

GST IN MALAYSIA: AN UGLY TRUTH OR A
BEAUTIFUL LIE?

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DECLARATION

We hereby declare that:

- (1) This undergraduate research project 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 research project has been submitted in support of any application for any other degree of 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 research project.
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ABSTRACT

This paper sets out to analyse the effect of the impending implementation of Goods and Services Tax (GST) in Malaysia based on the inflation perspective using the Generalized Method of Moments (GMM) estimation. The analyses are conducted on the basis of quarterly data spanning from 1998:1 to 2011:4. In other words, the general aim is to investigate whether GST will result in inflation in the Malaysian context. More specifically, using sales and services tax per consumption as proxy for GST, the paper intends to empirically determine the short term and long term impact of GST on inflation in Malaysia when GST is implemented on 1st April 2015 from the perspective of backward-looking and forward-looking Phillips curve based on New Keynesian Phillips Curve (NKPC). In addition, this research also seeks to show the reaction of the central bank in response to the changes in inflation rate. The empirical results of this study indicate that the imminent implementation of GST will cause inflation hike, both in the short term and long term, of approximately 0.8 percentage point and 1.6 percentage point, respectively. Secondly, we found that the central bank has increased interest rate in order to offset the rise in inflation rate. Lastly, we found that our empirical model possesses modest forecasting ability.

CHAPTER 1: INTRODUCTION

1.0 Introduction

This chapter mainly discusses about the research background, problem statements, research objectives, research questions as well as the significance of study.

1.1 Research Background

The uncertainty over whether or not Goods and Services Tax (GST) will be implemented in Malaysia was eventually quelled on 25th October 2013 after the announcement of the Budget 2014. GST will be introduced in Malaysia starting from 1st April 2015 at 6%. It will replace the current sales and services tax.

GST, also known as Value Added Tax (VAT), is a multi-stage consumption tax. It is a broad based consumption tax which covers every sector of the economy. All locally produced goods and services inclusive of imports will be taxed. Exception to this form of taxation are particular goods and services that are classified as zero rated supply and exempt supply.

1.1.1 Basic Concept of GST

GST is charged on the consumption of goods and services at every single stage of the supply chain. Although GST is levied from the supplier right up to the retail stage of the supply chain, it does not form part of the production cost as GST paid on the business inputs can be claimed back. Therefore, the number of stages a certain product passes through the supply chain is irrelevant because the tax paid on the business inputs at the

earlier stage can always be written off by the businesses at the later stage of the supply chain.

1.1.2 Types and rates of GST

Three categories of GST will be in use in Malaysia with effect from 1st April 2015. Each differs primarily in the rates and the method of handling each tax.

Firstly, standard-rated supplies are goods and services which are charged with the standard rate. Businesses collect GST and pay to the government. They can be reimbursed credit on their inputs provided their tax on input is greater than the tax on output. Secondly, zero-rated supplies are taxable goods and services which are charged with the zero rate. Businesses can claim input tax credit when they bring in these supplies, which will then be charged at zero rate. Thirdly, exempt supplies are non-taxable supplies which are eligible for tax relief, meaning they will not be charged any GST. Naturally, businesses cannot claim input tax credit when they bring in these supplies. Besides, they are also not eligible to charge output tax to consumer.

1.1.3 Motivation for the implementation of GST

The introduction of the GST serves to improve tax compliance, through a more comprehensive, transparent and simple tax system to enhance the efficiency and effectiveness of the existing taxation system. In addition, the government is looking for extra income to seeking additional revenue to rein in the nation's budget deficit. Simultaneously, the government also aim to be more independent and rely less on income generated by Petroliam Nasional Berhad (Petronas), a Malaysian oil and gas company.

The decision by the government to implement GST in 2015 is primarily driven by the combination of several external macroeconomic and domestic factors (Lim and Ooi, 2013). Firstly, multiple international ratings agencies are so cautious of Malaysia's ballooning fiscal debt to the extent that in July 2013, Fitch Ratings, a global rating agency, downgraded Malaysia's sovereign credit rating outlook from stable to negative. In August 2013, Moody's Investors Service, one of the Big Three credit rating agencies cautioned that the ratings are vulnerable because of Malaysia's towering debt, although it did evaluate Malaysia's rating at stable. Secondly, the US Federal Reserve is in the midst of tapering its stimulative quantitative easing policy. Consequently, foreigners have reduced their holdings of Malaysia Government Securities. Since a significant amount of Malaysian debt securities is held by foreigners, Malaysia is at risk.

1.1.4 Brief overview on GST adoption in the world

As of June 2014, a total of 160 countries in the world have implemented GST. To put that into perspective, the aggregate number of countries in the world approximates 200 (determining how many countries there are in the world is notoriously difficult, due not only to the ever-shifting political landscape, but also the term "country" is somewhat fluid and open to interpretation), with 193 of them being members of the United Nations. That is a staggering 80 percent of the total. It is worth noting that this figure will only get higher, as a number of countries are presently working towards implementing GST as well. The number of countries that have adopted GST based on regions, are as follows:

Table 1.1 Number of countries that have adopted GST based on regions

No.	Region	No. of countries
1	ASEAN	7
2	Asia	19
3	Europe	53
4	Oceania	7
5	Africa	44
6	South America	11
7	Caribbean, Central & North America	19

Source: gst.customs.gov.my

Also, we look at the some of the countries and the rates that they adopted for comparison purpose. One of the many questions that policymakers and the public are concerned about is whether the tax rate is higher or lower in countries with higher income level. To address this issue, we arranged the income level (GDP per capita) of the countries in descending order to determine if there is any relationship between the income level of countries and the GST rate.

Table 1.2 Selected countries and the current rate of GST in each country

No.	Country	GDP Per Capita (World Bank, 2012, USD)	Year of Implementation	Current rate of GST (%)
1	Australia	67,442	2000	10.0
2	Singapore	52,052	1993	7.0
3	Japan	46,731	1989	5.0
4	United Kingdom	38,920	1973	20.0
5	China	6,091	1994	17.0
6	Thailand	5,480	1992	7.0
7	Indonesia	3,557	1974	10.0

8	Philippines	2,587	1998	12.0
9	Vietnam	1,755	1999	10.0
10	Ghana	1,605	1998	12.5
11	India	1,503	2005	12.5
12	Laos	1,417	2009	10.0
13	Pakistan	1,257	1990	16.0
14	Cambodia	944	1999	10.0
15	Bangladesh	752	1991	15.0
16	Malaysia	10,432	2015	6.0

Source: gst.customs.gov.my and World Bank Data

Based on Table 1.2, the answer is a resounding no. It shows that GST rate in a country is not affected by its income level. For instance, although Australia's GDP per capita is almost double that of United Kingdom's, the GST rate in Australia is only half of that of UK's. To further accentuate this statement, we compare Australia with Bangladesh. Despite the enormous differences in GDP per capita between the two countries, Bangladesh still, surprisingly, have relatively higher tax rate than Australia.

1.1.5 Distinction between GST and Sales and Services Tax

Malaysia has been using the sales tax and services tax regime since 29th February 1972 and 1st March 1975, respectively. Sales tax is a single stage consumption tax which is imposed on locally produced goods and services as well as imports. As of October 2014, the standard rate is 10%; reduced rate of 5% for non-essential foodstuff and building materials and specific rates for petroleum products. On the other hand, service tax is

also a single stage consumption tax. This tax is imposed on specific services provided by a taxable person in Malaysia. As of October 2014, the flat rate is 6%. There are specific rates for credit card amounting RM50.00 (with effect from 1st January 2010). Previously, service tax rate was 5% but raised to 6% in January 2011.

The proposed GST rate at 6% is comparatively low in comparison with the current sales tax rate in Malaysia as well as the rates in neighbouring countries. For example, Singapore and Thailand have a GST rate of 7% while Indonesia has a rate of 10%, not to mention Australia (10%) and New Zealand (15%), and the general European Economic Community average rate of around 17-18%. Apparently, Malaysia is a latecomer but it is introducing a much lower rate compared to most early birds. To this end, it is anticipated that consumers will reap benefit as a result of the expected reduction in price in majority of the goods and services. In addition, with the introduction of GST, which is an effective tax revenue contributor, corporate and personal income tax rates are expected to be slashed over time.

However, throughout this research, there is one trend that we find impossible to ignore. Several countries that have implemented GST have, over the time, raised the GST rate. This is most apparent when the introductory rate is relatively low. One needs look no further than our neighbouring country for proof of that. In 1994, Singapore introduced GST at the rate of 3%. Currently, the rate is 7%. It is worth noting that this increase in the rate is still low relative to several other countries with GST regimes. For instance, the United Kingdom's VAT rate has increased 10%, from 10% in the 1970's to 20% now. All told, it would therefore not be too great an exaggeration to say that the GST rate in Malaysia will be raised over time.

GST differs from Sales and Services Tax in 5 aspects:

(1) Single stage tax versus multiple stage tax

As opposed to the sales and services tax, typically GST is imposed on the goods and services at every single stage of the production process.

(2) Taxable goods and services

Under service tax, the taxable services are merely those services which are specifically prescribed. However, under sales tax, all goods are subject to tax except if specifically exempted.

Under GST, all goods and services will be taxed, excluding those that are exempted. Therefore, this is why it is known as broad-based tax as more services will fall within the GST net compared to previously.

(3) Payment of tax and periods of accounting

Under sales and services tax structure, service tax becomes due only when payment is received. In the event that payment is not received, businesses are only required to pay tax at the end of the 12-month period from the date of invoice issued. On the other hand, sales tax has to be paid when there is a sale or disposal otherwise than by sale.

Under GST structure, one crucial characteristic is 'time of supply'. It decides when is GST incurred and have to be paid up. When an invoice is issued; any payment is given to the supplier; a supply which is subject to tax takes place, then a supply is regarded to have been made.

(4) Treatment of imported services and intangibles

Under the service tax, imported services are non-service tax-taxable due to the shortcomings and the limited purview of the aforementioned tax.

Under GST, through a concept known as reverse charge, imported services are eligible to be taxed. This concept treats service from abroad like it is imported by person who is on the receiving end of this particular service, not by the person overseas who provides this service. The person who receives this supply will have to pay GST on the supply which is received from abroad.

(5) Facility of group registration

Under sales and services tax regime, consolidated tax filings are not permitted. There is only 'group relief' when specific professional services carry out their service to companies that are within the same group. Then again, it is under specific restrictions.

