BRI, especially if the projects fail to generate enough economic benefits to cover their expenses (Bandiera & Tsiropoulos, 2020; Wang et al., 2019).

3.2 Methodology

3.2.1 Panel Unit Root Test

The panel unit root test serve a purpose to examine the stationary condition of the variables. A stationary data indicates that the statistical properties of the data does not vary over time (Hyndman & Athanasopoulos, 2018). In other words, the stationary condition assert that the data does not exhibit trends or seasonality for the time period. It is crucial to ensure the stationary of data especially in panel data as a non-stationary panel data indicates that the cross-sectional entities might exhibit trend or having error such as structural break (Kapetanios et al., 2011). Furthermore, (Hyndman & Athanasopoulos, 2018) asserting that regression non-stationary data will lead to the spurious regression problem, causing the misleading forecasting results. Understanding that the outcome of the unit root test will influence both model selection and the interpretation of results, we proceed to conduct the test in accordance with the specified hypothesis and decision criteria.

Our study employs the unit root tests proposed by Levin, Lin, and Chu (LLC), Im, Pesaran, and Shin (IPS), as well as the augmented Dickey-Fuller (ADF) test to assess the stationarity of the variables. Firstly, the LLC test is unit root test specifically designed by Levin et al. (2002) for moderate size panel data, consisting of 10 to 25 cross sections, and 25 to 250 time series observation for each cross section. Furthermore, the IPS method, designed for panel data characterized by heterogeneity, employs an alternative approach utilizing the likelihood method to conduct the unit root test, employing the t-bar test when N and T are sufficiently large (Im et al., 2003). Lastly, the ADF differ from other unit root test by adding the lag term for the dependent variable, and therefore make the error term uncorrelated, aiming to obtain a more unbiased estimator (Gujarati & Porter, 2009).

Table 3.2.1:

Hypotheses and Decision Rule of Unit Root Tests

Levin, Lin and Chu Test (LLC)		
	Hypothesis	Decision Rule

Level	H_0: Individual in the panel contain one unit root. H_1: Individual in the panel contain no unit root.	Reject H_0 if p-value is smaller than the alpha (0.05). Otherwise, do not reject.
First Difference	H_0: Individual in the panel contain two unit roots. H_1: Individual in the panel contain one unit root.	
Im, Pesaran, and Shin (IPS)		
Level	H_0: Panel contain unit root at level. H_1: Panel is stationary at level.	Reject H_0 if p-value is smaller than the alpha (0.05). Otherwise, do not reject.
First Difference	H_0: Panel contain unit root at first difference. H_1: Panel is stationary at first difference.	
Augmented Dickey-Fuller (ADF)		
Level	H_0: There is a unit root at level. H_1: The time series is stationary at level.	Reject H_0 if p-value is smaller than the alpha (0.05). Otherwise, do not reject.
First Difference	H_0: There is a unit root at first difference. H_1: The time series is stationary at first difference.	

3.2.2 Pooled Mean Group (PMG)

The data are panel data consisting of time series observations (T) and cross sectional observations (N) to allow for better detection of the important relationships between them. In this case, we use a panel PMG-ARDL model to study the short- and long-

run relationships between the variables. The ARDL model, developed by Pesaran & Shin (1999) and Im et al. (2003), has a number of econometric advantages over other traditional panel models. Firstly, the ARDL model applies to mixed stationary orders of variables. This therefore allows the ARDL model to incorporate both short-run and long-run relationships in a single equation. Plus, the model can provide econometric solutions to problems including endogeneity, heteroscedasticity, autocorrelation, and multicollinearity. In addition, the ARDL method can tolerate different lags for different variables, which makes the method very attractive, versatile and flexible.

Following the ARDL model, we continue to use the PMG estimator to obtain specific equations within the ARDL framework. Of the three estimation methods involved in the Pesaran panel ARDL model, we focus on the mean group (MG) and pooled mean group (PMG) estimation methods because they address the difficulties encountered by the other estimation methods, namely capturing the heterogeneous slope coefficients and error variances. In particular, PMG imposes a restriction on the homogeneity of cross-sectional long-run parameters. If this homogeneity assumption holds, MG estimation may lack efficiency.

Specifically, in PMG, the constraints on the long-term coefficients are the same due to arbitration requirement, shared technology, or the institutional growth that was shared by all groups, according to Pesaran & Shin (1999). On the flipside, the PMG estimator allows the short-run coefficients and error variances of the cross-sectional observations to differ due to a variety of factors that affect the performance of different countries. The resulting performance includes economic conditions, market size and policy application. Therefore, we believe that the PMG estimator produces more accurate estimates because it takes into account the heterogeneity of the short-run coefficients, whereas the long-run coefficients must be restricted to be the same and homogeneous for each individual unit in the panel.

This is also consistent with our expectation that the impact of the BRI on the debt-to-GDP ratio in the short run may vary from country to country due to the similarity of the economic structure and the absorptive capacity of the stimulus measures in

the five countries. However, over time, the effects of the debt sustainability is the same for them. We therefore use the PMG as this answer research questions.

Thus, an empirical equation is formed in this paper to test the constancy and sensitivity of the model.

$$D_{i,t} = \alpha_{1i} + \beta_{1i}PB_{i,t} + \beta_{2i}I_{i,t} + \beta_{3i}G_{i,t} + \beta_{4i}ER_{i,t} + \beta_{5i}BRI_{i,t} + \varepsilon_{i,t}$$

Equation 1

Where *D* represents the debt to *GDP* ratio, *PB* is the primary balance as a percentage of *GDP*, *I is the inflation rate*, *G* is the real *GDP*, *ER* is the exchange rate and $\varepsilon_{i,t}$ is the error term. The cross-section units which referring the countries are denoted by i = 1, 2, 3,…, (N) and t = 1, 2, 3, …, (T) represents time periods. Under these conditions, the conceivable objective of including BRI in Equation 1 is used to capture the direct impact of the BRI on debt sustainability.

Following that, the equation including the dissimilar lag of both dependent and independent variables is as follows:

$$D_{i,t} = \alpha_{1i} + \sum_{j=1}^{p} \beta_{i,j} D_{i,t-j} + \sum_{j=1}^{q} \delta_{i,j} Z_{i,t-j} + \varepsilon_{i,t}$$

Equation 2

Where, $Z_{it} = (PB, I, G, ER, BRI)$

Z_{it} denotes the vector of explanatory variables; α_{1i} represents the provincial fixed effect; δ_{ij} represents coefficients of the lagged explanatory variables (PB, I, G, ER, BRI); and $\varepsilon_{i,t}$ represents the error term.

In addition, the speed of adjustment to long-run equilibrium following a short-run shock can be calculated by working with an error correction model (ECM). Using the PMG procedure, Equation 2 can be re-parameterized as an error correction model (ECM):

$$\Delta D = ECT_{i,t} + \sum_{j=1}^{p-1} \Theta^*_{i,j} \Delta D_{i,t-j} + \sum_{j=0}^{q-1} \vartheta^*_{i,j} \Delta Z_{i,t-j} + \varepsilon_{i,t}$$

Equation 3

Where,

$ECT_{i,t} = \phi_i D_{i,t-1} - \varphi_i Z_{i,t}$

$\phi_i = -(1 - \sum_{j=1}^{p} \Theta_{i,j})$

$\varphi_i = -\frac{\sum_{j=0}^{q} \vartheta_{i,j}}{1 - \sum_{j=1}^{p} \Theta_{i,j}} = -\frac{\sum_{j=0}^{q} \vartheta_{i,j}}{\phi_i}$

$\Theta^*_{i,j} = -\sum_{s=j+1}^{p} \Theta_{i,s}$

$\vartheta^*_{i,j} = -\sum_{s=j+1}^{q} \vartheta_{i,s}$

In Equation 3, the $ECT_{i,t}$ term represents the speed of adjustment of the equilibrium relationship from short-term to long-term dynamics. If the $ECT_{i,t}$ is between -1 and 0 and the t-statistic is significant, it indicates that there is a long-run relationship between the variables. Also, ϕ_i, the adjustment speed term, is expected to be negative and significant to ensure the model supports the long-run relationship between debt to GDP ratio and control variables. Meanwhile, the vector φ_i indicates the long-run coefficient of the explanatory variables. Moving on, the remaining terms in Equation 3 indicate the short-term relationship. Therefore, determining the long-run coefficients (φ_i) and the speed of adjustment term (ϕ_i) is the central task of this paper.

3.3 Diagnostic Checking

3.3.1 Normality Test

According to Keya and Imon (2016), normality refers to the concept that a data set follows a normal or Gaussian distribution, which is a symmetrical bell-shaped curve. A normal distribution is characterized by its mean and standard deviation, and it is often used in statistical analysis and hypothesis testing. Based on Roshandel (2022), non-normality may affect the accuracy of statistical models and lead to biased

parameter estimates. For instances, the non-normality of the error will have an effect on the exact p-value of the coefficient test. Yet, it is important to carry out the normality test before performing the regression.

Skewness and kurtosis through Jaque Bera test will be the main method to test the normality of the data set. In the light of Klima (2021), Skewness determines the degree and direction of the skew and measures the degree of asymmetry in the probability distribution of a random variable relative to its average. Plus, its value can be positive or negative. When the skewness value is below -1 or higher than 1, it means that the distribution is highly skewed. Meanwhile, the distribution is fairly skewed, if the skewness value is between -1 and -0.5 or between 0.5 and 1. When the skewness value is between -0.5 and 0.5, it indicates that the distribution is roughly symmetric. For kurtosis, Klima (2021) also mentioned that it is a measure of how tailed a distribution is. In other words, it is used to calculate the height and sharpness of the distribution's central peak.

Hypothesis of Jarque Bera Test:

H_0: The error term is normally distributed.

H_1: The error term is not normally distributed.

Decision Rule:

Reject H_0 if JB test statistic is greater than the critical value. Otherwise, do not reject. or

Reject H_0 if p-value is lower than the level of significance. Otherwise, do not reject.

3.3.2 Correlation Analysis

In the light of Gogtay and Thatte (2017), correlation analysis is a statistical method applied to understand the strength of the linear relationship between two or more quantitative variables. It measures how changes in one variable correspond to changes in another, indicating the strength and direction of a linear association between the variables. In this research, correlation analysis is used as an important

tool to assess multicollinearity for the panel data model. If the two or more independent variables in a panel data model are highly correlated with each other, it might lead to unreliable and unstable estimates of the regression coefficients and can make it difficult to identify the individual effects of each independent variable on the dependent variable (Hayes, 2023).

According to Senthilnathan (2019), correlation coefficient is the unit measurement used by correlation analysis to examine the strength of the linear relationship between two variables. The value of correlation coefficient is starting from -1 until +1. Based on Gogtay and Thatte (2017), there is perfectly related for the two variables in a positive manner if the correlation coefficient is +1, and perfectly related in a negative manner if the correlation coefficient is -1. Meanwhile, correlation coefficient of zero indicates that there is no linear relationship between the two independent variables. Apart from it, there is a strong correlation if the coefficient value if lie between ±0.5 and ±1, moderate correlation if the coefficient value lies between ±0.3 and ±0.49, and weak correlation if it is less than ±0.29. If the correlation coefficient surpasses ±0.7, it means that there may be a serious correlation between independent variables in the model. In this situation, the coefficient estimates and p-values in the regression output may become unreliable.

3.3.3 Robustness Test

Robustness is an attribute of resilience that is used to measure the consistency of models under non-standard conditions (Micskei et al., 2012). Also, Lu & White (2014) stated that a robustness test is a commonly examination conducted to assess the reliability and stability of research findings or statistical results. It involves making variations or adjustments to different aspects of the research methodology, such as model specifications, data choices, or assumptions, to ensure that the main conclusions remain valid across different scenarios. In this study, we will conduct a robustness test by replacing the independent variables GDP growth rate and exchange rate with GDP per capita growth rate and the official exchange rate to

determine whether the results are sensitive to changes and to increase the credibility of the findings by demonstrating their elasticity under different conditions.

CHAPTER 4 DATA ANALYSIS

4.0 Introduction

This chapter will explore the extent to which the BRI and other control variables, including primary balance, inflation, real GDP, and exchange rate, exert a significant influence on the debt sustainability of recipient countries. To achieve this, we will analyse all test outcomes generated by Eviews 10.0 to establish conclusive findings. The discussion of these results aims to offer valuable insights for our research endeavours.

4.1 Panel Unit Root Test

The panel unit root test serve a purpose to test the stationary or non-stationary of the data. We conducted the Levin, Lin, and Chu (LLC), Im, Pesaran, and Shin (IPS), and the augmented Dickey-Fuller (ADF) at trend with intercept at level and first difference. Using the significant level 1%, 5% and 10% we reject the null hypothesis when the p-value smaller than alpha, concluding the stationary of the data.

Table 4.1.1:

LLC Test Output

	LLC	
	Level	**First Difference**
Variables	**Trend with Intercept**	**Trend with Intercept**
D	0.83392	-4.85136***
PB	-2.33261***	-6.72976***
I	-0.11544	-6.82011***
G	-8.88616***	-6.52970***
ER	-0.59006	-4.78142***
BRI	-2.65434***	-6.22261***

Table 4.1.2:

IPS Test Output

	IPS	
	Level	**First Difference**
Variables	**Trend with Intercept**	**Trend with Intercept**
D	2.92879	-3.41649***
PB	-0.81699	-4.81033***
I	-1.77489**	6.89608***
G	-6.68139***	-8.35567***
ER	-0.35234	-3.17368***
BRI	-0.80516	-6.99755***

Table 4.1.3:

ADF Test Output

	ADF	
	Level	**First Difference**
Variables	**Trend with Intercept**	**Trend with Intercept**
D	9.54064	42.1716***
PB	23.2953	54.7192***
I	28.2599*	75.6287***
G	73.4563***	90.1851***
ER	17.8869	38.7289***
BRI	21.7422	76.3564***

Note: ***, **, * = denote significance levels at 1%, 5% and 10% respectively.

The LLC assess the cross-sectional stationary of our data, by rejecting the null hypothesis, we conclude the cross-sectional are stationary. Referring Table 4.1.1, the result of LLC test shown a mixture of I(0) and I(1). With significant level of 1% LLC indicates that PB, G and BRI are at stationary at level while D, I and ER are stationary at first difference. Simultaneously, we conducted an IPS test to observe the panel stationary. As shown in Table 4.1.2 IPS outcomes imply that only G is stationary at level, while all other variables are stationary at first difference. Thirly, monitoring the stationary over a period of time, we also perform an ADF test and

present the outcome in Table 4.1.3. The outcome further validates the result of IPS, as it also asserted the stationary of G at level, while all other variables remain stationary at first difference. Given that our data only comprises a combination of I(0) and I(1) components, there are no I(2) variables so that the PMG model is well-suited for our analysis.

4.2 Pooled Mean Group (PMG)

4.2.1 Lag-length Selection for Pooled Mean Group (PMG) Analysis

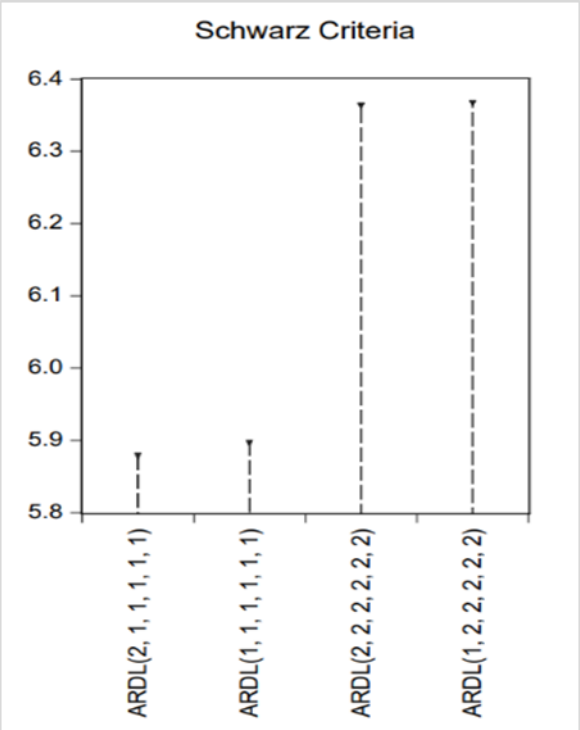


Figure 4.2.1 Eview lag-length selection under Schward Criteria

From the graph above, the ARDL (2,1,1,1,1,1) will be the best lag-length selection for our Pooled Mean Group (PMG) analysis. This is because the SC value of the ARDL (2,1,1,1,1,1) is the lowest when compared to other lag-lengths' SC value.

4.2.2 Pooled Mean Group (PMG) Analysis

The subsequent PMG outcome is computed and estimated using EViews 10.0 output to examine the correlation between the Belt and Road Initiative (BRI), primary balance, inflation rate, real GDP, and exchange rate in relation to the debt sustainability of BRI recipient nations. The data for the PMG analysis is evaluated based on the sample data collected from nine Belt and Road Initiative (BRI) recipient countries, comprising Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam, South Korea, Bangladesh, and Nepal, spanning a period of 20 years.

Table 4.2.2:

Long-Run PMG Result

Dependant variable: D	**PMG / ARDL**			**P-value**
	Coefficient	**Standard Error**	**t-Statistic**	
PB	-8.217209	2.074362	-3.961318	0.0001***
I	1.491461	0.419779	3.552970	0.0006***
G	5.877524	1.385290	4.242811	0.0000***
ER	-0.416871	0.069296	-6.015783	0.0000***
BRI	-4.665254	1.191839	-3.914331	0.0002***

Note: Model selection method: Schwarz Criteria (SC); Selected Model: PMG/ARDL (2, 1, 1, 1, 1, 1, 1); Fixed regressors: Constant; ***, **, * = denote significance levels at 1%, 5% and 10% respectively.

Examining the independent variables reveals key insights into their relationship with the debt sustainability of Belt and Road Initiative (BRI) recipient countries in long term. Fundamentally, the primary balance (PB) exhibits a negative correlation with debt-to-gdp ratio (D) in the long run. It indicates that higher primary balances in BRI recipient countries can lead to reduced government debt, thus supporting their debt sustainability. Meanwhile, in long term, primary balance's p-value (0.0001) is less than 1% level of significance, which suggests that the long run effect

of primary balance on the debt sustainability of BRI recipient countries is significant.

Similarly, inflation (I) displays positive correlation coefficients in the long run. This shows that inflation has a positive relationship with the debt-to-GDP ratio (D) of BRI recipient countries and suggests that it can increases the government debt of BRI recipient countries, then adversely affecting debt sustainability. Additionally, it significantly impacts debt sustainability in the long term with a p-value of 0.0006 which is smaller than the 1% significance levels.

Furthermore, GDP (G) exhibits a positive correlation in the long term. This indicates that an increase in GDP can put up the government debt of BRI recipient countries in the long term and impacting their debt sustainability. When looking into the p-value of GDP, it is significantly affecting debt sustainability in long-term. This is because its p-values of 0.0000 in the long run is less than the 1% significance level.

Moreover, the exchange rate (ER) demonstrates a negative correlation with the debt-to-GDP ratio (D) in the long-term analysis, suggesting that a higher exchange rate can reduce the government debt of BRI recipient countries, thereby enhancing their debt sustainability. Also, the exchange rate is significantly impacting debt sustainability in the long term with a p-value of 0.0000 which is smaller than 1% level of significance.

In addition, the Belt and Road Initiative (BRI) also shows negative correlation coefficients in the long run, indicating a negative relationship with the debt-to-GDP ratio (D). This implies that increased BRI investment in BRI recipient countries can help to reduce their government debt and thus improve their debt sustainability. At the same time, in long term, BRI's p-value of 0.0002 is smaller than the significant level of 1%. This suggests that in long run, the BRI has a significant impact on the government debt of BRI recipient countries and hence affect their debt sustainability.

In conclusion, the study shows that in the long term, primary balance, inflation, GDP, exchange rate, and BRI all significantly impact their government debt, thereby affecting their debt sustainability. Plus, in the long run, inflation and GDP positively relate to debt sustainability, while primary balance, exchange rate, and BRI have negative associations with debt sustainability.

4.2.3 Short-run Cross Sectional Result of PMG

The tables below show short-term cross-sectional results for overall and each Belt and Road Initiative (BRI) recipient country:

Table 4.2.3.1:

Overall Short-Run PMG Result

Dependant variable: D	**PMG / ARDL**			**P-value**
	Coefficient	**Standard Error**	**t-Statistic**	
D (D (-1))	0.562441	0.055520	10.13039	0.0000***
D (PB)	-0.896534	0.475704	-1.884646	0.0623*
D (I)	0.130923	0.314930	0.415720	0.6785
D (G)	-0.462776	0.096909	-4.775368	0.0000***
D (ER)	-0.484017	0.504419	-0.959553	0.3395
D (BRI)	-4.006804	4.102678	-0.976631	0.3310
Constant	-0.915404	0.788299	-1.161240	0.2482

Table 4.2.3.2:

Indonesia Short-Run PMG Result

Dependant variable: D	**PMG / ARDL**			**P-value**
	Coefficient	**Standard Error**	**t-Statistic**	
D (D (-1))	0.535507	0.021166	25.30018	0.0001***
D (PB)	-2.260854	0.993803	-2.274953	0.1074
D (I)	-0.312283	0.095680	-3.263811	0.0470**

D (G)	0.149930	0.232825	0.643962	0.5654
D (ER)	0.631334	0.508600	1.241317	0.3072
D (BRI)	0.474235	3.147043	0.150692	0.8898
Constant	-1.782300	1.522537	-1.170612	0.3263

Table 4.2.3.3:

Malaysia Short-Run PMG Result

Dependant variable: D	**PMG / ARDL**			**P-value**
	Coefficient	**Standard Error**	**t-Statistic**	
D (D (-1))	0.765124	0.009331	81.99830	0.0000***
D (PB)	-1.168351	0.070148	-16.65561	0.0005***
D (I)	-0.639498	0.013741	-46.53777	0.0000***
D (G)	-0.636372	0.011030	-57.69602	0.0000***
D (ER)	-1.552847	0.642191	-2.418044	0.0943*
D (BRI)	2.517308	0.986331	2.552194	0.0838*
Constant	0.137419	0.069735	1.970600	0.1434

Table 4.2.3.4:

Philippines Short-Run PMG Result

Dependant variable: D	**PMG / ARDL**			**P-value**
	Coefficient	**Standard Error**	**t-Statistic**	
D (D (-1))	0.717546	0.040921	17.53492	0.0004***
D (PB)	-1.779135	0.247299	-7.194253	0.0055***
D (I)	0.087390	0.122497	0.713403	0.5271
D (G)	-0.443081	0.031698	-13.97830	0.0008***
D (ER)	-0.038064	0.043774	-0.869554	0.4485
D (BRI)	3.471051	3.543961	0.979427	0.3996
Constant	-0.545737	1.140922	-0.478329	0.6651

Table 4.2.3.5:

Singapore Short-Run PMG Result

Dependant variable: D	PMG / ARDL			P-value
	Coefficient	Standard Error	t-Statistic	
D (D (-1))	0.277624	0.040969	6.776467	0.0066***
D (PB)	-1.063090	0.286214	-3.714313	0.0339**
D (I)	2.578707	0.568071	4.539409	0.0200**
D (G)	-0.547316	0.160497	-3.410120	0.0421**
D (ER)	-0.935209	407.6153	-0.002294	0.9983
D (BRI)	-36.14184	266.5535	-0.135589	0.9007
Constant	-5.990723	46.05726	-0.130071	0.9047

Table 4.2.3.6:

Thailand Short-Run PMG Result

Dependant variable: D	PMG / ARDL			P-value
	Coefficient	Standard Error	t-Statistic	
D (D (-1))	0.471380	0.014365	32.81421	0.0001
D (PB)	-1.687159	0.071711	-23.52730	0.0002***
D (I)	-0.171123	0.032431	-5.276600	0.0133**
D (G)	-0.335140	0.023910	-14.01649	0.0008***
D (ER)	0.805938	0.026054	30.93394	0.0001***
D (BRI)	-1.752867	3.839944	-0.456482	0.6791
Constant	2.375301	2.097575	1.132404	0.3398

Table 4.2.3.7:

Vietnam Short-Run PMG Result

Dependant variable: D	PMG / ARDL			P-value
	Coefficient	Standard Error	t-Statistic	
D (D (-1))	0.357009	0.026124	13.66585	0.0008***
D (PB)	0.022848	0.069020	0.331033	0.7624

D (I)	-0.233255	0.003429	-68.01757	0.0000***
D (G)	-0.507519	0.030322	-16.73771	0.0005***
D (ER)	0.301186	0.306699	0.982024	0.3985
D (BRI)	0.173986	2.035317	0.085483	0.9373
Constant	-1.075896	0.513575	-2.094915	0.1272

Table 4.2.3.8:

South Korea Short-Run PMG Result

Dependant variable: D	**PMG / ARDL**			**P-value**
	Coefficient	**Standard Error**	**t-Statistic**	
D (D (-1))	0.693277	0.033488	20.70223	0.0002***
D (PB)	-0.844811	0.081571	-10.35674	0.0019***
D (I)	-0.104828	0.065500	-1.600418	0.2078
D (G)	-0.376760	0.027814	-13.54575	0.0009***
D (ER)	-3.988999	9.840200	-0.405378	0.7124
D (BRI)	-5.305887	6.882721	-0.770900	0.4969
Constant	1.029674	0.521654	1.973865	0.1429

Table 4.2.3.9:

Bangladesh Short-Run PMG Result

Dependant variable: D	**PMG / ARDL**			**P-value**
	Coefficient	**Standard Error**	**t-Statistic**	
D (D (-1))	0.631950	0.052308	12.08123	0.0012***
D (PB)	2.470246	0.204217	12.09617	0.0012***
D (I)	-0.148336	0.006309	-23.51058	0.0001***
D (G)	-0.946361	0.028657	-33.02390	0.0001***
D (ER)	0.235086	0.004831	48.65947	0.0000***
D (BRI)	0.540878	0.058319	9.274395	0.0027***
Constant	-2.240635	21.71335	-0.103192	0.9243

Table 4.2.3.10:

Nepal Short-Run PMG Result

Dependant variable: D	PMG / ARDL			P-value
	Coefficient	Standard Error	t-Statistic	
D (D (-1))	0.612556	0.023412	26.16421	0.0001***
D (PB)	-1.758501	0.200640	-8.764452	0.0031***
D (I)	0.121531	0.055584	2.186441	0.1166
D (G)	-0.522362	0.021794	-23.96870	0.0002***
D (ER)	0.185426	0.009751	19.01687	0.0003***
D (BRI)	-0.038098	0.010752	-3.543334	0.0383**
Constant	-0.145741	1.351055	-0.107872	0.9209

In short-term PMG analysis, it shows that, overall, there is a significant negative association between the primary balance and the debt-to-GDP ratio at a significance level of 10%. Specifically, this relationship holds true for countries like Malaysia, Philippines, Singapore, Thailand, South Korea, and Nepal. This indicates that as the primary balance increases, there is a significant decrease observed in the debt-to-GDP ratio, signifying enhanced debt sustainability in the short term. This finding aligns with Fischer and Easterly (1990)'s theory suggesting that higher primary balance can mitigate rising debt. However, Bangladesh shows a contrary trend, where primary balance is significant positively correlated with the debt-to-GDP ratio. This unexpected relationship might be influenced by factors like corruption, as noted in Bangladesh's history, such as the Hall-Mark Group scam, which resulted in substantial financial losses (Khatun, 2012). This is because corruption can distort reported revenues, impacting the observed relationship between primary balance and debt. Additionally, while primary balance shows a positive correlation with Vietnam's debt-to-GDP ratio and a negative correlation with Indonesia's in the short term, these relationships are statistically insignificant.