Under GST, group registration gives companies the access to file consolidated GST returns. Given goods and services are constantly provided between group companies, this could lead to potentially improved cash flow management.

1.1.6 Consequences of GST

GST is a broad-based tax. As such, it is typically regarded as a regressive tax. Now, what regressive really means? To put it simply, a regressive tax inflicts a greater burden on poor people in that it takes a larger percentage from low-income individuals than the relatively rich ones. More often than not, the regressive nature of broad-based tax is a matter of grave concern to policymakers. However, in spite of this, GST has been introduced in 160 countries in the world. Of these 160 countries, not all of them experienced the regressive nature of GST. A few developing countries, for instance, Vietnam, Ethiopia and Pakistan, have faced progressive GST, in no small part due to these countries adopted the zero rating of basic essentials as well as exemptions. As mentioned earlier, there is a preconceived notion that GST is regressive. This argument, however, has not considered the fact that basic essentials are not taxed in developing countries. When this element is taken into account, VAT can be naturally progressive.

Another issue that plagued the thoughts of policymakers and the public alike is that GST would be inflationary. There have been important debates and literature over this issue. For instance, Syed A. Basher (2008) emphasized that the introduction of GST would not necessarily result in inflation. He explained that this is because inflation is defined as a repeated rise in average prices over time and does not refer to a once-and-for-all increase in prices. Sukumar Mukhopadhyay (2005) said that GST can never, by itself, lead to a sustained increase in the rate of change in price level. That said, however, Matti Viren (2008) discovered that more than one half of a tax increase (GST in this case) shifts to consumer prices. Before we delve deeper into this issue, we shall look at the implementation of GST/VAT and their relationship with changes in inflation rates between year before and after implementations in selected

nations. Is the effect positive or negative? For this purpose, we expanded Table 1.2 to include inflation rates in the respective countries.

Table 1.3 Current GST rate and inflation rate in each country

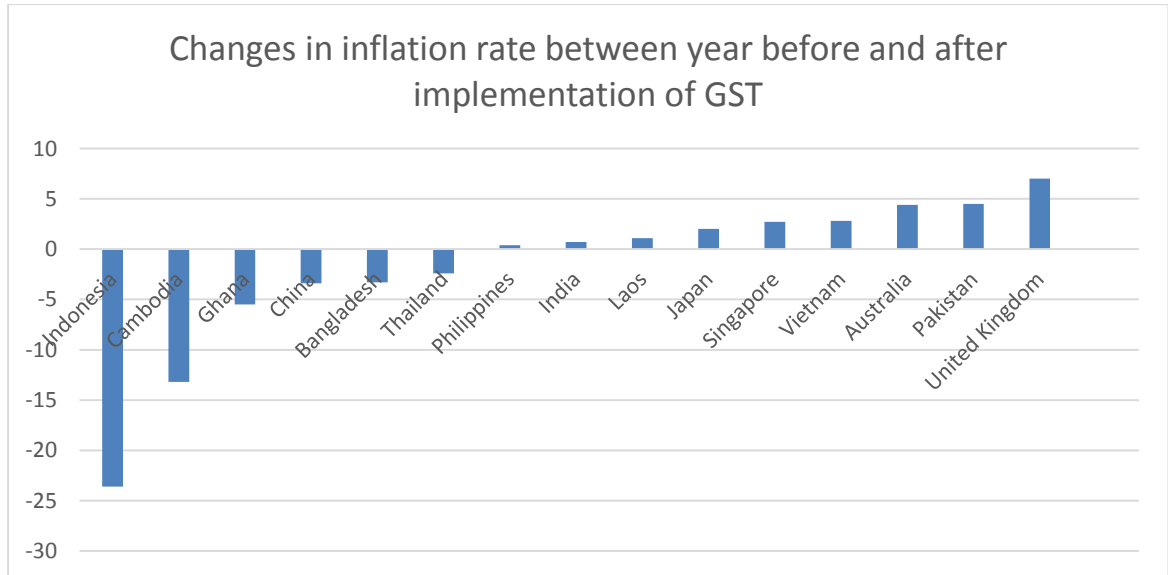
No	Country	Year before implementation & inflation rate	Year of implementation & inflation rate	Year after implementation & inflation rate	Current tax rate (%)	$\Delta \pi$ between year before and after implementation (%)
1	Australia	1999	2000	2001	10.0	+ 4.4
		0.3	2.6	4.7		
2	Bangladesh	1990	1991	1992	15.0	- 3.3
		6.3	6.6	3.0		
3	Cambodia	1998	1999	2000	10.0	- 13.2
		10.0	2.0	-3.2		
4	China	1993	1994	1995	17.0	- 3.4
		14.9	19.7	11.5		
5	Ghana	1997	1998	1999	12.5	- 5.5
		19.5	17.0	14.0		
6	India	2004	2005	2006	12.5	+ 0.7
		5.7	4.2	6.4		
7	Indonesia	1973	1974	1975	10.0	- 23.6
		34.8	46.5	11.2		
8	Japan	1988	1989	1990	5.0	+ 2.0
		0.3	2.2	2.3		
9	Laos	2008	2009	2010	10.0	+ 1.1
		8.9	-2.9	10.0		
10	Pakistan	1989	1990	1991	16.0	+ 4.5
		8.6	6.5	13.1		
11	Philippines	1997	1998	1999	12.0	+ 0.4

		6.2	22.4	6.6		
12	Singapore	1992	1993	1994	7.0	+ 2.7
		1.0	3.4	3.7		
13	Thailand	1991	1992	1993	7.0	- 2.4
		5.7	4.5	3.3		
14	United Kingdom	1972	1973	1974	20.0	+ 7.0
		8.0	7.3	15.0		
15	Vietnam	1998	1999	2000	10.0	+ 2.8
		8.8	5.7	11.6		
16	Malaysia	2015			6.0	----

Source: gst.customs.gov.my, World Bank Data and United Nations Statistics

Division

Figure 1.1 Changes in inflation rate between year before and after implementation of GST in selected nations



Source: Developed for the research

In Table 1.3, we included the year before and after implementation of GST as well as the respective inflation rates in the respective countries. We then compute the differences between the year before and after implementation to determine the changes in inflation rate in these

countries after the GST was implemented to see whether the changes are positive or negative. To put that into perspective, we plotted the changes in inflation rate between year before and after implementation against the tax rate in Figure 1.1. From Figure 1.1, it is apparent that there is no significant pattern between the implementation of GST and changes in inflation rate between year before and after implementation. As many as 9 countries i.e. Australia, India, Japan, Laos, Pakistan, Philippines, Singapore, United Kingdom and Vietnam experienced positive change in inflation rate between the year before and after implementation, whereas 6 countries i.e. Bangladesh, Cambodia, China, Ghana, Indonesia and Thailand experienced negative change in inflation rate between the year before and after implementation. As is evident from the mixed result above, the precise impact that the proposed GST will have on prices cannot be determined with absolute certainty. Thus, this serves as our motivation of our research, we want to know whether Malaysia will experience inflation or even deflation following the implementation of GST.

We then attempt to look at the Malaysian case from another perspective. First, we categorized the 15 countries (excluding Malaysia) into low tax group, medium tax group and high tax group. To achieve this purpose, we obtained the average tax rate of the 15 countries, which turns out to be 11.6%. After that, we calculated the difference between the average tax rate and standard deviation, which we shall name it the low tax group. The low tax group shall range from 0% to 7.54%, countries that fall under this range will be categorized as low tax group. For the high tax group, we calculated the addition of average tax rate and standard deviation. Countries that have tax rate above 15.66% will be classified as high tax group. The medium tax group, naturally, has the range between 7.54% and 15.66%.

Now that we have our three categories of tax groups, we construct Table 1.4. The reason we construct this table is to find out whether there is any clear pattern between the three tax groups and the average inflation

rate. Can we get a clear picture of their relationship? That is, does low tax group has low average inflation? Or, does high tax group has high average inflation? Or, there is no distinct pattern?

Let's look at Table 1.4. According to our definition of low, medium and high tax groups, Japan, Singapore and Thailand fall under low tax group. Whereas China, Pakistan and United Kingdom fall under high tax group. The remaining countries, therefore, shall be classified as medium tax group.

Table 1.4 Selected countries and their current inflation rate and current tax rate

No.	Country	Current inflation rate (%)	Current tax rate (%)
1	Australia	2.4	10
2	Bangladesh	7.5	15
3	Cambodia	2.9	10
4	China	2.6	17
5	Ghana	11.6	12.5
6	India	10.9	12.5
7	Indonesia	6.4	10
8	Japan	0.4	5
9	Laos	6.4	10
10	Pakistan	7.7	16
11	Philippines	3.0	12
12	Singapore	2.4	7
13	Thailand	2.2	7
14	United Kingdom	2.6	20
15	Vietnam	6.6	10

Source: gst.customs.gov.my and World Bank Data

Subsequently, we compute the average inflation rate and average tax rate for the three tax groups. The result is displayed in Table 1.5.