Additionally, the results indicate that in the short term, overall, inflation has a positive but statistically insignificant association with the debt-to-GDP ratio of countries participating in the Belt and Road Initiative (BRI). This trend is consistent

with the results observed in the Philippines and Nepal. Yet, it was observed that in Singapore, inflation significantly and positively impacts the debt-to-GDP ratio, suggesting that inflation leads to a significant increase in Singapore's government debt in the short term, thus affecting its debt sustainability. Conversely, Indonesia, Malaysia, Thailand, Vietnam, and Bangladesh exhibit different outcomes, with inflation having a negatively significant relationship with their debt-to-GDP ratio. This aligns with the findings of Fukunaga et al. (2022), which suggest that a 1 percentage point increase in the inflation rate can decrease the debt-to-GDP ratio by approximately 0.7 percentage points on average across countries. Nonetheless, for South Korea, inflation was found to have an insignificant negative relationship with its debt-to-GDP ratio.

Moreover, for GDP, the short-term results found that it has a significant negative correlation with the debt-to-GDP ratio across the BRI recipient countries. This trend is the same with the short-term results of Malaysia, Philippines, Singapore, Thailand, Vietnam, South Korea, Bangladesh, and Nepal, indicating that a rise in GDP significantly reduces their debt-to-GDP ratios, thereby bolstering debt sustainability. This situation is explained by Hodula and Meleck ý(2020), who posit that GDP expansion signifies economic growth, leading to increased tax revenues without tax rate hikes. Consequently, governments gain additional resources to manage their debt, potentially mitigating the need for further borrowing and reducing the short-term debt-to-GDP ratio. Nevertheless, for Indonesia, the short-term analysis reveals an insignificant positive relationship between GDP and its debt-to-GDP ratio.

Furthermore, the overall result reveals an insignificant negative correlation between the exchange rate and the debt-to-GDP ratio in the short run. This result is similar with Philippines, Singapore, and South Korea's results. However, as noted by Saheed et al. (2015), exchange rate movements can have varying effects on government debt, depending on each country's specific circumstances. Notably, Malaysia's result indicates a significant negative relationship between the exchange rate and its debt-to-GDP ratio in the short term. This means that an increase in the exchange rate could potentially reduce Malaysia's debt-to-GDP ratio. In contrast,

Thailand, Bangladesh, and Nepal exhibit different results from Malaysia, showing a significant positive relationship between the exchange rate and their debt-to-GDP ratios in the short term. For Indonesia and Vietnam, the results show an insignificant positive relationship between the exchange rate and their debt-to-GDP ratios in the short term.

Lastly, the short-term PMG result for overall suggests that the BRI has an insignificant negative correlation with the debt-to-GDP ratio of BRI recipient countries. This is same with the results that observed in Singapore, Thailand, and South Korea. Nonetheless, in the short-run, the result of Nepal displays a significant negative relationship between the BRI and its debt-to-GDP ratio. This implies that an increase in BRI funding to Nepal could potentially decrease its debt and maintain debt sustainability in the short term. Inversely, Malaysia and Bangladesh show significant positive relationships between the BRI and their debt-to-GDP ratios. This explained that increased BRI funding may elevate their debt burdens and impact debt sustainability negatively. Meanwhile, for Indonesia, Philippines, and Vietnam, the results reveal an insignificant positive relationship between the BRI and their debt-to-GDP ratios. In summary, while the impact of the BRI on recipient countries is different, overall, it appears to have an insignificant effect on their debt-to-GDP ratios in the short term.

4.3 Diagnosis Checking

4.3.1 Normality Test

The normality test is carried out to ensure that the error term is normally distributed and therefore the hypothesis testing for F-test and p-test holds. If the probability of Jarque-Bera is lower than alpha (0.05), reject H_0 and conclude the error terms are not normally distributed.

Referring Appendix 4.16, the p-value for the Jarque-Bera test is 0.0000 which is smaller than the significant level of 1% therefore rejecting the null hypothesis. As a result, there is enough evidence to conclude that the error term is not normally

distributed. However, as discussed in the central limit theorem, and asymptotic normality theory, when the sample size increases, the distribution tends towards normality (Kwak & Kim, 2017; Levin et al., 2002). Therefore, our hypothesis testing remains valid. This standpoint was supported by Ghasemi & Zahediasl (2012), who suggest that normality is preferred, but violation of normality would not significantly affect the validity of parametric procedures, the parametric test including t-test, correlation, and regression still can be used.

4.3.2 Correlation Analysis

The correlation analysis aims to assess the coefficients of determination between two or more quantitative variables. When the coefficient value falls under the range of ±0.5 and ±1, we conclude that there is a strong correlation. Besides, coefficient values between ±0.3 and ±0.49 mean having a moderate correlation, while coefficient values less than ±0.29 indicate there is a weak correlation.

Table 4.3.2:

Correlation Analysis

	D	PB	I	G	ER	BRI
D	1.0000	0.3336	-0.3316	-0.1031	-0.3475	-0.1604
PB	0.3336	1.0000	-0.0839	0.1417	-0.2987	-0.1080
I	-0.3316	-0.0839	1.0000	0.2478	0.3885	0.1550
G	-0.1031	0.1473	0.2478	1.0000	1.000	0.0718
ER	-0.3475	-0.2987	0.3885	0.0824	0.0824	0.4427
BRI	-0.16047	-0.1080	0.1550	0.0718	0.0717	1.0000

Referring Table 4.3.2, the coefficient value for all variables are less than ±0.5, indicating that there is no strong correlation between variables, and therefore we can conclude there is no multicollinearity problem. The highest coefficient value occurs within the ER and BRI (0.4427). As such the absence of multicollinearity in our dataset, indicates that the independent are not highly correlated with each other,

enhancing the reliability of our statistical analysis. Consequently, our findings are more likely to accurately capture the relationships between variables in the model.

4.3.3 Robustness Test

To examine the consistency of our model, we conduct the robustness test by replacing the independent variables. We replace two control variables of our model, the GDP and exchange rate. Firstly, we substitute the GDP growth rate with the GDP growth rate per capita. The GDP provides a view of the overall economic performance and expansion of a nation, but the GDP per capita incorporates the average income per person giving an insight into the economic progress on a per-person basis. As both of them offer a different perspective, we use the GDP growth rate as a benchmark to observe its impact on debt while adopting GDP per capita as robust to observe from a more individual perspective. Next, we replace the exchange rate with the official exchange rate which is both obtained from the Refinitiv terminal and measured in the indirect method, USD/LCU. The exchange rate is determined by the market forces of the foreign exchange market. However, the official exchange rate is the rate announced by a country's foreign exchange administration, which is often used by the government for official purposes such as trade and government. While the exchange rate reflects how much its actual obligation to pay for its debt, the official exchange rate shows the owed amount after incorporating the government intervention. Hence, we used the exchange rate as the benchmark rate, and the official exchange rate is used for robustness.

Table 4.3.3:

Robustness Test Output

	PMG Result	
	Original Model	**Replace the Control Variable Measurement (G&ER)**
Variables	**Long Run Coefficient**	
PB	-8.217209***	-4.685778***

I	1.491461***	-0.549363***
G	5.877524***	2.567432***
ER	-0.416871***	1.062933***
BRI	-4.665254***	-6.308624***
	Short Run Coefficient	
PB	-0.896534*	-0.869815
I	0.130923	0.440491
G	-0.462776***	-0.519361
ER	-0.484017	4.286920
BRI	-4.006804	-5.672162

Note: ***, **, * = denote significance levels at 1%, 5% and 10% respectively.

From Table 4.3.3, we can observe that after replacing the independent variables, the sign of regression long-run coefficient for BRI, PB, and GDP remains consistent and significant at 1%, only the signs of I and ER changed. Additionally, the short-term coefficient similarly indicates minimal variation in significant variables, with the exception of GDP becoming statistically insignificant in the short term. Therefore, we conclude that no significant changes have occurred, indicating that our empirical results from the benchmark regression remain robust after replacing the measurement indicator for the control variable.

CHAPTER 5 DISCUSSION, CONCLUSION AND IMPLICATIONS

5.0 Introduction

This chapter will provide a comprehensive explanation of the findings generated in the fourth chapter. The section will first begin by presenting a summary of the outcomes generated from the panel PMG-ARDL model. Then, it will proceed to examine the key determinants that affect the debt sustainability of BRI recipient countries. Next, implications regarding how policymakers, investors, and academic researchers could utilize the findings are presented. Lastly, the study's limitations are identified, and suggestions for future research are provided.

5.1 Summary of Statistical Analysis

Table 5.1:

Summary of PMG output

No.	Null Hypothesis	Coefficient	P-value	Decision
1.	H_0: There is an insignificant relationship between primary balance and General government gross debt-to-GDP ratio.	-8.2172	0.0001	Significant negative relationship
2.	H_0: There is an insignificant relationship between inflation and General government gross debt-to-GDP ratio.	1.4914	0.0006	Significant positive relationship
3.	H_0: There is an insignificant relationship between GDP and	5.8775	0.0000	Significant positive relationship

	General government gross debt-to-GDP ratio.			
4.	H_0: There is an insignificant relationship between exchange rate appreciation and General government gross debt-to-GDP ratio.	-0.4168	0.0000	Significant negative relationship
5.	H_0: There is an insignificant relationship between BRI and General government gross debt-to-GDP ratio.	-4.6652	0.0002	Significant negative relationship

5.2 Discussions of Major Findings

5.2.1 Primary Balance

From the result obtained in this study, primary balance is negatively insignificant related to debt-to-GDP ratio in short run. This suggests that an increase in the primary balance corresponds to a decrease in the debt to GDP ratio. However, the overall insignificance implies that basic income and expenditure may not be a key determinant of the debt-to-GDP ratio. This result aligns with the findings drawn by Bandiera & Tsiropoulos (2020), who noted that only specific emerging market (EM) countries, and none of the low-income developing countries (LIDCs), may need to consider increasing their debt-stabilizing primary balance, particularly under the lowest growth projections. The Ando et al. (2023) also supports this by emphasizing that the importance of the primary balance is more pronounced in advanced economies, while emerging market economies and low-income countries are more significantly influenced by factors such as growth and inflation. It is highlighted that a mere 52 percent of instances of increased primary balance are accompanied

by a decrease in debt ratios. Consequently, the insignificant relationship found in Indonesia and Vietnam are attributed to differing economic dynamics.

Despite the overall insignificance, a closer examination of the individual impact of the primary balance on the debt-to-GDP ratio reveals a negatively significant relationship in the short run for most countries (except Indonesia and Vietnam and in the long run. This observation is in line with the theory of the government budget constraint articulated by Fischer & Easterly (1990), suggesting that if the government's primary deficit exceeds the amount of seigniorage it can obtain, the debt-to-GDP ratio will continue to rise indefinitely. This stems from the basic concept underlying the government budget constraint that the government's spending obligations should be met through its revenues and any newly issued debt. When we substitute the primary balance (calculated as the difference between total government revenues and non-interest expenditures) into this equation, a positive primary balance (PB > 0) indicates that the government's revenues exceed its non-interest expenditures, thereby generating a surplus and helping to reduce the debt burden. Conversely, a negative primary balance (PB < 0) indicates a deficit, suggesting that the government is relying on borrowing to pay for non-interest expenditures. In simple terms, a positive primary balance contributes to debt reduction by providing a surplus that can offset interest payments. All in all, this reflects the theory of intertemporal budget constraint, claiming that the present value of future primary balances should be equal or exceed the initial value of public debt (Lankester-Campos et al., 2020).