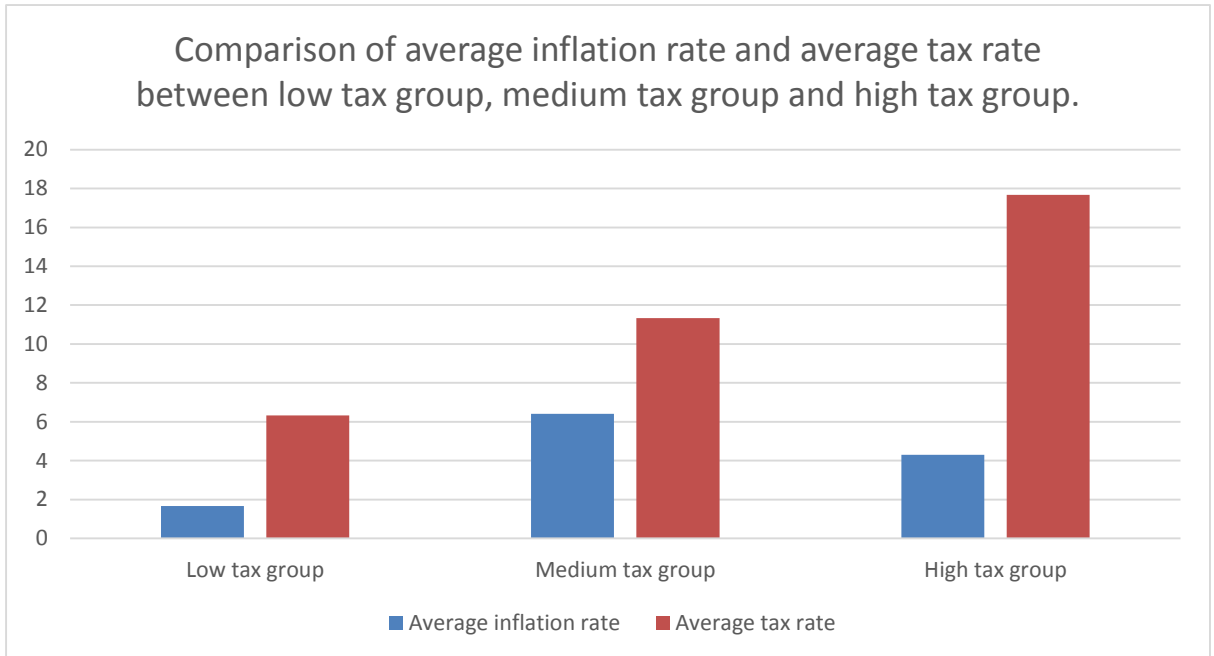
Table 1.5 Tax groups and their average inflation rate and average tax rate

Tax groups	Average inflation rate (%)	Average tax rate (%)
Low tax group	1.67	6.33
Medium tax group	6.41	11.33
High tax group	4.3	17.67

Source: Developed for the research

Using the results in Table 1.5, we came out with Figure 1.2 to have a more straightforward and clearer view of the relationship between average inflation rate and average tax rate of the three tax groups.

Figure 1.2 Comparison of average inflation rate and average tax rate between low tax group, medium tax group and high tax group.



Source: Developed for the research

From Figure 1.2, apparently there is no discernible pattern of the aforementioned relationship. Although the low tax group has the lowest average inflation rate, the medium tax group has the highest average inflation rate among all, even higher than that of the high tax group. Interestingly, Figure 1.1 and Figure 1.2 produced mixed outcome. This arouses our curiosity and motivates us to understand further.

Based on our earlier definition, Malaysia falls under low tax rate group with 6% GST. Does that mean Malaysia will have low inflation rate? Figure 1.2 already answers our question, which is no. Does it imply that Malaysia will experience inflation or even deflation? The answer is obvious according to Figure 1.1. The opponents of GST in Malaysia often based their claims primarily on two points. One, GST will cause inflation that will burden the poor. Two, GST will have impact on income distribution. It must be emphasized that in this study, we did not cover this

topic. Therefore, we are only interested in the first point. Is that true for the case of Malaysia? From the evidence provided above, we cannot find any pattern to substantiate their allegations. It seems that people's general consensus are not entirely true. It seems that what people always believe, surprisingly, cannot be reflected in the data. Hence, as educated citizens of Malaysia, we feel obliged to give informed opinions to the public and policymakers.

1.2 Problem Statement

It is imperative for researchers and economists to anticipate the imminent ramifications that might potentially befall the economy following the implementation of GST. Previous researchers found that the inflationary impact of GST on economy is one-off and temporary. However, they are not specific as to the short term and long term effect of the aforementioned inflationary impact. Therefore, this becomes one of the issues of our research.

Ever since the announcement of the impending implementation of GST in year 2015, on the one hand, certain government officials and portals have been giving assurances that goods prices would not be affected. On the other hand, there have been growing concerns of inflationary impact on the goods and services. Dissenting voices grow louder in recent months as more numerical evidence have surfaced, claiming that GST will no doubt increase the prices. For that reason, we seek to answer this question once and for all by providing empirical evidence.

1.3 Research Objectives

The literature on the GST is surprisingly sparse given that the inception of GST is an inevitable progression in Malaysian tax landscape. In view of the dearth of

literature that has covered the issue of GST, this research is carried out to realize the following purposes.

1.3.1 General Objective

Our aim is to analyse the effect of the impending implementation of GST in Malaysia based on the inflation perspective. Previous researches had expanded their research to many countries and their results indicated, to a certain extent, that GST put upward pressure on prices, albeit of transitory nature. Therefore, our general objective is to identify whether GST will result in inflation for Malaysian case.

1.3.2 Specific Objectives

The specific objectives are clarified from the general objective above. There are several specific objectives as presented below:

- (i) To examine the relationship between the impending implementation of GST in Malaysia and the inflation rate.
- (ii) To investigate the short term and long term impact of GST on inflation in Malaysian context when GST is implemented.

1.4 Research Questions

The research questions formulated in this research are shown as below:

- (i) What is the degree of inflationary impact of GST in Malaysia?
- (ii) What is the short term and long term impact of GST on inflation in Malaysia?
- (iii) What is the response of central bank following the changes in inflation rate?

1.5 Significance of Study

This undergraduate research project seeks to investigate the inflationary effect of GST in Malaysia in order to make a contribution to the literature by exploring the relationship between GDP deflator and selected economic indicators.

As can be seen from the literature review presented in Chapter 2, numerous papers have already investigated the repercussion of GST on inflation. Nonetheless, our contribution of this study to this topic is different in the sense that this study employs an entirely unique approach. We take into account a wide range of economic indicators before narrowing down the list and cherry-picking the most appropriate economic indicators using empirical testing.

The findings of our study are able to contribute new findings to this particular topic of study. As a matter of fact, nearly all preceding studies have pointed out that the inflationary effect of GST was one-off and of transient nature but to the best of our knowledge, they did not specifically and explicitly state the short term and long term impact of the GST. However, our findings set out to answer that very question.

This study is also anticipated to contribute to the policy developments literature and tax administration through showing the inflationary impact of GST in Malaysia. Contrary to conventional wisdom, GST turns out to be counterintuitive as the data indicated that inflation is minimal when people perceived otherwise.

1.6 Chapter Layout

In the next section, literature review will be provided in Chapter 2 about the existing relevant studies on traditional and New Keynesian Phillips curve and how it relates to our topic of study. In Chapter 3, it will present the data collections, econometric methodologies, theoretical framework, analysis of models and several econometric tests. The findings and empirical results of this study will be provided in Chapter 4 as well as the interpretation of results. In Chapter 5, it is part of concluding remarks of this study which will include the summarization of results and policy implication of the findings.

1.7 Conclusion

Research background, problem statements, objectives of the study, research questions and significance of study was provided in this chapter. The next chapter is about the relevant literature review of this study.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

After discussing the background of study, problem statement, research questions, research objectives and significance of study in Chapter 1, we now proceed to Chapter 2 to provide the relevant literature review including theoretical models and theoretical framework.

2.1 Background of GST in Malaysia

Since 2010, many euro area countries have undertaken substantial fiscal consolidation in response to the need to curb government debt. In particular, to boost revenues, some governments have opted to raise rates of direct taxation, such as income tax, and indirect taxation. This is however same to Malaysia case. According to the research of Siti Norbaya, Dr Hj Asry and Nor Haryanti (2014), Malaysia will implement GST in next year 2015, the main objectives are to generate more national revenue in order to cover the debt deficit. Government still does not know whether it can achieve the objectives. Therefore, the purpose of this study is to identify whether GST can affect the consumer price index (CPI). As a Malaysian, we also know that this new tax system of course is unacceptable by Malaysian because consumers have to bear the higher prices of goods and services and in the meantime, producers have to bear the burden for higher costs. Therefore, the main purpose of our study is to identify whether GST will affect the inflation in Malaysia.

Although the implementation of GST has gained increasing global acceptance and recognition (Hooper and Smith, 1997), Malaysians are not completely persuaded. Eventually, there are many arguments about the pros and cons of GST.

2.2 Review of Literature

2.2.1 Ramifications of VAT on Inflation

One purpose of this chapter is to point out that some ramifications are often expected as the result of adopting VAT. Discussions of VAT have centred on its possible effects on inflation, income distribution, economic growth, and the balance of payments. In this final year project, we are mainly discussing the effects on inflation which is related to our own country.

Carare and Danninger (2009) and Carbonnier (2007) told the world that the implementation of GST provides an exclusive chance to evaluate price setting behaviour related to a sudden increase in price. From their research, they found that a large part of the inflation effect could have possibly happened before the increment. Other than that, Jonker, Folkertsma and Blijenberg (2004) investigated the price setting behaviour in Netherlands. They also discuss the effect of the GST increase in January 2001 on inflation in Netherlands. In 1st January 2001, the Dutch general VAT rate was increased from 17.5% to 19%. They find that the 1.5 percent point increase in the VAT was almost completely passed through into consumer prices.

According to Gautier and Lalliard (2014), Carare and Danninger (2009) and Viren (2009), they found that more than half of VAT changes are passed on to consumer prices one quarter after the rate increase. Basically, this is partly due to VAT changes have often had significant but short lived

effects on retailers' adjustment behaviour and on inflation. Changes in indirect taxation influence prices because the after-tax price paid by the consumer is the sum of the before-tax price, whose payment is kept by the merchant as earnings, and taxes.

A study on the effect of VAT on inflation (Valadkhani and Layton, 2004), it seems fair to conclude that, GST had a serious but short-lived impact on inflation only in the first quarter when new tax system was implemented. Especially among the major capital cities, when a GST was implemented, there is no significant change in the average price. In France, for example, price changes are much more frequent in the first quarter (Berardi *et al.*, 2013).

On top of that, Carare and Danninger (2009) claimed that the repercussions of the rise in rate of VAT have mostly taken place immediately after implementation. The reason is the increase in price was already taken into account in 2006 as consumers were anticipating a rise in VAT. This effect is known as "inflation smoothing". Consumers stocked up on daily items and groceries earlier as they were wary of the higher expected prices a year later. On the one hand, Gabriel and Adam (2006) concluded that it is very obvious that any change in VAT will substantially affect the inflation. On the other hand, we can conclude that VAT changes will lead to a short period increase in the inflation, but the impact dies out later.

2.2.2 Other empirical evidences

Nevertheless, some people warn of the complexity in implementing GST. At the same time, these people argue that the increase in tax income would merely encourage greater government expenses (Bickley, 1989). Other than that, GST would hit the lower income group harder than the

higher income group (Hooper and Smith, 1997). The primary reason is GST would put a damper on the lower income group's purchasing power.

2.2.3 The opponents' view

Prior to the introduction of GST, Johnson, Freebairn and Scutella (1999) argued that in the long run both reductions in personal income tax and increases in social security rates could sufficiently attenuate the average price rises among broad groups of households. Valadkhani (2005) found that prices did not increase significantly before or after the introduction of GST beyond what could have been expected on the basis of the discernible systematic pattern of fluctuation in the data. Moreover, based on his research, the varying one-off effect of GST on prices was significant in seven out of eleven CPI groups, the effect was found insignificant for the other four CPI groups.

Also, Bundesbank (2007) reveals that in 2007, core inflation in Germany increases less than the expectation, yet some people were still worried that the inflationary impact would come later than expected. Moreover, the impact of a change in VAT could then be transmitted slowly to inflation. In France, the average time between two price changes is estimated to be approximately six months, albeit with substantial differences between sectors: energy and food prices are changed frequently while prices for services are changed just once a year (Baudry *et al.* 2005). Finally, the process of gathering information on the economic environment before a price change may be costly for retailers. Spacing out price changes over time makes it possible to lower these informational costs and might lead retailers to revise their prices only at certain periods of the year (Zbaracki *et al.*, 2004).

2.2.4 Second Round Effects

However, what makes people worry about is what the Bank of England calls “second-round effects”. Kirkby (2013) said that people refuse inflation spikes for fear that it might lead to a price-wage inflation spiral. When workers notice the surge in inflation, they request for higher wages in order to offset the potential additional price hike by companies. Over time, inflation is planted into expectations. Subsequently, this sets off an inflation spiral. This is what the aforementioned second-round effects mean. On top of that, Bank of England (2011) concludes that reports from the Banks Agents did not rule out the possibility that the transfer of the hike in VAT to consumer price would exceed expectation.

Gordon (2013) described the second-round effect as the built-in inflation in his triangle model. Due to previous inflation, the second-round effect causes inflation ripples. For example, an initial increase in prices will cause a higher pay claims on wages as workers look to maintain their lifestyle. This is also known as a “wage-price effect”. Therefore, when GST increases in Malaysia, there is not only first round effect, but also the second round effects which the inflation will be caused by employees’ demand for high wages to offset the increase of first round inflation.

In long run, of course we don’t know how many round the effects of GST creates on inflation, but what we can confirm is that there will have more than second round effects on inflation as Gordon described in his journal. So, implementation of GST by increasing 2 more percentage points make a very high inflation in the long run. All in all, as we know that Malaysian are worried about whether the implementation of VAT can cause the price of goods and services increase to a long extent. In short, it

is our interest to determine how much inflation will increase in short run and long run.

2.2.5 Producers will not lose

Nonetheless, Hooper and Smith (1997) opined that since GST is a multi-stage tax, it is collected at every stage of the supply chain and production process. They underlined the differences between output tax and input tax. The former is a GST tax which suppliers will impose on goods and services that are subject to tax. The latter, meanwhile, is a tax that businesses will charge on acquisition of goods and services. To this end, GST would not be a burden to sellers and would not be recorded as expenses in financial statements. Also, Scotland (2006) asserts that not all producers would seek to transfer the GST completely to consumers. Thus, the actual impact could be lesser. If the VAT rates change, the repricing of products and services is not automatic at all. For example, in the event of a VAT increase, companies exposed to sharp market competition typically increase their prices to a lesser extent than non-competing companies.

2.2.6 Increase Government Revenue

The advocates of GST said this tax can achieve the objective of cutting down federal government deficit (McGowan and Billings, 1997). Besides, they asserted that GST can expand government method of gaining revenue. They pointed out that since GST functions as a consistent source of income to government due to the unique taxation structure, government can serve the people better by upgrading public services and to a greater extent, boost economic stability. In short, Keen, Michael and Ben Lockwood (2006) concluded that the GST story in Canada as in most countries has not resulted to any significant extent either in higher taxes or

bigger governments, but rather in governments being able to finance their expenditures in economically less damaging ways.

2.2.7 Expected Aggregate Consumption and Economics growth of Malaysia

An implementation in the VAT often stimulates public interest and sometimes becomes an important factor for elections. Many people believe that VAT will have a bad effect on aggregate consumption and will weaken economic growth. Also, a reduction in the VAT rate is sometimes an argument for strengthening economic growth by stimulating aggregate consumption under a recession. Miki (2011) told that although there is a decline of overall consumption and economic expansion after implementing GST, there is also a rise of overall consumption and economic expansion before the raise of GST. This will offset the negative effect after the raise. Other economists say that effect of the VAT rate is only temporary therefore we should not fear about it.

Logically, if there is an announcement that government will implement the VAT, definitely people will purchase those items which can be stocked before the rise of the VAT rate. Subsequently, after the implementation of VAT, the aggregate consumption will decline because people will use their stock that purchase before VAT instead of buying new items. In this case, the economic growth will decline. After that, the aggregate consumption will grow up gradually as people run out of their stock and need to buy new items. Thus, the effect of the change of the VAT is easily understood theoretically, but it is difficult to grasp the significance of this effect in practice. It goes without saying that aggregate consumption and economic growth are not determined only by the change in the VAT rate. Hamburger (1954) and Barro (1991) showed that the

aggregate consumption is determined by the income, wealth, interest rates and the age distribution of the population.

2.3 Review of Relevant Theoretical Models

2.3.1 Traditional Phillips Curve

Roeger and Herz (2012) asserted that the traditional Phillips curve tells us that inflation is a backward-looking phenomenon, produced by price-setting behaviour based on a backward-looking rule of thumb. Therefore, traditional Phillips curve is determined by cyclical indicator and lagged values of inflation. However, the traditional Phillips curve had been theoretically criticised, by the post-war inflation in the United States and Europe.

2.3.2 New Keynesian Phillips Curve

Subsequently, New Keynesian Phillips curve had been developed. Compared to traditional Phillips curve, New Keynesian Phillips curve much more emphasized on modern analysis of inflation. Roberts (1995) termed the “New Keynesian Phillips curve” is a model of price setting based on nominal rigidities, which implies that current inflation is determined by next period’s expected inflation and by real marginal cost as the driving variable. This model is widely used in the analysis of monetary policy, leading Bennett McCallum (1997) to call it “the closest thing there is to a standard specification”. Taylor (1979) and Calvo (1983) deemed that inflation is a forward-looking phenomenon caused by staggered nominal price setting. Whereas, Rotemberg (1982) has the

same perspective with Taylor (1979) and Calvo (1983) that inflation is a forward-looking phenomenon, but he found that inflation is caused by quadratic price adjustment cost. We know firms seldom change their price, but when they do so, definitely they will set their price equal to the average desired price until the next price adjustment. Gordon (2013) opined that the actual price level, in turn, is equal to a weighted average of all prices that firms have set in the past.

2.4 Conceptual Framework

2.4.1 Forward- looking Phillips Curve (New Keynesian)

Robert (1995) explained that the first-order conditions for optimization imply that expected future market conditions matter for today's pricing decision. The model can be solved to yield the standard NKPC that makes the inflation rate (π_t) depend on expected future inflation (π_{t+1}) and the unemployment (or output) gap:

$$\pi_t = \beta_1 \pi_{t+1} + \beta_2 (U_t - U^*_t) + \varepsilon_t \quad (2.1)$$

where U is the unemployment rate. In our notation lower case letters represent first differences of logarithms and upper-case letters represent either levels or log levels. The lower-case π in this study represents the first difference of the log of the price level, and it is not the price level itself. Besides, the constant term is suppressed, and so the NKPC has the interpretation that if $\beta_1 = 1$, then U^*_t represents the NAIRU. Subsequently we show the difference made by the decision whether to treat the NAIRU as a constant or as a Hodrick-Prescott (H-P) trend.

Although there are many criticisms about forward-looking Phillips curves, we still able to study Malaysian case from its perspective. There might

be a possibility that forward-looking Phillips curve is suitable for Malaysian case and able to capture the inflationary behaviour in Malaysia. In short, forward-looking Phillips curve will be included in our study.

2.4.2 Backward-looking Phillips Curve (traditional)

Roeger and Herz (2012) told the world that traditional Phillips curve relates inflation to some cyclical indicator and lagged values of inflation. It implies that inflation is a backward-looking phenomenon, produced by adaptive expectations or by price-setting behaviour based on a backward-looking rule of thumb. Fuhrer (1997) has been criticising the forward-looking term in which there is a central challenge to the NKPC approach to find a proxy for the forward-looking expectations term (π_{t+1}). The standard approach is to use instrumental variables.

The first-stage equation to be included in the two-stage least squares (2SLS) estimation progress is

$$\pi_{t+1} = \lambda \sum_i \lambda_i \pi_{t-1} + \varphi(U_t - U^*_t) \quad (2.2)$$

Substituting the first-stage equation (2) into the second-stage equation (1), we obtain the reduced-form

$$\pi_t = \beta_1 \sum_i \lambda_i \pi_{t-1} + (\beta_1 \varphi + \beta_2)(U_t - U^*_t) + \varepsilon_t \quad (2.3)$$

Thus in practice the NKPC is simply a regression of the inflation rate on a few lags of inflation and the unemployment gap. Fuhrer (1997) explained that some restrictions are necessary in order to separately identify the effects of expected future variables. If the model is specified with unconstrained leads and lags, it will be difficult for the data to

distinguish between the leads, which solve out as restricted combinations of lag variables, and unrestricted lags.

2.4.3 Phillips Curve: Does It Fit or Does It Fail?

In 2008, there was a widespread failure of Phillips Curve research to annotate the behaviour of inflation. An even greater failure of Phillips Curve existed during the 1970s, when the first 1973-75 oil shock caused inflation and unemployment to be positively correlated. Subsequently, Gordon (1977) had developed the empirical triangle model. Phillips Curve was then depended on three elements which are inertia, demand, and supply and in which wages are implicitly solved out of the reduced form. The specification has three distinguishing characteristics. First, the role of inertia is broadly interpreted to go beyond any specific formulation of expectations formation to include other sources of inertia, e.g., explicit or implicit wage and price contracts. Second, the driving force from the demand side is the unemployment or output gap. Third, supply shock variables appear explicitly in the inflation equation rather than being forced into the error term as in the NKPC approach. This general framework can be written as:

$$\pi_t = a(L)\pi_{t-1} + b(L)Dt + c(L)z_t + \varepsilon_t \quad (2.4)$$

As before, lower-case letters designate first differences of logarithms, upper-case letters designate logarithms of levels, and L is a polynomial in the lag operator. Starting in 1975, a new body of research showed that the same possibility of a positive or negative correlation with demand factors such as the unemployment rate had to be true as well for the macroeconomic inflation rate, because of aggregate supply shifts.