The observed negatively significant results are further corroborated by studies conducted by Celasun et al. (2006), Georgescu (2014), Chandia et al. (2019), Islam et al. (2023), and Checherita-Westphal (2019). These studies emphasize the necessity of maintaining a primary fiscal surplus to stabilize or reduce the debt-to-GDP ratio, with a sustained high primary surplus being crucial for mitigating debt sustainability risk. Statistically, Tanner & Samake (2008) suggest that fiscal policy is sustainable as long as the primary surplus-to-GDP ratio remains above 6.5percent, while Budina & Van Wijnbergen (2008) assert that fiscal policy with primary surpluses of 6 percent of GDP is sustainable. The IMF has also advised Malaysia

that if the debt-to-Gross Domestic Product (GDP) ratio exceeds 77%, the country should aim to achieve a primary surplus of 4% of GDP within the next ten years so as to bring the debt-to-GDP ratio down to the current 45%. The IMF has recommended that this be achieved through the implementation of substantial subsidies and the introduction of a value-added tax (Doraisami, 2011).

In all scenarios considered, the study by Izák (2009) proves that the borrowing expenditures of governments with primary deficits increase considerably. The coefficients show a large impact, with debt-servicing costs increasing by more than 20 basis points for each percentage point increase in the primary deficit. Looking at the long run, governments should maintain a strong enough primary surplus to ensure positive or zero net wealth. The primary balance is the focus of policy intervention to ensure fiscal sustainability.

5.2.2 Inflation

The findings indicate that there is a positive but statistically insignificant correlation between inflation and the debt-to-GDP ratio in short run, suggesting that a rise in inflation may increase the debt-to-GDP ratio, although the effect may not be significant due to a lack of statistical significance. The reasoning behind this observation is consistent with the economic theory of the "Fisher effect" proposed by economist Irving Fisher. According to this theory, nominal interest rates adjust to changes in the rate of inflation (Hayes, 2022). Findings by Fukunaga et al. (2022) support this view by showing that interest rates on a significant portion of total public debt rise in response to inflationary shocks in the countries studied. As a result, such upward adjustments have no significant impact on the correlation ratios of the debt-to-GDP ratios. In addition, the insignificant relationship between inflation and the debt-to-GDP ratio is influenced by the source of materials for the Belt and Road Initiative, with China supplying the bulk of the materials, which may mitigate the impact of inflation on the cost of materials.

While the overall short-term results show a non-significant relationship, the analysis of individual countries shows a significant relationship in six out of nine countries, which is consistent with the long-term results showing a positive correlation between inflation and the debt-to-GDP ratio. Essentially, this positive correlation is substantiated by a study by Balasundharam et al. (2023), which asserts that the use of inflation as a debt reduction strategy is not desirable and tends to be ineffective in the longer term. They claimed that any debt relief achieved through inflation is likely to be temporary, especially if high debt levels stem from overly expansionary fiscal policies, persistent spending pressures or revenue shortfalls. In fact, to significantly reduce the current debt-to-GDP ratio, inflation would have to soar significantly. This means that a negative correlation cannot be established without extremely high inflation or hyperinflation. If high inflationary expectations are entrenched, the real debt burden can only be effectively reduced by a combination of inflation and costly measures such as capital controls or financial repression, as the insights of Reinhart & Sbrancia (2015) point out.

Moving on, the significant relationship is consistent with the aforementioned theory of the Fisher effect. As inflation increases, lenders will naturally demand higher nominal interest rates to offset the decline in the purchasing power of money. As a result, borrowers, including governments with outstanding debt, experience higher borrowing costs. Furthermore, the theory that the real value of money changes over time supports this positive correlation. According to this theory, even if the nominal value of debt remains constant, its real value decreases. Essentially, the borrower will eventually pay off the debt in a currency that has less purchasing power. As demonstrated by Cochrane (2011), the severe economic challenges that accompany severe inflation are emphasized as a form of sovereign default. In such cases, repayment of the debt in a less valuable currency can lead to a de facto partial default on the debt. Moreover, sovereign defaults often occurred in times of economic recession, highlighting the intricate link between inflation and economic challenges.

Furthermore, beyond the reduction in the purchasing power of the domestic currency, according to Oyadeyi et al. (2024), inflation discourages savings and

investment. Specifically, governments may respond to inflation by adopting monetary policies such as raising interest rates, which leads to an increase in savings but a decrease in the level of investment. The dampening effect of inflation on the saving and investment process can hinder capital formation and long-term economic development. This dynamic leads to a slowdown in economic growth, making it difficult for countries to generate the revenue needed to service their debt, which can lead to an increase in the debt-to-GDP ratio. A case in point is the Latin American debt crisis, in which industrialized countries prioritized the reduction of inflation, leading to a tightening of monetary policy, a rise in global nominal interest rates and a subsequent global recession in 1981. At the same time, commercial banks adopted measures such as shorter repayment periods and higher lending rates, making the debt burden of Latin American countries unsustainable (Sims, n.d.).

5.2.3 GDP

The short-run analyses show a statistically significant negative correlation between real GDP and the debt-to-GDP ratio. Essentially, as a country's real GDP increases, the corresponding debt-to-GDP ratio decreases, suggesting that effective debt management is more sustainable. The study also provides results for individual countries and shows that 8 out of 9 countries show a significant negative relationship in the short run. Indonesia is the exception due to the small sample size and despite the short run effect, all countries show a significant relationship in the long run. There is very little literature showing a non-significant relationship between GDP and the debt-to-GDP ratio, leading to the belief that any such cases may be due to sample size limitations rather than a lack of a genuine relationship.

Principally, this negative correlation is evidenced by the formula for the debt-to-GDP ratio, where an increase in GDP (the denominator) leads to a decrease in the ratio (Balasundharam et al., 2023). Following that, the negative correlation found in the short run is consistent with previous studies by Checherita-Westphal & Rother (2011), Oyadeyi et al. (2024) and Jacobs et al. (2020). The studies of these scholars suggest that real GDP growth play a role in the external debt to GDP ratio

and in the case of insufficient GDP growth, it may prompt calls for debt rescheduling. As suggested by Reinhart & Rogoff (2010), their study asserted that public debt is sustainable as long as it remains below 90 percent of GDP. Similarly, Islam et al. (2023) report argues for prudent management of public debt, keeping it below 60% by 2030, conditional on achieving a strong GDP growth rate of 10%. They argue that a higher GDP growth rate enhances a country's ability to properly manage and support its debt, thus justifying a GDP growth target. Furthermore, Cuddington (1997) emphasized that a country is assured of meeting its budget constraint if its debt growth rate is within the parameters of the real interest rate and the GDP growth rate, emphasising the critical role of adequate GDP in ensuring debt sustainability. Henceforth, Kofi Asravor et al. (2023) concluded that governments should prioritise increasing GDP or improving revenue generating capacity to enhance domestic debt sustainability.

As poised by Chen et al. (2024), a country's ability to service its debt is closely related to its GDP. Similar to the methodology used by institutions such as the World Bank and the IMF, they also use the 'present value constraint' approach to examine the sustainability of external debt. As explained by Carrera & Vergara (2012), this approach assesses whether the net present value (PV) of a country's external debt has stabilized, considering key factors such as GDP, exports of goods and services or government revenues. According to the Seabrooke (2006), in times of financial crisis, shrinking revenues marked by declining GDP are likely to lead to a surge in public deficits. This highlights the importance of robust revenue generation as a key determinant of maintaining debt sustainability. This is better illustrated by an examination of historical examples, notably Japan, where the debt-to-GDP ratio soared to a staggering 230 percent, and the United States, where it reached 100 percent. These historical events vividly illustrate the inherent risk of debt exceeding GDP levels as a potential catalyst for financial crises. According to the IMF, 60% of GDP is considered the critical debt level, while World Bank guidelines suggest 80-100%. Once this limit is exceeded, servicing external debt requires the allocation of resources. In addition to producing products and solutions for domestic needs, the country needs to produce products and solutions for export trade. The cautionary note embedded in these historical benchmarks shows the importance of maintaining

a balance between debt and GDP levels to avoid adversely affecting the economic stability of countries during challenging financial times. However, it is worth noting that according to the formula, if the growth of debt exceeds the growth of GDP, the overall ratio of debt to GDP rises. Thus, in the long run, this relationship may shift positively. This overall trend still points to a more sustainable fiscal trajectory, emphasizing the key role of string economic growth in shaping a country's ability to manage and reduce its debt well over the longer term.

5.2.4 Exchange Rate

The obtained results reveal an insignificantly negative relationship between exchange rate appreciation and the debt-to-GDP ratio in the short run, indicating that an increase in the value of the currency is likely to lead to a decrease in the debt-to-GDP ratio. However, the overall non-significance suggests that exchange rates might not be a key determinant of the debt-to-GDP ratio in the short run.

The insignificant results of our study are consistent with the findings of Galstyan & Velic (2017) who found that exchange rates exhibit greater persistence during periods of low public and external debt. This suggests that fluctuations in exchange rates may not have a notable impact on the debt-to-GDP ratio. Similar to our study, the six countries that exhibit a non-significant relationship do not have high levels of debt, thus yielding the insignificant study's outcomes. Notwithstanding these considerations, given our limited sample size, it is recommended to shift the focus to the study of long-term relationships due to the distinctive features of the BRI, which include extended multi-year loan repayment periods and the significant time required for countries to adapt to BRI investments.

Delving deeper into our primary focus on the long run, the results demonstrate a significantly negative relationship, aligning with the hypothesis in Chapter 2 that the ratio of debt to GDP declines as the currency appreciates. Theoretically, the public debt dynamics model developed by Mupunga & Roux (2016) explains that changes in public debt are attributed to key macroeconomic variables such as

primary balance of payments, real GDP, exchange rate and real interest rates. This amply demonstrates the important relationship between the exchange rate and the debt-to-GDP ratio. Moreover, this relationship is justified by the expenditure switching effect described by Friedman (1953), which defines the tendency of consumers and firms to adjust their expenditure patterns in response to exchange rate movements. Specifically, currency depreciation makes foreign currency debt more expensive domestically, leading to higher domestic leverage, higher borrowing costs, lower investment and economic growth, and ultimately higher debt-to-GDP ratios.

Supporting this view, E. Ahmad & Ahmed (1998), Bilquees (2003), and Chandia & Javid (2013) contend that exchange rates have a substantial impact on a country's debt burden. Sundus et al. (2022) statistically demonstrate that a 1 percent depreciation can contribute to nearly a 1.43 percent increase in debt obligations in Pakistan. This means that the prolonged depreciation of the Pakistani rupee has led to an increase in the cost of borrowing and an increase in the value of external debt in local currency terms, thus adding to the country's public debt burden. To a greater extent, Carrera & Vergara (2012) further assert that exchange rate movements not only affect the value of foreign currency-denominated debt, but also affect interest rates and economic growth. Devaluation leads to higher interest rates, lower GDP growth and changes in the underlying balance of payments trajectory required for fiscal sustainability. It can therefore be inferred that exchange rates do have a significant impact on the debt-to-GDP ratio in the long run.

In summary, the short-run relationship between exchange rates and the debt-to-GDP ratio may not be statistically significant for reference, but a comprehensive analysis of the long-run dynamics reveals a significant and inverse relationship, which is consistent with established economic theories and supported by empirical findings in the literature.

5.2.5 BRI

Based on the results of this study, BRI investment shows a negative and insignificant correlation with the debt-to-GDP ratio in the short run. This suggests that an increase in BRI investments leads to a decrease in the debt-to-GDP ratio, thereby enhancing debt sustainability. However, the lack of significance in this relationship reveals that BRI investment is not the primary driver of the decrease in the debt-to-GDP ratio for BRI recipient countries in the short run. This finding is supported by the individual country analyses, where Singapore, Thailand, and South Korea also exhibit an insignificant negative relationship between BRI and the debt-to-GDP ratio in the short run. These results align with the Neoclassical Growth Theory where foreign investment is viewed as a catalyst for economic expansion, potentially enhancing a nation's debt sustainability by fostering growth (Yue et al., 2016). Also, it is consistent with the findings from studies carried out by Twillert & Vega (2023), Della Posta (2023), Alex (2020), and Warner (2014, as cited in Hurley et al., 2019). For instance, Twillert & Vega (2023) research indicates that BRI investment may stimulate economic growth and outweigh the initial BRI investment, especially in the short run. This could be attributed to the efficiency and effectiveness of BRI investment project selection and debt structure composition. However, the short-term positive association between BRI investment and economic growth is extremely weak, with insignificant lagged impacts (Warner, 2014, as cited in Hurley et al., 2019). This weakness mainly stems from the fact that in the short run, the returns on investment remain modest compared to the costs of debt. Also, the economics of large-scale investments may take time to fully materialize, thereby exerting limited influence on economic expansion and debt sustainability efforts. Despite its limited influence, BRI investment remains a positive indicator for respective countries as it decreases the debt-to-GDP ratio.

While the overall analysis performs insignificantly negative relationship between BRI investment and the debt-to-GDP ratio, there are some exceptions among individual countries due to their distinct features in term of strategies, culture, policies, and unique circumstances. For instance, in the short run, countries like Indonesia, the Philippines, and Vietnam exhibit an insignificantly positive relationship with the debt-to-GDP ratio. This implies that an increase in BRI

investment leads to a corresponding increase in the debt-to-GDP ratio, heightening the risk of debt trap. Although these findings diverge from previous analyses of BRI impacts in the short run, they underscore that BRI investment remains not the primary driver for surges of debt-to-GDP ratio in the short term. However, the finding of positive relationship is consistent with the studies of Alex (2020), Carmody et al. (2022), HuBandiera & Tsiropoulos (2020). For instance, according to World Bank (2019) , BRI investment serves as a hindrance to economic expansion by leading to higher indebtedness in most countries' economies. It increases the debt-to-GDP ratio particularly when government borrowing fails to align with sufficient economic growth and revenue generation to service the debt effectively (Hurley et al., 2019). Apart from that, the studies conducted by Carmody et al. (2022) further indicates that weak political decision-making and project selection can lead to an insignificant positive influence of BRI investment on the debt-to-GDP ratio. This is proven in the case of Kenya where the government opted to borrow semi-concessional and commercial loan from China to initiate the Mombasa Nairobi Standard Gauge Railway (SGR) construction, disregarding the low projected demand and the more economical alternative of refurbishing the existing metre gauge network which would have been sufficient. This wrong decision increased Kenya's debt service payments in the short term and burdening them from the BRI investment. In short, while BRI investment may perform a positive relationship with the debt-to-GDP ratio in certain BRI recipient countries due to various reasons, it remains not the primary factors that affect the debt-to-GDP ratio in the short term.

The findings above indicate that 6 out of 9 individual countries exhibit an insignificant relationship between BRI investment and the debt-to-GDP ratio in the short term. However, three countries, Bangladesh, Malaysia and Nepal, stand out with significance relationship between the BRI investment and debt-to-GDP ratio. To quote Bangladesh and Malaysia as instance, they demonstrate a significantly positive relationship, suggesting that an increase in BRI investment leads to a higher debt-to-GDP ratio. This finding aligns with studies by Alex (2020), which claimed that China investment in BRI projects will further intensify the debt accumulation in short term. This is mainly due to the reason that the asymmetric structure between

the China's vast economy and the smaller economies of most of BRI recipient countries renders the latter vulnerable to debt distress. For instance, Sri Lanka and Djibouti with annual GDP circa US$1.8 billion struggle to absorb significant China BRI investment within a short timeframe, thereby having the issue of debt profile deteriorated dramatically (Carmody et al., 2022). On the other hand, countries like Nepal show a significant negative relationship between the BRI investment and the debt-to-GDP ratio in the short run. This finding is aligned with the studies by Bandiera & Tsiropoulos (2020), which suggest that infrastructure investment can spur job creation and growth in the local economies in short and medium term. This can be supported by the case in Ethiopia, where rapid economic growth has been largely attributed to a substantial public investment program financed through loans and other credit instruments. Moreover, factors such as optimized resource utilization, increased productivity, improved product selection may also contribute to the significant negative relationship.

When considering the long-term perspective, all nine BRI recipient countries exhibit a significant negative relationship with the debt-to-GDP ratio. This significance emerges as the effects of BRI investments begin to manifest. For instance, the impact of BRI investments on trade agreements and infrastructure development, such as railways and ports, becomes more pronounced and generates sufficient returns on investment to offset debt costs, thereby stimulate economic growth in recipient countries (Twillert & Vega, 2023). Also, Bandiera & Tsiropoulos (2020) further reveal that the BRI investment will significantly enhance debt sustainability by improving countries' productivity through physical infrastructure and improved connectivity. This finding aligns with China's BRI goals, aimed at addressing infrastructure gap and achieving five principles of cooperation such as policy coordination, facilities connectivity, unimpeded trade, financial integration, and cultural exchange. In summary, the BRI investment is beneficial for all BRI recipient countries in this research for long run. However, it may take time for these benefits to fully materialize.

5.3 Implication of Study

This study presents distinctive insights compared to prior research, demonstrating that, in the short term, China's BRI investment insignificantly affects the general government gross debt of the nine Asia BRI recipient countries. However, the results further reveal that in the long run, it has a significant negative relationship with those BRI recipient countries' general government gross debt. This implies that an increase in BRI investment will leads to a decrease in general government gross debt and an increase of debt sustainability. Consequently, this section will discuss the implications regarding how policymakers, investors and academic researchers could utilize this finding in their strategies planning and analysis.

5.3.1 Policymakers

As policymakers of the nine BRI recipient countries receive China's BRI investment primarily to develop their countries and not for the purpose of falling into indebtedness, it is essential for them to have a significant and up-to-date model to know the impact of BRI investment on their country's debt level. According to the findings in this study, it is clearly presented that the China's BRI investment has a significant negative relationship to the general government gross debt of the nine BRI recipient countries in long run. This result is a new and outstanding finding, as it indicates that BRI investment positively affects the debt-to-GDP ratio of Asia BRI recipients, markedly different from findings in low-income countries where the BRI leads to higher debt issues. In fact, the BRI's investment is mainly functions to stimulate the GDP growth of Asia BRI recipient countries rather than the debt accumulation, which is beneficial for their economic expansion and debt sustainability.

In this regard, policymaker of these BRI recipient countries can formulate more appropriate policies and strategies for managing their debt sustainability, especially on maximizing their benefits associated with BRI involvement. For example, they should prioritize establishing a supportive environment to attract and effectively

utilize the BRI investment to drive sustainable economic development. This may include implementing transparent and accountable governance mechanisms to ensure that BRI funds are allocated efficiently and directed towards projects with huge socio-economic benefits. In addition, policymakers should also actively engage in communications and negotiation with China to secure a more favourable investment terms in order to mitigate the potential risk associated with high debt accumulation. By strategically leverage this finding, the policymakers have high possibility to generate positive impact on their countries in the long run especially on address infrastructure gap and enhance debt sustainability. More importantly, these findings may provide confidence for each country's government to accept the BRI investment and call for greater international cooperation among them with China.

5.3.2 Investors

The research findings carry significant implication for both domestic and international investors. For domestic investors operating within the BRI recipient countries, these findings provide them with more confidence and courage to engage in the local business environment. This is because they recognise that China BRI investment mainly served as a catalyst for country's sustainable economic growth, which is beneficial to their investment and operation. In line with this, they will be more willing to explore local partnership and investment opportunities, especially towards those companies involved in BRI projects as it contributes to local development and possesses huge growth opportunities. For international investors, these findings demonstrate substantial strategic investment opportunities in BRI recipient countries as investors start to acknowledge the improvement of country's debt sustainability alongside the rise in BRI investment. In light of this, the international investors can leverage these insights to identify investment opportunities, especially in infrastructure development, energy, information and communication sectors. Moreover, these findings provide both domestic and international investors with a clearer understanding of risk exposure, making them

more willing to engage in impact investing and responsible investing practices that support national development goals.

5.3.3 Academic Researchers

There are limited studies conducted by previous researchers on investigate the relationship between China's BRI investments and debt sustainability on Asia's BRI recipient countries. Our study addresses the gap and reveals a new finding regarding the correlation between increased BRI investments and improved debt sustainability, which markedly different from studies conducted in low-income BRI recipient countries. In line with this, future academic researchers could use it as a reference point and expand their investigation based on this paper. For instance, they can delve deeper to include more BRI recipient countries or explore other relevant factors such as country's investment allocation strategies and governance frameworks. For more advance, they may investigate the underlying mechanisms of these trends to provide valuable insights to policy discourse and aid policymakers in designing more effective strategies for sustainable development within the BRI framework.

5.4 Limitation of Study

5.4.1 Lack of Data

The primary challenge our study faced was the inability to access sufficiently comprehensive and up-to-date data due to limitations in data availability. Despite efforts to gather data from reputable sources such as the World Bank, Refinitiv, and IMF, we encountered significant limitations due to incomplete publicly available data. Certain variables had missing data, necessitating their exclusion from our analysis. Specifically, missing data towards the end of our study period prevented effective interpolation methods from addressing these gaps, ultimately impacting the scope and depth of our study. To address this issue, we focused our analysis on

nine countries with comprehensive and comparable data. However, it is important to note that each country has its own unique cultural, economic, and regulatory characteristics, limiting the generalizability of our findings beyond this sample. Therefore, our report should be considered as a reference for these nine countries only, as the results may not fully represent all BRI recipient countries.

In addition, our study aims to assess the real-time impact of the Belt and Road Initiative on debt sustainability. Nonetheless, the ongoing and evolving nature of this initiative adds to the complexity, making it impossible to conclude whether the Belt and Road Initiative poses a threat to public debt or promotes economic growth based on current data alone. Over time, the level of proficiency of countries in managing the impact of this major investment on debt sustainability is likely to vary, necessitating a nuanced understanding of how different countries have responded to the challenges posed by the BRI in subsequent years.

Furthermore, the initial dependent variable in this study is external debt, which was chosen because it accurately reflects government borrowing from other countries. Unfortunately, extensive external debt data spanning 20 years are not accessible for numerous countries. Therefore, we chose a more encompassing dependent variable, general government debt, to overcome the data limitation.

5.4.2 Inadequate Access to Software Resources

As part of our research methodology, we aimed to perform a Hausman test to determine whether the Pooled Mean Group or Mean Group approach was more appropriate for our study. However, we encountered a limitation in using the EViews 10.0 software as it only supports the Hausman test for Ordinary Least Squares (OLS) regression models. Since our model uses a different PMG method than OLS, we were unable to perform the Hausman test in that version of the software. Therefore, we were unable to directly assess the relative appropriateness of the PMG method and the mean group method using the Hausman test function in the current software version.

5.5 Recommendation for Future Research

This section comprises some suggestions for overcoming the constrains and gaining a more thorough comprehension of the research topic. Firstly, it is recommended that future researchers should maximize efforts to access and compile more up-to-date data, so that a more accurate assessment for BRI topic can be conducted. For illustrate, future researchers may meticulously explore all available online sources, especially official websites, to obtain the highest suitability and reliability data. In cases where data remains insufficient, they could consider utilizing alternative variables that mitigate data limitations and enable a more comprehensive analysis. Apart of that, future studies may explore the possibility of establishing collaborative partnerships with relevant parties such as Non-government organisations (NGOs), government agencies and various research institutions to gain access to the latest datasets. By leveraging such partnerships, the future researchers can expand the scope of their studies beyond the nine countries studied in this report. Any new findings obtained can also be used to provide valuable insights to assist relevant parties in their decision making processes.

Secondly, it is recommended that future researchers with improved resource accessibility consider employing advanced software tools such as Eviews 13 or other high-level alternatives which can accommodate tests like Hausman test even with relatively small sample size. This step is essential for achieving enhanced accuracy and increased robustness in their findings. Moreover, future research should explore potential collaboration with organizations or research institution offering access to the latest software versions to overcome limitation of inadequate access to software. Through these measures, future researchers can enhance the precision of their analyses, thus making significant contributions to advancements in their respective fields especially the BRI topics.

5.6 Conclusion

This study investigates the impact of BRI investment on the debt-to-GDP ratio and debt sustainability of nine Asia BRI recipient countries. In the short run, BRI investment shows an insignificant relationship with the debt-to-GDP ratio in most BRI recipient countries in this research, except for Bangladesh and Nepal, which exhibit a significant relationship. However, in the long run, all nine countries demonstrated a significant negative relationship between BRI investment and debt-to-GDP ratio, suggesting that an increase in BRI investment leads to corresponding drop in debt-to-GDP ratio, thus enhancing debt sustainability. These findings address a research gap and provides valuable insights to relevant parties such as policymakers, investors and future researchers for informed decision making process.

REFERENCES

Adrain, P., & Prachi, M. (2023). *How to Tackle Soaring Public Debt*. International Monetary Fund. https://www.imf.org/en/Blogs/Articles/2023/04/10/how-to-tackle-soaring-public-debt

Ahmad, E., & Ahmed, A. (1998). A simulation analysis of the debt problem in pakistan. *The Pakistan Development Review*. http://www.jstor.org/stable/41261061

Aizenman, J., & Marion, N. (2011). Using inflation to erode the US public debt. *Journal of Macroeconomics*, *33*(4). https://doi.org/10.1016/j.jmacro.2011.09.001

Alex, H. (2020). The Belt and Road Initiative: Motivations, Financing, Expansion and Challenges of Xi's Ever-expanding Strategy. *Journal of Infrastructure, Policy and Development*, *4*(1), 139–169. https://doi.org/10.24294/jipd.v4i1.1180

Al-Fadhat, F., & Prasetio, H. (2022). How China's Debt-Trap Diplomacy Works in African Countries: Evidence from Zimbabwe, Cameroon, and Djibouti. *Journal of Asian and African Studies*, 00219096221137673. https://doi.org/10.1177/00219096221137673

Ando, S., Asonuma, T., Sollaci, A. B., Ganelli, G., Mishra, P., Patel, N., Alva, A. P., & Presbitero, A. (2023). Coming down to earth: how to tackle soaring public debt. *IMF World Economic Outlook, April*.