Then, a question arises that what actually determines the supply shock and thus the failure of Phillips curve? Other than component costs, rising labour costs, expectations of inflation and the higher indirect taxes will also cause supply shock.

2.4.4 The determinations of inflation (supply side): Rising labour costs, expectation of inflation and high indirect taxes

Brauer (1997) confirmed a link from services sector wages and prices to overall inflation. If compensation growth accelerates in the service producing sector, then growth is likely to show up directly as more rapid inflation in service prices. Moreover, higher hourly labour costs in services can, through their contribution to the production and distribution of goods, indirectly affect goods prices.

The light is further shed on the expectations of inflation. Clark and Davig (2008) concluded that long-term expectations track closely the unobserved trend that is an important factor in inflation dynamics, implying that changes in long-run expectations can lead to persistent movements in inflation. On top of that, shocks to either measure of expectations lead to a rise in the other measure and some limited pass-through to inflation. Shocks to inflation cause both short and long-term expectations to rise. Other factors such as monetary policy, economic activity, and food price inflation also affect expectations and inflation. Expectations of inflation are very important in forming what actually happens to inflation. When people view that prices are increasing for daily goods, they will then concern about the effects of inflation on their standard of living.

Erwan and Lalliard (2014) highlighted the changes in indirect taxation influence prices because the after-tax price paid by the consumer is the sum of the before-tax price, whose payment is kept by the merchant as earnings, and taxes. Indirect taxes comprise taxes that are proportional to the value of the good, such as value added tax (VAT), and excise duties, which are charged per unit of the good sold.

2.4.5 How VAT fit in inflation by using New Keynesian Phillips Curve

Finally, we will use the New Keynesian Phillips curve Model to investigate inflationary consequence of VAT. As mentioned above that inflation is not only influenced by the lagged values of inflation but also the expectation of future inflation. It is same to how VAT affects inflation. First, inflation is determined by the lagged inflation, people will determine the inflation based on past inflation. On top of that, when government announces that VAT will start in next year, definitely VAT will create the ex post behaviour for people to expect that inflation will be higher in the future. Therefore, it makes us very interested to examine how the VAT can fit in inflation by using the New Keynesian Phillips Curve model and this is also one of the main motivation for our final year project.

CHAPTER 3: METHODOLOGY

3.0 Introduction

In Chapter 3, we will discuss about the methodology that had been used for our research. In this chapter, we will cover the model, preliminary test, ordinary least square (OLS) estimation, diagnostic checking for ordinary least square (OLS), estimation method for generalized method of moments (GMM), the diagnostic checking for generalized method of moments (GMM) such as J-test and the sources of our data.

3.1 The Model

In our research, we start our model with traditional backward-looking Phillips Curve:

$$\pi_t = \beta_1\pi_{t-1} - \beta_3\mu_t + \varepsilon_t \quad (3.1)$$

This is because the inflation will not only be affected by the unemployment but also its own past value. Plus, backward-looking Phillips curve was found to cope well with the price inflation and other economic variables but according to the New Keynesian Phillips curve (NKPC), the expectation of the inflation rate is also an important factor that will affect the current inflation rate. Therefore, we come out with a new model:

$$\pi_t = \beta_1\pi_{t-1} + \beta_2\pi_{t+1} - \beta_3\mu_t + \varepsilon_t \quad (3.2)$$

This new model not only includes the backward-looking Phillips curve, but also includes the forward-looking Phillips curve into our model. Hence, this new model will be more appropriate to our research.

In order to achieve our objective of examining the relationship between the inflation rate and the impending implementation of GST in Malaysia, the variable TAX_t had been created. TAX_t represents the $\frac{\text{sales and services tax revenue}}{\text{consumption}}$. The reason we created this variable is to enable us to make a comparison between the sales and services tax and the GST. Besides, this variable is needed because Malaysia currently does not have a GST. Therefore, we have to take the sales and services tax revenue as a proxy for GST. In our research, we had divided the sales and services tax revenue with the consumption because the GST is based on the amount of consumption we made. Moreover, the division of sales and services tax revenue with the consumption also will provide us the actual tax rate that we currently pay based on the consumption we made.

In order to fully capture the inflation rate, we had also included some other variables like consumption, real effective exchange rate, oil price, crisis, interactive term of interest rate multiplied with $\frac{\text{sales and services tax revenue}}{\text{consumption}}$ and producer price index. Therefore, we had separated our variables into demand pull inflation and supply push inflation. Demand pull inflation means that there is too much money chasing too few goods which cause the price of the goods to increase due to the supply of the goods less than the demand of goods. In our research, we only have three demand pull variables which are unemployment, $\frac{\text{sales and services tax revenue}}{\text{consumption}}$ and consumption. On the other hand, supply push means the type of inflation which is caused by increases in the cost of goods or services where no suitable alternative is available. In our research, we have five supply push variables which are real effective exchange rate, oil price, crisis, interest rate and producer price index. Hence, we created the following model:

$$\pi_t = \beta_1\pi_{t-1} + \beta_2\pi_{t+1} - \beta_3\mu_t + \beta_4\Delta TAX_t + \beta_5CON_t + \beta_6\Delta LREER_t + \beta_7\Delta LOIL_t - \beta_8CRISIS_t - \beta_9\Delta R_{TB_t} + \beta_{10}\Delta LPPI_t + \varepsilon_t \quad (3.3)$$

Where $\beta_1\pi_{t-1}$ represents the lagged GDP Deflator of Malaysia at time t-1, $\beta_2\pi_{t+1}$ represents the lead GDP Deflator of Malaysia at time t+1, $\beta_3\mu_t$ represents the unemployment rate of Malaysia which the trend had been removed at time t, $\beta_4\Delta TAX_t$ represents the first differences of $\frac{\text{sales and services tax revenue}}{\text{consumption}}$ of Malaysia at time t, β_5CON_t represents the consumption of Malaysia which the trend had been removed at time t, $\beta_6\Delta LREER_t$ represents the first differences of log real effective exchange rate of Malaysia at time t, $\beta_7\Delta LOIL_t$ represents the first differences of log oil price of Malaysia at time t, $\beta_8CRISIS_t$ represents the first differences of crisis of Malaysia at time t, $\beta_9\Delta R_{TB_t}$ represents the interactive term of interest rate multiplied with $\frac{\text{sales and services tax revenue}}{\text{consumption}}$ at time t, $\beta_{10}\Delta LPPI_t$ represents the first differences of log producer price index of Malaysia at time t, (while $t=1 \dots T$). The ε_t represents the error term at time t.

3.2 Variables description

The following is the description of the dependent and independent variables:

GDP Deflator (π_t) – GDP Deflator is used to estimate the price inflation or deflation with respect to a specific base year; the GDP deflator will be equal to 100 when it is in its base year. Unlike the CPI, the GDP deflator is different compared to CPI because CPI is based on a fixed basket of goods and services. On the other hand, the GDP deflator's "basket" is able to change from year to year with people's different perception in consumption and investment patterns. (Ian, 2009)

Unemployment Rate (μ_t) – Unemployment rate is the ratio of the number of people who are jobless to the number in the labor force. Normally, government will try to maintain a 4% or less than 4% unemployment rate in order to encourage economic growth.

Tax (TAX_t) – TAX_t is the ratio of sales and services tax revenue to consumption. TAX_t is created in order to examine the portion of sales and services tax paid by the consumer compared to their consumption.

Consumption (CON_t) – Consumption is the portion of income that is used by the consumer for spending purposes. Consumption is the total saving deducted by the total income of the consumer.

Real Effective Exchange Rate ($LREER_t$) - The weighted average of a country's currency compared with the index or basket of other types of currencies that had adjusted for the impact of inflation. Moreover, the weights are then resolved by making comparison between the relative trade balances, in terms of one country's currency, with another country within the index.

Oil Price ($LOIL_t$) – The price for petroleum. The changes in oil price may significantly affect the macroeconomic variables.

Crisis ($CRISIS_t$) - A crisis is an event that is expected to cause an unstable and dangerous situation that may affect the whole society. Most of the time, crises will have a negative effect in the economy. We found that there is a crisis between June 1997 to January 1998 and August 2007 to September 2008 (Elliott, 2011)

Interest Rate (R_{TB_t}) – This is an interactive term of multiplication of the TAX_t and the interest rate. The reason we include this term is to examine how the government react through interest rate when there is an inflation which is caused by the adjustment of the sales and services tax. Interest rate can be defined as a cost of borrowing or an income. Therefore, the changes in the interest rate may directly affect the economic condition of a country.

Producer Price Index ($LPPI_t$) - The Producer Price Index measures the average differences in prices obtained by domestic producers for their output over time. This is important as it may affect the cost of the producer.

According to the Phillips curve, the expected sign for the unemployment to inflation is negative. This is because when unemployment rate increases, there are more workers are unemployed and the demand for the output of the firm will drop. As a result, the supply will be more than demand and this causes the price to drop. Besides, the expected sign for $\frac{\text{sales and services tax revenue}}{\text{consumption}}$ is positive. This is because when the sale and services tax revenue increases and consumption is assumed to be constant; the price of the goods will also increase. This is due to the sales and services tax revenue is mainly dependent on the sales itself. So, the higher the sales and services tax revenue, the higher is the price of the goods. Hence, the inflation rate will also increase. Next, the expected sign for the consumption is also positive. This is because the higher the consumption, the higher the demand for the goods. This will cause the demand to be more than the supply and cause the price of the goods to increase. Therefore, inflation rate will be higher.

Moreover, the expected sign for the real effective exchange rate is also positive. This is because when the real effective exchange rate increases, the cost of import

the input will increase. Due to the increase in the cost of production, the producer will charge a higher price on the consumer and cause the inflation rate to increase.

Furthermore, the expected sign for the oil price is also positive. This is because the production cost will increase when the oil price increases. For the sake of maximizing their profit, producer will charge a higher price on the consumer and cause the inflation rate to increase. Other than that, the expected sign for the crisis is negative. This means that when there is a crisis in the economy, the unemployment rate will increase, the workers that are unemployed will lose their income and the demand for the goods will decrease. As a result, the supply will be more than demand and the price of the goods will decrease and cause the inflation rate to decrease. Next, the expected sign for the interest rate multiplied with $\frac{\text{sales and services tax revenue}}{\text{consumption}}$ is also negative. This is because when the sales and services tax revenue increases, the inflation rate will also increase. In order for the central bank to control the inflation, contractionary monetary policy will be implemented by central bank. This is because by implementing contractionary monetary policy will cause the interest rate to increase. Hence, people tend to take less loan from the bank. As a result, the consumption in the economy will decrease and cause the supply to be higher than the demand. Therefore, the price of the goods will decrease and inflation rate will also decrease. Moreover, the expected sign for the producer price index is positive. This is because when the producer price index increases, this implies that the selling price will also increase and inflation rate will increase.