Ashraf, J., Luo, L., & Anser, M. K. (2022). Do BRI policy and institutional quality influence economic growth and environmental quality? An empirical analysis from South Asian countries affiliated with the Belt and Road Initiative. *Environmental Science and Pollution Research*, *29*(6), 8438–8451. https://doi.org/10.1007/s11356-021-16330-y

Assibey-Yeboah, M., & Mohsin, M. (2014). The real effects of inflation in a developing economy with external debt and sovereign risk. *North American Journal of Economics and Finance, 30*. https://doi.org/10.1016/j.najef.2014.07.004

Balasundharam, V., Basdevant, O., Benicio, D., Ceber, A., Kim, Y., Mazzone, L., Selim, H., & Yang, Y. (2023). *Fiscal consolidation: Taking stock of success factors, impact, and design*. International Monetary Fund.

Bandiera, L., & Tsiropoulos, V. (2020). A Framework to Assess Debt Sustainability under the Belt and Road Initiative. *Journal of Development Economics, 146*. https://doi.org/10.1016/j.jdeveco.2020.102495

Bilquees, F. (2003). An analysis of budget deficits, debt accumulation, and debt instability. *The Pakistan Development Review*. http://www.jstor.org/stable/41260539

Brkić, M. (2021). Costs and benefits of government borrowing in foreign currency: is it a major source of risk for EU member states outside the Euro? *Public Sector Economics*, *45*(1), 63–91. https://doi.org/10.3326/pse.45.1.2

Budina, N., & Van Wijnbergen, S. (2008). Quantitative approaches to fiscal sustainability analysis: a case study of turkey since the crisis of 2001. *The World Bank Economic Review*, *23*(1), 119–140. https://doi.org/10.1093/wber/lhn011

Cahyadin, M. (2021). External Debt Sustainability in Selected ASEAN Countries: Do Macroeconomic Data and Institutions Matter? *Jurnal Ekonomi Kuantitatif Terapan*, *14*, 1–241. https://doi.org/10.24843/JEKT.2021.v14.i01.p03

Carmody, P., Taylor, I., & Zajontz, T. (2022). China's spatial fix and 'debt diplomacy' in Africa: constraining belt or road to economic transformation? *Canadian Journal of African Studies / Revue Canadienne Des Études Africaines*, *56*(1), 57–77. https://doi.org/10.1080/00083968.2020.1868014

Carrera, C. M., & Vergara, R. (2012). Fiscal Sustainability: The impact of real exchange rate shocks on debt valuation, interest rates and GDP growth. *World Development*, *40*(9), 1762–1783. https://doi.org/https://doi.org/10.1016/j.worlddev.2012.04.024

Celasun, O., Debrun, X., & Ostry, J. D. (2006). *Primary Surplus Behavior and Risks to Fiscal Sustainability in Emerging Market Countries: A "Fan-Chart" Approach* . International Monetary Fund. https://www.imf.org/external/pubs/ft/wp/2006/wp0667.pdf

Chandia, K. E., & Javid, A. Y. (2013). An analysis of debt sustainability in the economy of pakistan. *Procedia Economics and Finance*, *5*, 133–142. https://doi.org/https://doi.org/10.1016/S2212-5671(13)00019-1

Chandia, K. E., Riaz, S., Javid, A. Y., Iqbal, M. B., Azam, M., & Gul, I. (2019). Assessment of Public and External Debt Sustainability Using Debt Dynamics Equation Approach: A Comparative Study of Pakistan and India. *Millennial Asia*, *10*(1). https://doi.org/10.1177/0976399619825688

Checherita-Westphal, C. (2019). Interest rate-growth differential and government debt dynamics. *European Central Bank*. https://www.ecb.europa.eu/pub/economic-bulletin/focus/2019/html/ecb.ebbox201902_06~0c96ee6f7c.en.html

Checherita-Westphal, C., & Rother, P. (2011). The impact of government debt on growth. An empirical investigation for the euro area. *Revue Économique, Presses de Sciences-Po*, *62(6)*, 1015–1029. https://ideas.repec.org/a/cai/recosp/reco_626_1015.html

Chen, J. (2023, February 28). *Debt: What it is, How it works, Types, and Ways to Pay Back*. Investopedia. https://www.investopedia.com/terms/d/debt.asp#:~:text=to%20raise%20capital.-,How%20Debt%20Works,or%20years%20in%20the%20future.

Chen, Q., Kumar, P., Dipesh, & Baskonus, H. M. (2024). On the equilibrium point and Hopf-Bifurcation analysis of GDP-national debt dynamics under the delayed external investment: A new DDE model. *Alexandria Engineering Journal*, *91*, 510–515. https://doi.org/https://doi.org/10.1016/j.aej.2024.02.022

Cochrane, J. H. (2011). Inflation and debt. *National Affairs*, *9*(2), 56–78.

Cuddington, J. T. (1997). Analyzing the sustainability of fiscal deficits in developing countries. *Available at SSRN 597231*.

Dalia, H. (2020). *Back to Basics: What is Debt Sustainability? – IMF F&D*. https://www.imf.org/en/Publications/fandd/issues/2020/09/what-is-debt-sustainability-basics

Della Posta, P. (2023). The Belt and Road Initiative: Inclusive Globalization and Poverty Reduction. *Global Journal of Emerging Market Economies*, *15*(2), 273–288. https://doi.org/10.1177/09749101231167448

Development Finance International. (n.d.). *Debt sustainability*. DFI. Retrieved March 16, 2024, from https://www.development-finance.org/en/topics-of-work/debt-strategy-information/debt-sustainability#:~:text=Debt%20%22sustainability%22%20is%20often%20defined,debt%20relief%20or%20accumulating%20arrears.

Doraisami, A. (2011). The global financial crisis: countercyclical fiscal policy issues and challenges in Malaysia, Indonesia, the Philippines, and Singapore. *Asian Development Bank Institute*.

Escolano, J. (2010). *A practical guide to public debt dynamics, fiscal sustainability, and cyclical adjustment of budgetary aggregates* (Vol. 2). International Monetary Fund Washington, DC.

European Bank. (n.d.). *Belt and Road Initiative (BRI)*. Retrieved March 11, 2024, from https://www.ebrd.com/what-we-do/belt-and-road/overview.html

Fischer, S., & Easterly, W. (1990). *The economics of the government busget constraint*. https://documents1.worldbank.org/curated/ar/362551468150565949/pdf/769990JRN0WBRO0Box0377291B00PUBLIC0.pdf

Friedman, M. (1953). Essays in positive economics. *University of Chicago Press*.

Fukunaga, I., Komatsuzaki, T., & Matsuoka, H. (2022). Inflation and public debt reversals in advanced economies. *Contemporary Economic Policy*, *40*(1). https://doi.org/10.1111/coep.12537

Galstyan, V., & Velic, A. (2017). Debt thresholds and real exchange rates: An emerging markets perspective. *Journal of International Money and Finance*, *70*, 452–470. https://doi.org/https://doi.org/10.1016/j.jimonfin.2016.06.012

Garcia-Macia, D. (2023). *The effects of of inflation on public finances*.

Georgescu, G. (2014). Public debt, Sovereign Risk and Sustainable Development of Romania. *Procedia Economics and Finance*, *8*. https://doi.org/10.1016/s2212-5671(14)00101-4

Ghasemi, A., & Zahediasl, S. (2012). Normality tests for statistical analysis: a guide for non-statisticians. *International Journal of Endocrinology and Metabolism*, *10*(2), 486.

Gogtay, N. J., & Thatte, U. M. (2017). Principles of Correlation Analysis. In *Journal of The Association of Physicians of India* ■ (Vol. 65).

Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics*. McGraw-hill.

Hakura, D. (2020, September 1). *What is Debt Sustainability?* IMF. https://www.imf.org/en/Publications/fandd/issues/2020/09/what-is-debt-sustainability-basics

Hayes, A. (2022). *Fisher Effect Definition and Relationship to Inflation*. Investopedia. https://www.investopedia.com/terms/f/fishereffect.asp

Hayes, A. (2023). *Multicollinearity: Meaning, Examples, and FAQs*. https://www.investopedia.com/terms/m/multicollinearity.asp

Hodula, M., & Meleck ý, A. (2020). Debt management when monetary and fiscal policies clash: some empirical evidence. *Journal of Applied Economics*, *23*(1). https://doi.org/10.1080/15140326.2020.1750120

Hurley, J., Morris, S., & Portelance, G. (2019). Examining the debt implications of the Belt and Road Initiative from a policy perspective. *Journal of Infrastructure, Policy and Development*, *3*(1), 139–175.

Hyndman, R. J., & Athanasopoulos, G. (2018). *Forecasting: principles and practice*. OTexts.

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, *115*(1), 53–74. https://doi.org/https://doi.org/10.1016/S0304-4076(03)00092-7

International Monetary Fund. (2020). *The evolution of public debt vulnerabilities in lower income economies*. IMF and World Bank . https://www.imf.org/en/Publications/Policy-Papers/Issues/2020/02/05/The-Evolution-of-Public-Debt-Vulnerabilities-In-Lower-Income-Economies-49018

Islam, W., Ahmed, J., & Faraz, N. (2023). To borrow or not to borrow: Empirical evidence from the public debt sustainability of Pakistan. *ADBI Working Paper, No. 1354*.

Iz åk, V. (2009). Primary balance, public debt and fiscal variables in postsocialist members of the european union. *Prague Economic Papers*, *18*(2), 114–130.

Jacobs, J., Ogawa, K., Sterken, E., & Tokutsu, I. (2020). Public Debt, Economic Growth and the Real Interest Rate: A Panel VAR Approach to EU and OECD Countries. *Applied Economics*, *52*(12), 1377–1394. https://doi.org/10.1080/00036846.2019.1673301

Jost, A., & Alice, Z. (2018). *Briefing papers: "Debt Sustainability Assessment: the State of the Art."*

Kapetanios, G., Pesaran, M. H., & Yamagata, T. (2011). Panels with non-stationary multifactor error structures. *Journal of Econometrics*, *160*(2), 326–348. https://doi.org/https://doi.org/10.1016/j.jeconom.2010.10.001

Keya, R. Das, & Imon, A. H. M. R. (2016). A Brief Review of Tests for Normality. *American Journal of Theoretical and Applied Statistics*, *5*(1), 5. https://doi.org/10.11648/j.ajtas.20160501.12

Khatun, F. (2012). *State of governance in the banking sector dealing with the recent shocks*.

Klima, K. (2021). *Connect, Learn, and Share | The GoodData Community*. https://community.gooddata.com/metrics-and-maql-kb-articles-43/normality-testingskewness-and-kurtosis-24

Kofi Asravor, R., Akosua Arthur, L., Acheampong, V., Lamptey, C., & Yeboah, M. (2023). Domestic debt sustainability and economic growth: Evidence from Ghana. *Research in Globalization*, *7*, 100144. https://doi.org/10.1016/j.resglo.2023.100144

Kwak, S. G., & Kim, J. H. (2017). Central limit theorem: the cornerstone of modern statistics. *Korean Journal of Anesthesiology*, *70*(2), 144. https://doi.org/10.4097/kjae.2017.70.2.144

Lankester-Campos, V., Loaiza-Mar ń, K., & Monge-Badilla, C. (2020). Assessing public debt sustainability for Costa Rica using the fiscal reaction function. *Latin American Journal of Central Banking*, *1*(1), 100014. https://doi.org/https://doi.org/10.1016/j.latcb.2020.100014

Levin, A., Lin, C.-F., & James Chu, C.-S. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics*, *108*(1), 1–24. https://doi.org/https://doi.org/10.1016/S0304-4076(01)00098-7

Lu, X., & White, H. (2014). Robustness checks and robustness tests in applied economics. *Journal of Econometrics*, *178*, 194–206. https://doi.org/https://doi.org/10.1016/j.jeconom.2013.08.016

Micskei, Z., Madeira, H., Avritzer, A., Majzik, I., Vieira, M., & Antunes, N. (2012). Robustness Testing Techniques and Tools. In K. Wolter, A. Avritzer, M. Vieira, & A. van Moorsel (Eds.), *Resilience Assessment and Evaluation of Computing Systems* (pp. 323–339). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-29032-9_16

Mupunga, N., & Roux, P. Le. (2016). Analysing the Theoretical and Empirical Foundations of Public Debt Dynamics in Zimbabwe. *Studies in Economics and Econometrics*, *40*(1), 95–118. https://doi.org/10.1080/10800379.2016.12097293

Neaime, S. (2015). Twin deficits and the sustainability of public debt and exchange rate policies in Lebanon. *Research in International Business and Finance*, *33*. https://doi.org/10.1016/j.ribaf.2014.09.004

Nedopil, C. (2023). *China Belt and Road Initiative (BRI) Investment Report 2023*. https://greenfdc.org/wp-content/uploads/2023/07/Nedopil-2023_China-Belt-and-Road-Initiative-BRI-Investment-Report-2023-H1-1.pdf

OECD. (n.d.). *General government debt*. https://data.oecd.org/gga/general-government-debt.htm

OECD. (2018). *The Belt and Road Initiative in the global trade, investment and finance landscape*. 61–101. https://doi.org/10.1787/BUS_FIN_OUT-2018-6-EN

Ogbeifun, L., & Shobande, O. (2020). Debt sustainability and the fiscal reaction function: evidence from MIST countries. *Future Business Journal*, *6*(1), 33. https://doi.org/10.1186/s43093-020-00037-6

O'Neill, R., Ralph, J., & Smith, P. A. (2017). *What is inflation?* Springer International Publishing .