3.3 Preliminary Analysis

3.3.1 Unit Root Test

Stationarity is a very important issue in time series analysis. This is because the stationarity of the series may significantly affect the result

of the research. Stationarity is the reversion in that the data fluctuates around a constant long run mean. Therefore, we may use the unit root test to examine the stationarity and the order of integration the non-stationary time series model. A series that do not have a unit root will be preferred because the absence of unit root means that the series do not depends on time and the effect of shock dissipates over time. There are three kinds of unit root test which are Dickey-Fuller unit root test (1979), Augmented Dickey-Fuller unit root test (1981) and Phillips-Perron unit root test (1988).

Among the three unit root test, the most popular unit root test that had been used by the researchers is Augmented Dickey-Fuller (ADF) unit root test. This is because ADF test is available for a big sample size series and includes the dynamic effect which does not exist in the Dickey-Fuller (DF) test. The ignorance of dynamic effect will cause the error in the model become not normally distributed or white noise. Plus, it may also cause an autocorrelation problem.

To demonstrate the important statistical issues that are related with autoregressive unit root tests, let's consider the simple AR(1) model:

$$y_t = \phi y_{t-1} + \varepsilon_t, \varepsilon_t \sim \text{WN}(0, \sigma^2) \quad (3.4)$$

The null and alternative hypothesis will be

$$H_0 : \phi = 1 (y_t \text{ is not stationary})$$

$$H_1 : |\phi| < 1 (y_t \text{ is stationary})$$

The test statistic is

$$t_{\phi=1} = \frac{\hat{\phi} - 1}{SE(\hat{\phi})}$$

Where $\hat{\phi}$ is the least squares estimate and $SE(\hat{\phi})$ is the usual standard error estimate. The reason the ϕ have to be less than 1 is if the ϕ is 1 or more than 1, y_t will fall outside the unit circle and cause y_t to become not stationary. On the other hand, if the ϕ is less than 1, y_t will fall inside the unit circle and cause y_t to become stationary. (Zivot and Wong, 2006).

3.3.2 Hodrick–Prescott Filter

In a time series model, we may apply Hodrick–Prescott (HP) filter to remove the cyclical component from the raw data. HP filter is a mathematical tool that is usually used in macroeconomics to remove the cyclical component of the data. HP filter is first proposed in 1923 by E. T. Whittaker. In 1990s, this filter had been popularized in the economics field by Robert J. Hodrick and Nobel Memorial Prize winner Edward C. Prescott. By using a HP filter, smoothed-curve representation of time series model can be retrieve and cause it to be more responsive to long-run than to short-run fluctuations. By modifying the multiplier, the sensitivity of the trend to short-run fluctuations will be adjusted.

Conceptually, Hodrick–Prescott filter consists of trend component and cyclical component.

$$y_t = \tau_t + c_t \quad (3.5)$$

Where τ_t is the trend component and c_t is the cyclical component. Suppose there is a suitably chosen, positive value of λ , there exists a trend component that will solve

$$\min_{\tau} (\sum_{t=1}^T (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} [(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2) \quad (3.6)$$

The first part of the equation represents the sum of the squared deviations $d_t = y_t - \tau_t$ which penalizes the cyclical component. The second part represents the sum of squares of the trend component's second differences multiply by λ . This second part penalizes the variations in the growth rate of the trend component. Therefore, the larger the value of λ , the higher the penalty. (Morten and Harald, 2002).

3.4 OLS Estimation

We had used OLS as our preliminary estimation method in order to examine the effect of GST on inflation. OLS estimation is a method commonly used by the researchers but in our research, OLS estimator is not that appropriate because the OLS estimator ignores the error-component structure of the model. Therefore, it will be inefficient. Plus, things are quite different when the model includes a lagged dependent variable. For example,

$$\pi_{i,t} = a_i + \gamma\pi_{i,t-1} + \varepsilon_{i,t} \quad (3.7)$$

It is obvious that this OLS estimator for this model has serious biased problem because the correlation of the lagged dependent variable with the individual specific effect (a_i) is either random or fixed. Since $\pi_{i,t}$ is a function of a_i , then $\pi_{i,t-1}$ is a function of a_i as well. Therefore, $\pi_{i,t-1}$, which is a independent variable in the model, is correlated with the error term and this will cause OLS estimators to be biased and inconsistent even if the error terms are not serially correlated. Therefore, Generalized Method of Moments (GMM) should be implemented in our research.

3.5 Diagnostic Checking for OLS Estimation

In order to ensure the validity of our estimation result, several diagnostic checking had been carried out to examine the three major problems that may occur in our model. They are normality, autocorrelation and heteroscedasticity problem.

The normality of a model is important because if the error term is not normally distributed, then it must not be implemented in any other tests like Z test, t tests, F tests and chi-squared tests. Besides, if the error term is not normally distributed, this means that the dependent variable or at least one independent variable is in the wrong functional form, or important variables had been omitted.

Next, autocorrelation problem happens when error terms are correlated to each other. Autocorrelation problem should be avoided because if autocorrelation problem occurs, our standard error will not be efficient anymore. As a result, the whole model will become biased, inefficient and inconsistent. Plus, the result we produce will also be misleading.

Heteroscedasticity problem happens when the variance of the error terms are not consistent over time. The inconsistency of the variance may cause our hypothesis testing to become invalid. Therefore, we need to apply Newey-West HAC procedure to converge the biased standard error to its true value so that our hypothesis testing will be valid.

For the diagnostic checking, we had applied the Jarque-Bera (JB) test to identify for the normality of the error term. The null hypothesis for JB test is the error term is normally distributed. Besides, we have applied Breush-Godfrey Serial

Correlation test to examine the autocorrelation problem. The null hypothesis for Breush-Godfrey Serial Correlation test is there is no autocorrelation problem. Lastly, we applied Autoregressive Conditional Heteroscedasticity (ARCH) test to test for the heteroscedasticity problem. The null hypothesis is there is no heteroscedasticity problem.

3.6 Generalized Method of Moments (GMM)

GMM estimation was developed by Hansen in 1982, and after that, GMM estimators has become a widely used method of estimation in economics and finance field. This is because GMM estimators have large sample properties that can easily categorize in ways that make the comparison less complicated. This estimator can be studied a priori in ways that make asymptotic efficiency comparisons easy. This method can also provide a natural way to construct tests which take into account of both sampling and estimation error.

In practice, GMM estimators are popular among researchers because it can be constructed without determining the full data generating process unlike the Maximum likelihood estimator. This characteristic has been exploited in analyzing partially specified economic models, in studying potentially misspecified dynamic model designed to match target moments, and in constructing stochastic discount factor models that tie asset pricing with the sources of macroeconomic risk.

Consider the linear regression model:

$$y_t = z_t' \delta_0 + \varepsilon_t, t=1, \dots, n \quad (3.8)$$

Where z_t is the $L \times 1$ vector of independent variable, δ_0 is a vector of coefficient for the independent variables and ε_t is a random error term. This model enables some or all of the elements of z_t to be correlated with the error term, ε_t , i.e., $E[z_{tk}\varepsilon_t] \neq 0$ for some k . If $E[z_{tk}\varepsilon_t] \neq 0$ then z_{tk} is known as an endogenous variable. If z_t contains endogenous variables, then the least squares estimator of δ_0 will be biased and inconsistent.

Associated with this model, it is considered that there exists a $K \times 1$ vector of instrumental variables x_t which may comprise some or all of the elements of z_t . Let w_t represent the vector of unique and non-constant elements of $\{y_t, z_t, x_t\}$. It is assumed that $\{w_t\}$ is stationary and ergodic stochastic process.

The instrument variables x_t satisfy the set of K orthogonality condition

$$E[g_t(w_t, \delta_0)] = E[x_t\varepsilon_t] = E[x_t(y_t - z_t'\delta_0)] = 0 \quad (3.9)$$

where $g_t(w_t, \delta_0) = x_t\varepsilon_t = x_t(y_t - z_t'\delta_0)$. After expanding it, gives the relation

$$\Sigma_{xy} = \Sigma_{xz}\delta_0 \quad (3.10)$$

where $\Sigma_{xy} = E[x_t y_t]$ and $\Sigma_{xz} = E[x_t z_t']$. For identification of δ_0 , it is required that the $K \times L$ matrix $E[x_t z_t'] = \Sigma_{xz}$ be of full rank L . This rank condition ensures that δ_0 is a unique solution. Note, if $K=L$, then Σ_{xz} is invertible and δ_0 may be determined using

$$\delta_0 = \Sigma_{xz}^{-1}\Sigma_{xy} \quad (3.11)$$

A necessary condition for the identification of δ_0 is the order condition

$$K \geq L \quad (3.12)$$

which simply states that the number of instrument variable must be greater than or equal to the number of explanatory variables in the first model. If $K=L$ then δ_0 is said to be just identified; if $K > L$ then δ_0 is said to be over-identified; if $K < L$ then δ_0 is not identified (Zivot and Wong, 2006).

3.7 Diagnostic Checking for Generalized Method of Moments

3.7.1 J-Test

In a GMM context, when the parameters to be estimated is less than the moment conditions, a chi-square test can be used to test the over-identifying restrictions and this test statistic is known as J-Statistic. The main purpose of conducting a J-Test is to identify whether the model's moment conditions match the data well or not. The value of the J-Test must be a positive value. Therefore, the null hypothesis of the J-Test will be the model is valid, whereas, the alternative hypothesis will be the model is not valid. Hence, we will reject the null hypothesis when the value of the J-Test is lower than 0.1 significance level. This means that the model is not valid. On the other hand, we will not reject the null hypothesis when the value of the J-Test is higher than 0.1 significance level. This means that the model is valid.

3.8 Data Collection

In this research, we had chosen to use a time series data to do our empirical testing because in order to examine the effect of inflation that is caused by Goods and Services Tax (GST), changes in the particular time period will have a more important effect compared to the changes in the independent variables. Therefore, we had decided to use a quarterly basis data for a period of 14 years which is from 1998 to 2011 to do our empirical testing. As a result, we had a sample size of 56 observations. Besides, all of the data that we employed are secondary data that we obtained from the International Monetary Fund (IMF) and Bank Negara Malaysia (BNM).

3.8.1 Secondary Data

A secondary data is a kind of data that is collected for other purposes. This data is mainly collected by government agencies, universities, private organizations or even students every day in order to identify the current situation of the world and come out with appropriate decision to solve it. There are many advantages of using secondary data such as it is less time consuming and lower cost. This is because most of these secondary data can be easily obtained from internet or some relevant journals. Besides, secondary data also allow the researcher to cover a larger geographic range. Compared to primary data, secondary data enable the researchers to get the data from different countries in order for the researchers to compare among countries. However, secondary data also has some drawbacks like it may not be reliable. This is because the perception of the author may influence the accuracy of the secondary data.

In our research, secondary data had been employed. The secondary data that we employed is mainly obtained from the International Monetary Fund (IMF) and Bank Negara Malaysia (BNM). These data include consumer price index (CPI), real effective exchange rate (REER), oil price, GDP deflator, producer price index (PPI), unemployment rate and others. The sample period of this research is from 1998Q1 to 2011Q4 which is the year just after the Asian Financial Crisis to the recent year. Plus, quarterly data had been used; this may help us to have a clearer view on the movement of the economy. The total observations of our study are 56 and this is considered to be a big sample. A bigger sample is better because it may give us more information which may help us in the decision making process.

3.9 Conclusion

In conclusion, we had illustrated the source of our data and the procedure of processing the data by using the OLS and GMM. Besides, we had also run the diagnostic checking for the OLS and GMM in order to examine the econometric problem and validity of our variables. Next, the empirical result will be further illustrated in Chapter 4.

CHAPTER 4: RESULT

4.0 Introduction

The objective of this chapter is to make clear on the following questions, how much will the inflation rise following the introduction of GST in Malaysia? What are the short term and long term impact on inflation? Several previous studies have already provided convincing proofs to these questions. However, we have used a different method to measure the cause of GST on the inflationary effect to economy of Malaysia.

We have used the data which are extracted from IMF International Financial Statistic (IFS). The data consists of 56 observations started from 1998Q1 to 2011Q4. These data were analysed by using E-views 6, software that are mainly for general statistical analysis and econometric analysis.

4.1 Preliminary Analysis

4.1.1 Introduction of Stationarity Checking

We started our analysis with the unit root test which is the Augmented Dickey Fuller (ADF) test to identify the stationary status of all variables. These variables consist of GDP deflator, unemployment rate, tax, consumption rate, real effective exchange rate, oil price, Treasury bill rate and the producer price index. Table 4.1 in the next page represents all the results of ADF test we have conducted.

Table 4.1 ADF Unit Root Test Results

Variables	Augmented Dickey-Fuller			
	Level		First Difference	
	Intercept	Trend + Intercept	Intercept	Trend + Intercept
(GDP deflator) / inflation	-3.0699**	-3.1539*	-8.3685***	-8.3548***
(Unemployment rate) U_cycle	-6.2173***	-6.1665***	-7.1375***	-7.0698***
(Tax)	-0.9349	-3.2498*	-5.602***	-5.7728***
(Consumption) C_cycle	-5.4038***	-5.3534***	-4.1467***	-4.1326***
(REER)	-1.8173	-1.92	-7.4999***	-7.4748***
(Oil Price)	-1.0869	-4.6282	-7.4024***	-7.3329***
(Producer Price Index)	-0.3479	-0.33913	-5.0718***	-5.0139***

Note 1: The asterisks *, **, *** indicate rejection of the null hypothesis at 10%, 5% and 1% level of significance respectively.

Note 2: ADF test applied with maximum 10 lags length with automatic selection of SIC.

4.1.2 Evaluation of Stationary Test

For the null hypothesis, the variable is not stationary; while the alternative hypothesis is the variable is stationary. We will reject the null hypothesis if p-value of the variable is less than 10%, 5% and 1% of significant level, then the variable will be stationary.

According to the results shown in Table 4.1, there is only one variable that is stationary at 1%, 5% and 10% significant level. That variable is GDP deflator. This implies that the variable is stationary at their level form with $I(0)$.

On the contrary, ADF test shows that there are four variables that are not stationary in either 1% or 5% significant level. These variables consist of tax, real effective exchange rate, oil price and the producer price index. However, four of these variables are significant at first difference with $I(1)$. Besides, the unemployment rate and consumption rate are in the first difference form after we applied Hodrick-Prescott (HP) filter on them. This is because HP filter has eliminated the cyclical components of unemployment rate and consumption. Therefore, we do not need to use unit root test. U_Cycle and C_Cycle.

4.2 Why is OLS Estimations not suitable to measure the inflationary effect on GST?

4.2.1 Introduction

In the beginning stage of our research, we have conducted both backward-looking model and forward-looking model with the OLS estimations. Previously, researchers have used OLS to estimate the determinants of VAT for other countries. We have decided to follow their footsteps and use the OLS estimations.

Table 4.2 and Table 4.3 show the OLS estimation result of backward-looking and forward-looking model, respectively.

Table 4.4 and Table 4.5 show the result of diagnosis checking for backward-looking model and forward-looking model, respectively.

4.2.2 Evaluation of OLS Estimation

Backward-Looking

Based on the equation 1 in Table 4.2, we can see that both highlighted results of the variables are significant. When lagged inflation rate increases by 1 percentage point, on average the estimated inflation will increase by 0.82 percentage point. On the other hand, when unemployment decreases by 1 percentage point, estimated inflation will increase by 0.03 percentage

point. From the highlighted results shown in equation 2, we found that the tax variable is not statistically significant. In fact, the tax variable is not significant at all from equation 1 to equation 8. This might be due to the potential existence of endogeneity problem and causes the OLS estimation to be invalid.

Forward-Looking

From the equation 1 in Table 4.3, we can see the highlighted results of lead inflation is statistically significant at 1%, 5% and 10% level of significance. We learned that when lead inflation rate increases by 1 percentage point, on average the estimated inflation will increase by 0.86 percentage point, holding other variables constant. However, we found that unemployment rate in the equation 1 is not significant. In addition, the variable that we are interested in – Tax, has very minimal impact on the GDP deflator due to the insignificance of variable and the difference in expected sign from equation 1 to equation 8. This problem applies to the other variables in OLS estimation for forward-looking.

Based on the results from Table 4.2, Table 4.3, Table 4.4 and Table 4.5, we conclude that OLS estimation is not suitable for determining the inflationary effect on GST. There are four reasons to prove that the statement we have made is valid. The first reason is majority of the equations from both backward-looking and forward-looking's estimation results are not normally distributed. Secondly, autocorrelation problem can be found in most of the estimation results, at 5% significant level. Besides, heteroscedasticity problem can also be found at 10% significant level.

Thirdly, we have discovered that most of the variables are not statistically significant in their respective equations. The estimation results

become meaningless and they will mislead us in measuring the inflationary effect on GST. The fourth problem happens in the forward-looking model, we learned that the data of $\beta^2(\pi_{(t+1)})$ as ex-ante is supposed to be forecasted. However, while using OLS estimation, it will result in data problem due to OLS will only use existing data to estimate. Practically, we will get autocorrelation problem if we insist to use OLS model to run the data of $(\pi_{(t+1)})$. Later on, we proceed to use GMM estimation since OLS estimation provides meaningless result.

Table 4.2 OLS Estimation Result (Backward-looking)

Equation	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable								
Sample	1998:1	1998:1	1998:1	1998:1	1998:1	1998:1	1998:1	1998:1
Period	2011:4	2011:4	2011:4	2011:4	2011:4	2011:4	2011:4	2011:4
$\hat{\beta}_1$ (π_{t-1})	0.8224*** (0.0692)	0.8224*** (0.07)	0.8213*** (0.0728)	0.813*** (0.0728)	0.8271*** (0.0557)	0.7949*** (0.0602)	0.8298*** (0.0675)	0.7894*** (0.0617)
$\hat{\beta}_2$ (Unemployment)	-0.0285* (0.0149)	-0.0285* (0.0152)	-0.0282* (0.0158)	-0.032* (0.016)	-0.0202 (0.0123)	-0.0228* (0.0124)	-0.0209 (0.0125)	-0.0186 (0.0112)
$\hat{\beta}_3$ (Tax)	-	0.0022 (0.2589)	0.0058 (0.2677)	-0.0218 (0.2673)	0.1989 (0.2078)	0.1531 (0.2089)	0.1437 (0.2085)	0.2499 (0.1896)
$\hat{\beta}_4$ (Consumption)	-	-	0.0073 (0.1181)	-0.0077 (0.1182)	0.1567 (0.0945)	0.0982 (0.1032)	0.0748 (0.105)	0.0496 (0.0945)
$\hat{\beta}_5$ (LREER)	-	-	-	0.3286 (0.268)	0.3906* (0.2053)	0.4096* (0.2041)	0.446** (0.2061)	0.4312** (0.1851)
$\hat{\beta}_6$ (Oil Price)	-	-	-	-	0.1511*** (0.025)	0.1365*** (0.0271)	0.1404*** (0.0272)	0.0499 (0.0355)
$\hat{\beta}_7$ (Crisis)	-	-	-	-	-	0.0201 (0.0149)	0.0222 (0.015)	0.0149 (0.0136)
$\hat{\beta}_8$ (Tax * Interest Rate)	-	-	-	-	-	-	-0.0073 (0.0065)	-0.0108* (0.0059)
$\hat{\beta}_9$ (Producer Price Index)	-	-	-	-	-	-	-	0.8260*** (0.2356)
Adjusted R ²	0.5561	0.5561	0.5561	0.5346	0.7528	0.7320	0.7335	0.7851
D.W. Test Stat.	1.3187	1.3185	1.3165	1.3373	1.4374	1.4976	1.5213	1.8351

Note 1: The asterisks *, **, *** indicate rejection of the null hypothesis at 10%, 5% and 1% level of significance respectively, standard error in parentheses.

Table 4.3 OLS Estimation Result (Forward-looking)

Note 1: The asterisks *, **, *** indicate rejection of the null hypothesis at 10%, 5% and 1% level of significance respectively, standard error in parentheses.