Owusu, B., Bökemeier, B., & Greiner, A. (2023). Regime-based debt sustainability analysis: Evidence from euro area economies. *European Journal of Political Economy*. https://doi.org/10.1016/j.ejpoleco.2023.102458

Oyadeyi, O. O., Agboola, O. W., Okunade, S. O., & Osinubi, T. T. (2024). The debt-growth nexus and debt sustainability in Nigeria: Are there reasons to be concerned? *Journal of Policy Modeling*, *46*(1), 129–152.

Perkis, D. F. (2020). Making sense of private debt. *Page One Economics®*.

Pesaran, M. H., & Shin, Y. (1999). *An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis* (pp. 371–413). Cambridge University Press. https://pure.york.ac.uk/portal/en/publications/an-autoregressive-distributed-lag-modelling-approach-to-cointegra

Reinhart, C. M. (2002). Default, currency crises, and sovereign credit ratings. *World Bank Economic Review*, *16*(2). https://doi.org/10.1093/wber/16.2.151

Reinhart, C. M., & Rogoff, K. S. (2010). Growth in a time of debt. *American Economic Review*, *100*, 573–578. https://www.aeaweb.org/articles?id=10.1257/aer.100.2.573

Reinhart, Carmen. M., & Sbrancia, M. Belen. (2015). *The liquidation of government debt*. *30*, 291–333. https://www.imf.org/external/pubs/ft/wp/2015/wp1507.pdf

Roshandel, M. R. (2022). *Can we do regression analysis with non normal data distribution? | ResearchGate*. https://www.researchgate.net/post/Can_we_do_regression_analysis_with_non_normal_data_distribution

Saheed, Z. S., Sani, I. E., & Idakwoji, B. O. (2015). Impact of Public External Debt on Exchange Rate in Nigeria. *International Finance and Banking*, *2*(1). https://doi.org/10.5296/ifb.v2i1.7734

Seabrooke, L. (2006). The Bank for International Settlements. *New Political Economy*, *11*(1), 141–149. https://doi.org/10.1080/13563460500494982

Senthilnathan, S. (2019). Usefulness of Correlation Analysis. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3416918

Sims, J. (n.d.). Latin American debt crisis of the 1980s. *Federal Reserve.* Retrieved March 16, 2024, from https://www.federalreservehistory.org/essays/latin-american-debt-crisis#:~:text=Nominal%20interest%20rates%20rose%20globally,and%20French%2DDavis%201995).

Sufian, J. (2018). The Impact of BRI on Trade and Investment in ASEAN. *CIMB Southeast Asia Research Sdn Bhd (CARI) 13th Floor, Menara CIMB, Jalan Stesen Sentral*, *2*. https://www.lse.ac.uk/ideas/Assets/Documents/reports/LSE-IDEAS-China-SEA-BRI.pdf

Sundus, Naveed, S., & Islam, T. U. (2022). An empirical investigation of determinants & sustainability of public debt in Pakistan. *Plos One*, *17*(9), e0275266.

Tanner, E., & Samake, I. (2008). Probabilistic sustainability of public debt: a vector autoregression approach for Brazil, Mexico, and Turkey. . *Palgrave Macmillan Journals*, *66*, 149–182. https://www.jstor.org/stable/30035940

The Economist. (2022, August 25). *How China should handle its bad loans to poor countries*. https://www.economist.com/leaders/2022/08/25/how-china-should-handle-its-bad-loans-to-poor-countries?utm_medium=cpc.adword.pd&utm_source=google&utm_campaign=a.24apt_apac_intropricing&utm_content=conversion.non-brand.anonymous.apac_my_en_intro-pricing_na_non-brand_google_subs_pmax_other_na_na&gad_source=1&gclid=CjwKCAjw17qvBhBrEiwA1rU9w1jGCdBKhNcod9o0pgtZILehv7DQnwwztplQ7xoNK3KRCwV-8VglMxoCTgYQAvD_BwE&gclsrc=aw.ds

Togan Eğrican, A., Caner, S., & Togan, S. (2022). Reforming public debt governance in Turkey to reach debt sustainability. *Journal of Policy Modeling*, *44*(5). https://doi.org/10.1016/j.jpolmod.2022.07.004

Twillert, V. T., & Vega, S. H. (2023). Risk or opportunity? The Belt and Road Initiative and the role of debt in the China-Central Asia-West Asia Economic Corridor. *Eurasian Geography and Economics*, *64*(3), 365–377. https://doi.org/10.1080/15387216.2021.2012816

Wang, E., Liu, X., Wu, J., & Cai, D. (2019). Green Credit, Debt Maturity, and Corporate Investment—Evidence from China. *Sustainability*, *11*(3). https://doi.org/10.3390/su11030583

World Bank. (2019). *Belt and Road Economics: Opportunities and Risks of Transport Corridors*. https://www.worldbank.org/en/topic/regional-integration/publication/belt-and-road-economics-opportunities-and-risks-of-transport-corridors

Yue, S., Yang, Y., & Hu, Y. (2016). Does Foreign Direct Investment Affect Green Growth? Evidence from China's Experience. *Sustainability*, *8*(2). https://doi.org/10.3390/su8020158

APPENDICES

Appendix 4.1: E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – Level & Trend and Intercept for D01 (Debt-to-GDP ratio)

Panel Unit Root Test on D01

Panel unit root test: Summary
Series: D01
Date: 03/07/24 Time: 15:48
Sample: 2003 2022
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.83392	0.7978	9	162
Breitung t-stat	4.66750	1.0000	9	153
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	2.92879	0.9983	9	162
ADF - Fisher Chi-square	9.54064	0.9459	9	162
PP - Fisher Chi-square	7.32522	0.9871	9	171

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4.2: E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – 1st Difference & Trend and Intercept for D01 (Debt-to-GDP ratio)

Panel Unit Root Test on D(D01)

Panel unit root test: Summary
Series: D(D01)
Date: 03/07/24 Time: 15:49
Sample: 2003 2022
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.85136	0.0000	9	153
Breitung t-stat	-2.46625	0.0068	9	144
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.41649	0.0003	9	153
ADF - Fisher Chi-square	42.1716	0.0010	9	153
PP - Fisher Chi-square	66.3756	0.0000	9	162

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4.3: E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – Level & Trend and Intercept for PB (Primary Balance)

Panel Unit Root Test on PB

Panel unit root test: Summary
Series: PB
Date: 03/07/24 Time: 15:50
Sample: 2003 2022
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.33261	0.0098	9	162
Breitung t-stat	-0.52571	0.2995	9	153
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.81699	0.2070	9	162
ADF - Fisher Chi-square	23.2953	0.1795	9	162
PP - Fisher Chi-square	34.5685	0.0107	9	171

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4.4: E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – 1st Difference & Trend and Intercept for PB (Primary Balance)

Panel Unit Root Test on D(PB)

Panel unit root test: Summary
Series: D(PB)
Date: 03/07/24 Time: 15:50
Sample: 2003 2022
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.72976	0.0000	9	153
Breitung t-stat	-1.59145	0.0558	9	144
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.81033	0.0000	9	153
ADF - Fisher Chi-square	54.7192	0.0000	9	153
PP - Fisher Chi-square	134.136	0.0000	9	162

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

SAppendix 4.5: E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – Level & Trend and Intercept for I (Inflation)

Panel Unit Root Test on I

Panel unit root test: Summary
Series: I
Date: 03/07/24 Time: 15:50
Sample: 2003 2022
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.11544	0.4540	9	162
Breitung t-stat	0.86240	0.8058	9	153
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.77489	0.0380	9	162
ADF - Fisher Chi-square	28.2599	0.0582	9	162
PP - Fisher Chi-square	49.3789	0.0001	9	171

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4.6: E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – 1st Difference & Trend and Intercept for I (Inflation)

Panel Unit Root Test on D(I)

Panel unit root test: Summary
Series: D(I)
Date: 03/07/24 Time: 15:51
Sample: 2003 2022
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.82011	0.0000	9	153
Breitung t-stat	-1.42504	0.0771	9	144
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.89608	0.0000	9	153
ADF - Fisher Chi-square	75.6287	0.0000	9	153
PP - Fisher Chi-square	161.644	0.0000	9	162

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4.7: E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – Level & Trend and Intercept for G (GDP)

Panel Unit Root Test on G

Panel unit root test: Summary
Series: G
Date: 03/07/24 Time: 15:51
Sample: 2003 2022
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-8.88616	0.0000	9	162
Breitung t-stat	-2.36549	0.0090	9	153
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.68139	0.0000	9	162
ADF - Fisher Chi-square	73.4563	0.0000	9	162
PP - Fisher Chi-square	141.211	0.0000	9	171

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4.8: E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – 1st Difference & Trend and Intercept for G (GDP)

Panel Unit Root Test on D(G)

Panel unit root test: Summary
Series: D(G)
Date: 03/07/24 Time: 15:52
Sample: 2003 2022
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.52970	0.0000	9	153
Breitung t-stat	2.04663	0.9797	9	144
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-8.35567	0.0000	9	153
ADF - Fisher Chi-square	90.1851	0.0000	9	153
PP - Fisher Chi-square	163.281	0.0000	9	162

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4.9: E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – Level & Trend and Intercept for ER (Exchange Rate)

Panel Unit Root Test on ER

Panel unit root test: Summary
Series: ER
Date: 03/07/24 Time: 15:52
Sample: 2003 2022
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.59006	0.2776	9	162
Breitung t-stat	0.89772	0.8153	9	153
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.35234	0.3623	9	162
ADF - Fisher Chi-square	17.8869	0.4631	9	162
PP - Fisher Chi-square	13.7607	0.7446	9	171

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4.10: E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – 1st Difference & Trend and Intercept for ER (Exchange Rate)

Panel Unit Root Test on D(ER)

Panel unit root test: Summary
Series: D(ER)
Date: 03/07/24 Time: 15:53
Sample: 2003 2022
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.78142	0.0000	9	153
Breitung t-stat	-1.31456	0.0943	9	144
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.17368	0.0008	9	153
ADF - Fisher Chi-square	38.7289	0.0031	9	153
PP - Fisher Chi-square	83.9660	0.0000	9	162

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4.11: E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – Level & Trend and Intercept for BRI_FDI (Belt-road Initiatives Investment)

Panel Unit Root Test on BRI_FDI

Panel unit root test: Summary
Series: BRI_FDI
Date: 03/07/24 Time: 15:54
Sample: 2003 2022
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.65434	0.0040	9	162
Breitung t-stat	-2.27555	0.0114	9	153
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.80516	0.2104	9	162
ADF - Fisher Chi-square	21.7422	0.2436	9	162
PP - Fisher Chi-square	49.0505	0.0001	9	171

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4.12: E-views Results - Levin, Lin & Chu Test (LLC), Im, Pesaran, and Shin (IPS), Augmented Dickey-Fuller (ADF) – 1st Difference & Trend and Intercept for BRI_FDI (Belt-road Initiatives Investment)

Panel Unit Root Test on D(BRI_FDI)

Panel unit root test: Summary
Series: D(BRI_FDI)
Date: 03/07/24 Time: 15:54
Sample: 2003 2022
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.22261	0.0000	9	153
Breitung t-stat	-4.60576	0.0000	9	144
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.99755	0.0000	9	153
ADF - Fisher Chi-square	76.3564	0.0000	9	153
PP - Fisher Chi-square	195.272	0.0000	9	162

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 4.13: E-views Results - Pooled Mean Group/Autoregressive Distributed Lag Model (PMG/ARDL) Analysis (Short-run & Long-run)

Dependent Variable: D(D01)
Method: ARDL
Date: 03/07/24 Time: 15:56
Sample: 2005 2022
Included observations: 162
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Schwarz criterion (SIC)
Dynamic regressors (2 lags, automatic): PB I G ER BRI_FDI
Fixed regressors: C
Number of models evalulated: 4
Selected Model: ARDL(2, 1, 1, 1, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
PB	-8.217209	2.074362	-3.961318	0.0001
I	1.491461	0.419779	3.552970	0.0006
G	5.877524	1.385290	4.242811	0.0000
ER	-0.416871	0.069296	-6.015783	0.0000
BRI_FDI	-4.665254	1.191839	-3.914331	0.0002
Short Run Equation				
COINTEQ01	-0.055593	0.038572	-1.441269	0.1525
D(D01(-1))	0.562441	0.055520	10.13039	0.0000
D(PB)	-0.896534	0.475704	-1.884646	0.0623
D(I)	0.130923	0.314930	0.415720	0.6785
D(G)	-0.462776	0.096909	-4.775368	0.0000
D(ER)	-0.484017	0.504419	-0.959553	0.3395
D(BRI_FDI)	-4.006804	4.102678	-0.976631	0.3310
C	-0.915404	0.788299	-1.161240	0.2482

Mean dependent var	0.711648	S.D. dependent var	4.484790
S.E. of regression	2.632968	Akaike info criterion	3.970512
Sum squared resid	714.0498	Schwarz criterion	5.336388
Log likelihood	-280.3461	Hannan-Quinn criter.	4.524316

*Note: p-values and any subsequent tests do not account for model selection.

Appendix 4.14: E-views Results – Short-run Cross Sectional Results for Pooled Mean Group/Autoregressive Distributed Lag Model (PMG/ARDL) Analysis

1) Indonesia

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.071218	0.003425	-20.79265	0.0002
D(D01(-1))	0.535507	0.021166	25.30018	0.0001
D(PB)	-2.260854	0.993803	-2.274953	0.1074
D(I)	-0.312283	0.095680	-3.263811	0.0470
D(G)	0.149930	0.232825	0.643962	0.5654
D(ER)	0.631334	0.508600	1.241317	0.3027
D(BRI_FDI)	0.474235	3.147043	0.150692	0.8898
C	-1.782300	1.522537	-1.170612	0.3263

2) Malaysia

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	0.002382	0.000254	9.379092	0.0026
D(D01(-1))	0.765124	0.009331	81.99830	0.0000
D(PB)	-1.168351	0.070148	-16.65561	0.0005
D(I)	-0.639498	0.013741	-46.53777	0.0000
D(G)	-0.636372	0.011030	-57.69602	0.0000
D(ER)	-1.552847	0.642191	-2.418044	0.0943
D(BRI_FDI)	2.517308	0.986331	2.552194	0.0838
C	0.137419	0.069735	1.970600	0.1434

3) Philippines

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	0.004780	0.002104	2.271860	0.1077
D(D01(-1))	0.717546	0.040921	17.53492	0.0004
D(PB)	-1.779135	0.247299	-7.194253	0.0055
D(I)	0.087390	0.122497	0.713403	0.5271
D(G)	-0.443081	0.031698	-13.97830	0.0008
D(ER)	-0.038064	0.043774	-0.869554	0.4485
D(BRI_FDI)	3.471051	3.543961	0.979427	0.3996
C	-0.545737	1.140922	-0.478329	0.6651

4) Singapores

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	0.080396	0.004284	18.76727	0.0003
D(D01(-1))	0.277624	0.040969	6.776467	0.0066
D(PB)	-1.063090	0.286214	-3.714313	0.0339
D(I)	2.578707	0.568071	4.539409	0.0200
D(G)	-0.547316	0.160497	-3.410120	0.0421
D(ER)	-0.935209	407.6153	-0.002294	0.9983
D(BRI_FDI)	-36.14184	266.5535	-0.135589	0.9007
C	-5.990723	46.05726	-0.130071	0.9047

5) Thailand

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.074239	0.001558	-47.66574	0.0000
D(D01(-1))	0.471380	0.014365	32.81421	0.0001
D(PB)	-1.687159	0.071711	-23.52730	0.0002
D(I)	-0.171123	0.032431	-5.276600	0.0133
D(G)	-0.335140	0.023910	-14.01649	0.0008
D(ER)	0.805938	0.026054	30.93394	0.0001
D(BRI_FDI)	-1.752867	3.839944	-0.456482	0.6791
C	2.375301	2.097575	1.132404	0.3398

6) Vietnam

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.055969	0.000505	-110.8773	0.0000
D(D01(-1))	0.357009	0.026124	13.66585	0.0008
D(PB)	0.022848	0.069020	0.331033	0.7624
D(I)	-0.233255	0.003429	-68.01757	0.0000
D(G)	-0.507519	0.030322	-16.73771	0.0005
D(ER)	0.301186	0.306699	0.982024	0.3985
D(BRI_FDI)	0.173986	2.035317	0.085483	0.9373
C	-1.075896	0.513575	-2.094915	0.1272

7) South Korea

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.026399	0.000537	-49.16206	0.0000
D(D01(-1))	0.693277	0.033488	20.70223	0.0002
D(PB)	-0.844811	0.081571	-10.35674	0.0019
D(I)	-0.104828	0.065500	-1.600418	0.2078
D(G)	-0.376760	0.027814	-13.54575	0.0009
D(ER)	-3.988999	9.840200	-0.405378	0.7124
D(BRI_FDI)	-5.305887	6.882721	-0.770900	0.4969
C	1.029674	0.521654	1.973865	0.1429

8) Bangladesh

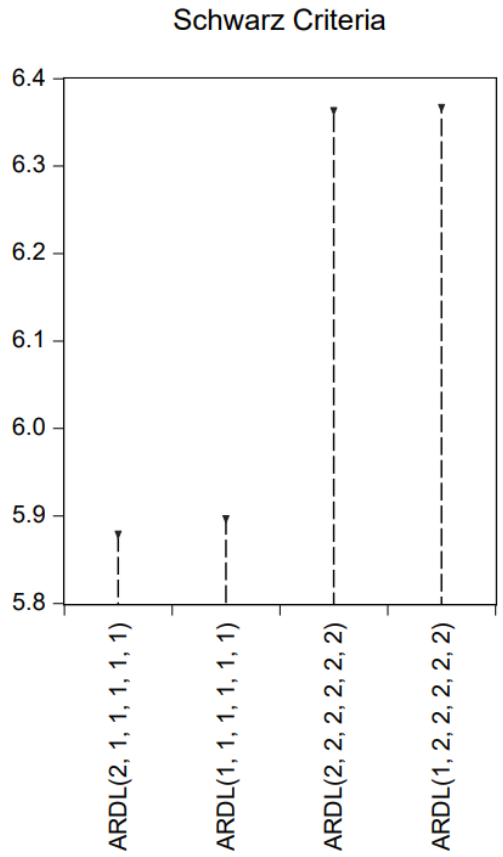
Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.336891	0.009736	-34.60269	0.0001
D(D01(-1))	0.631950	0.052308	12.08123	0.0012
D(PB)	2.470246	0.204217	12.09617	0.0012
D(I)	-0.148336	0.006309	-23.51058	0.0002
D(G)	-0.946361	0.028657	-33.02390	0.0001
D(ER)	0.235086	0.004831	48.65947	0.0000
D(BRI_FDI)	0.540878	0.058319	9.274395	0.0027
C	-2.240635	21.71335	-0.103192	0.9243

9) Nepal

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ01	-0.023178	0.000628	-36.90403	0.0000
D(D01(-1))	0.612556	0.023412	26.16421	0.0001
D(PB)	-1.758501	0.200640	-8.764452	0.0031
D(I)	0.121531	0.055584	2.186441	0.1166
D(G)	-0.522362	0.021794	-23.96870	0.0002
D(ER)	0.185426	0.009751	19.01687	0.0003
D(BRI_FDI)	-0.038098	0.010752	-3.543334	0.0383
C	-0.145741	1.351055	-0.107872	0.9209

Appendix 4.15: E-views Results – Model Selection Criteria (Lag-length Selection) – Schwarz Information Criterion (SIC) for Pooled Mean Group/Autoregressive Distributed Lag Model (PMG/ARDL) Analysis

1) Graph

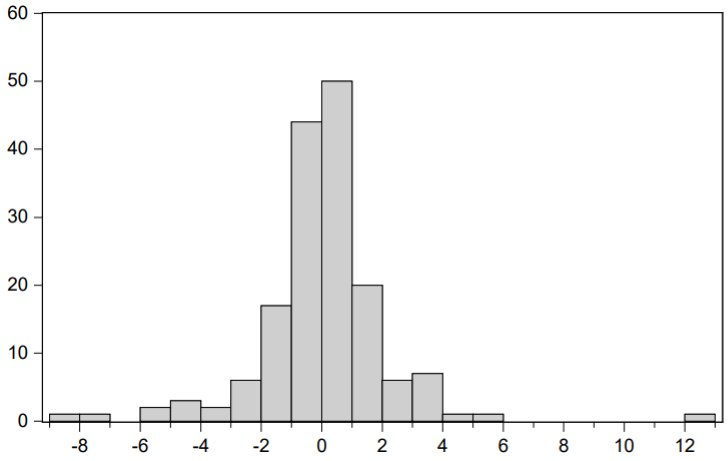


2) Table

Model Selection Criteria Table
Dependent Variable: D01
Date: 03/07/24 Time: 16:06
Sample: 2003 2022
Included observations: 180

Model	LogL	AIC	BIC*	HQ	Specification
3	-280.346052	4.411680	5.879241	5.007532	ARDL(2, 1, 1, 1, 1, 1)
1	-304.668462	4.600845	5.896873	5.127052	ARDL(1, 1, 1, 1, 1, 1)
4	-205.100488	4.038278	6.363505	4.982355	ARDL(2, 2, 2, 2, 2, 2)
2	-228.293090	4.213495	6.367189	5.087927	ARDL(1, 2, 2, 2, 2, 2)

Appendix 4.16: E-views Results – Normality Test (Jarque-Bera Test) for PMG/ARDL Model



Series: Residuals	
Sample 2003 2022	
Observations 162	
Mean	3.08e-16
Median	0.046447
Maximum	12.23707
Minimum	-8.394720
Std. Dev.	2.105966
Skewness	0.438793
Kurtosis	11.58983
Jarque-Bera	503.2482
Probability	0.000000

Appendix 4.17: E-views Results – Correlation Analysis for PMG/ARDL Model

Correlation

	D01	PB	I	G	ER	BRI_FDI
D01	1.000000	0.333625	-0.331550	-0.103108	-0.347511	-0.160472
PB	0.333625	1.000000	-0.083859	0.141730	-0.298747	-0.108020
I	-0.331550	-0.083859	1.000000	0.247818	0.388498	0.155020
G	-0.103108	0.141730	0.247818	1.000000	0.082429	0.071760
ER	-0.347511	-0.298747	0.388498	0.082429	1.000000	0.442705
BRI_FDI	-0.160472	-0.108020	0.155020	0.071760	0.442705	1.000000

Appendix 4.18: E-views Results – Robustness Test for PMG/ARDL Model (Replace G to GDP__R_, Replace ER to ER_R_)

Dependent Variable: D(D01)
Method: ARDL
Date: 03/08/24 Time: 11:50
Sample: 2005 2022
Included observations: 162
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Schwarz criterion (SIC)
Dynamic regressors (2 lags, automatic): PB I GDP__R_ ER_R_ BRI_FDI
Fixed regressors: C
Number of models evalulated: 4
Selected Model: ARDL(2, 2, 2, 2, 2, 2)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
PB	-4.685778	0.935909	-5.006660	0.0000
I	-0.549363	0.077026	-7.132165	0.0000
GDP__R_	2.567432	0.275362	9.323847	0.0000
ER_R_	1.062933	0.080854	13.14636	0.0000
BRI_FDI	-6.308624	0.809350	-7.794683	0.0000
Short Run Equation				
COINTEQ01	-0.143351	0.067963	-2.109264	0.0392
D(D01(-1))	0.413499	0.086857	4.760705	0.0000
D(PB)	-0.869815	0.627731	-1.385648	0.1712
D(PB(-1))	-0.896934	0.210116	-4.268753	0.0001
D(I)	0.440491	0.416603	1.057339	0.2947
D(I(-1))	0.055869	0.224327	0.249050	0.8042
D(GDP__R_)	-0.519361	0.385309	-1.347907	0.1829
D(GDP__R_(-1))	0.061744	0.208128	0.296661	0.7678
D(ER_R_)	4.286920	6.623487	0.647230	0.5200
D(ER_R_(-1))	-4.786976	5.005901	-0.956267	0.3429
D(BRI_FDI)	-5.672162	5.719931	-0.991649	0.3255
D(BRI_FDI(-1))	-1.818801	1.703186	-1.067882	0.2900
C	-1.392450	1.138923	-1.222602	0.2264

Mean dependent var	0.711648	S.D. dependent var	4.484790
S.E. of regression	1.833248	Akaike info criterion	3.051628
Sum squared resid	194.9262	Schwarz criterion	5.215743
Log likelihood	-152.6465	Hannan-Quinn criter.	3.929083

*Note: p-values and any subsequent tests do not account for model selection.

Appendix 4.19: E-views Results – Interpolation for Philippines 2015 BRI (Cardinal Spline)

Last updated: 03/07/24 - 11

2013	0.60
2014	1.21
2015	1.00
2016	0.87
2017	1.97
2018	1.60
2019	5.46
2020	1.32
2021	0.49
2022	0.91