Equation	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable								
Sample	1998:1	1998:1	1998:1	1998:1	1998:1	1998:1	1998:1	1998:1
Period	2011:4	2011:4	2011:4	2011:4	2011:4	2011:4	2011:4	2011:4
$\hat{\beta}_1$	0.8553***	0.8489***	0.8360***	0.8296***	0.8800***	0.8313***	0.7912***	0.7943***
(π_{t+1})	(0.0746)	(0.0772)	(0.0763)	(0.0778)	(0.0880)	(0.0966)	(0.0989)	(0.1162)
$\hat{\beta}_2$	-0.0128	-0.0123	-0.0064	-0.0082	-0.0100	-0.0138	-0.017	-0.017
(Unemployment)	(0.0156)	(0.0161)	(0.0162)	(0.0167)	(0.0167)	(0.0169)	(0.0168)	(0.017)
$\hat{\beta}_3$	-	-0.0348	0.0647	0.0518	-0.0089	-0.0535	-0.0226	-0.0257
(Tax)		(0.2714)	(0.2735)	(0.2765)	(0.2798)	(0.2811)	(0.2781)	(0.287)
$\hat{\beta}_4$	-	-	0.1961	0.1889	0.1308	0.0636	0.1037	0.1041
(Consumption)			(0.1177)	(0.1194)	(0.1282)	(0.1394)	(0.1401)	(0.1419)
$\hat{\beta}_5$	-	-	-	0.1476	0.0992	0.1407	0.0862	0.085
(LREER)				(0.2792)	(0.2808)	(0.2817)	(0.2803)	(0.2843)
$\hat{\beta}_6$	-	-	-	-	-0.0461	-0.0530	-0.0487	-0.0469
(Oil Price)					(0.0382)	(0.0385)	(0.0381)	(0.0515)
$\hat{\beta}_7$	-	-	-	-	-	0.0244	0.0189	0.0189
(Crisis)						(0.0204)	(0.0204)	(0.0207)
$\hat{\beta}_8$	-	-	-	-	-	-	0.0121	0.0122
(Tax * Interest Rate)							(0.008)	(0.0082)
$\hat{\beta}_9$	-	-	-	-	-	-	-	-0.0212
(Producer Price Index)								(0.4047)
Adjusted R ²	0.5234	0.5118	0.537	0.5396	0.5528	0.5658	0.5859	0.586
D.W. Test Stat.	1.1787	1.1756	1.2618	1.2607	1.4995	1.4688	1.5487	1.5518

Table 4.4 Diagnosis Checking for OLS (Backward-Looking) [P-Value]

Equation	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LM Test (1)	0.0077	0.0077	0.0073	0.0102	0.0249	0.0442	0.0705	NA
LM Test (2)	0.0288	0.0286	0.0272	0.0360	0.0192	0.0326	0.0510	0.5728
LM Test (3)	0.0647	0.0644	0.0618	0.0810	0.0461	0.0704	0.1045	0.7512
ARCH Test (1)	0.9066	0.9067	0.9069	0.9245	0.4094	0.4340	0.3867	0.6844
ARCH Test (2)	0.4309	0.4327	0.4384	0.4672	0.1054	0.0897	0.0309	0.6115
ARCH Test (3)	0.4953	0.4973	0.5044	0.4420	0.2002	0.1592	0.0727	0.7815
Jacque-Bera	0.0607	0.0604	0.0574	0.126	0.0009	0.0007	0.0020	0.6094

Note: LM test & ARCH test (1), (2), and (3) represents lag one to lag three.

Table 4.5 Diagnosis Checking for OLS (Forward-Looking) [P-Value]

Equation	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LM Test (1)	0.0048	0.0047	0.0269	0.0267	0.1942	0.1441	0.0665	0.0600
LM Test (2)	0.0159	0.0139	0.0576	0.0606	0.3735	0.3107	0.1668	0.1576
LM Test (3)	0.0320	0.0299	0.1231	0.1319	0.5469	0.4800	0.2714	0.2546
ARCH Test (1)	0.7032	0.7127	0.8377	0.7518	0.8393	0.5380	0.5237	0.5203
ARCH Test (2)	0.9230	0.8193	0.8605	0.7436	0.9955	0.8867	0.8161	0.8177
ARCH Test (3)	0.8130	0.9023	0.8104	0.8176	0.7333	0.3697	0.4143	0.4068
Jacque-Bera	0.0105	0.0136	0.0113	0.0123	0.0119	0.0288	0.0709	0.0687

Note: LM test & ARCH test (1), (2), and (3) represents lag one to lag three.

4.3 Generalized Method of Moments (GMM)

4.3.1 Introduction

To deal with the problems we faced using OLS estimation, we apply the GMM estimation, which is efficient in the presence of the arbitrary heteroskedasticity, to address for this issue. In the coming page, Table 4.6 will be displaying the results table for GMM estimation.

4.3.2 Evaluation of GMM Estimation

Since the OLS model we used earlier is full with econometric problems and the insignificance of variables, we proceed to the GMM estimation. Table 4.6 shows our GMM estimation result of the expected inflation rate due to implementation of GST.

By looking at our GMM estimation, it shows improvement compared with OLS estimations that suffered from econometric problems. As the result shown in Table 4.6, we only include three variables in the first model which are lagged inflation rate, lead inflation rate and unemployment rate. We found that when the lagged inflation rate increases by 1 percentage point, on average the inflation rate will increase by 0.5772 percentage point. Due to the reverse relationship between lagged inflation rate and lead inflation rate, when lead inflation rate increases by 1 percentage point, on average, the estimated inflation rate will increase by 0.4228 percentage point. For unemployment rate, when it increases by 1

percentage point, on average the estimated inflation rate will decrease by 0.0361 percentage point, holding other variables constant.

Subsequently, we included an additional variable (sales and services tax revenue)/consumption, (TAX) into the equation 2. This affects the lagged inflation rate to decrease by 0.0493 percentage point compared with the previous equation. On the other hand, the lead inflation rate increases by 0.0493 percentage point after we added the variable, tax into equation 2. Lastly, the unemployment rate also got affected and increases by 0.004 percentage point. In the following step, we introduced a new variable which is consumption and form the equation 3. As a consequence, the lagged inflation rate increased by 0.0057 percentage point due to the introduction of consumption. In contrast, unemployment rate has a slight increase of 0.0101 percentage point compared with the one in equation 2. Finally, we can see that the tax has also decreased by 0.3049 percentage point.

From equation 4, we inserted the real effective exchange rate which we expected it to be an important variable to our estimations. The lagged inflation rate shows that there is a slight decrease from 0.5336 percentage point to 0.5 percentage point after we included the new variable. In contrast, the lead inflation rate shows that it increases by 0.0135 percentage point. We discovered that the unemployment rate decreases significantly by 0.0136 percentage point compared with the result in equation 3. For tax rate, it decreases from 0.6071 percentage point to 0.7446 percentage point. Last but not least, the consumption actually increased by 0.144 percentage point after real effective interest rate was introduced.

After real effective exchange rate was added into the model, it is then followed by oil price, crisis, production price index and an interactive

term between interest rate and tax. After every variable is added into the model, the coefficients of the variables start to fluctuate and give us different value to indicate the effect of those variables to the expected inflation rate. Out of the 8 equations that we had estimated through GMM, we had decided to choose equation 8 as our model for this research project. This is because it had included all of the relevant variables that may affect the inflation rate. Besides, this model also gives us the correct expected sign which we had mentioned in the chapter 3.

In equation 8, we found that when lagged inflation rate increases by 1 percentage point, on average the expected inflation rate will increase by 0.4881 percentage point. Due to the reverse relationship between lagged inflation rate and lead inflation rate, when lead inflation rate increases by 1 percentage point, on average the expected inflation rate will increase by 0.51 percentage point. In addition, when unemployment rate increases by 1 percentage point, on average, the expected inflation will decrease by 0.0077 percentage point. This is consistent with the theory stated in the Phillips curve. Next, estimated inflation will increase by 0.4232 percentage point when the tax rate increases by 1 percentage point, but due to our average rate for the sales and services tax (SST) over consumption is approximately 4%, therefore, we should multiply this coefficient by 2 (2 is the result of the difference between 6% and 4%, i.e. 6% minus 4% equals 2%) because Malaysia will have a GST rate of 6%. Hence, inflation will be expected to increase by 0.8464 percentage point when GST is implemented. On the other hand, implementation of the GST not only will have a short term effect on inflation, but also a long term effect. In the following content, we will illustrate how the long run effect is obtained.

$$\pi_t = \beta_1\pi_{t-1} + \beta_2\pi_{t+1} - \beta_3\mu_t + \beta_4\Delta TAX_t + \dots + \varepsilon_t \quad (4.1)$$

In long run, the model will not consist of π_{t-1} . Therefore, π_{t-1} will transform into π_t . As our main concern is the tax variable. Hence we will simplify the model up to tax variable only, and formed equation 4.2 – the long run model.

$$\pi_t = \beta_1\pi_t + \beta_2\pi_{t+1} - \beta_3\mu_t + \beta_4\Delta TAX_t \quad (4.2)$$

After that, we proceed further by simplifying the equation 4.2.

$$\begin{aligned} \pi_t - \beta_1\pi_t &= \beta_2\pi_{t+1} - \beta_3\mu_t + \beta_4\Delta TAX_t \\ (1 - \beta_1)\pi_t &= \beta_2\pi_{t+1} - \beta_3\mu_t + \beta_4\Delta TAX_t \\ \pi_t &= \frac{\beta_2\pi_{t+1}}{(1 - \beta_1)} - \frac{\beta_3\mu_t}{(1 - \beta_1)} + \frac{\beta_4\Delta TAX_t}{(1 - \beta_1)} \end{aligned}$$

Then we obtain the tax variable and compute the long run effect.

$$\frac{\beta_4\Delta TAX_t}{(1 - \beta_1)} = \frac{0.4232}{1 - 0.4881}$$

$$= 0.8267 \text{ percentage point}$$

After calculation, we found that the estimated long term inflation rate will increase by 1.6534 percentage point if GST is implemented at 6% (which is roughly 2 percentage point higher than our result). Moreover, when consumption increases by 1 percentage point, on average, the inflation will expected to increase by 0.0999 percentage point which is considered to have a relatively small effect on expected inflation. Furthermore, inflation rate is expected to increase by 0.1381 percentage point when the real effective exchange rate increases by 1 percentage point. Other than that, when oil price increases by 1 percentage point, on average, the inflation will expected to increase by 0.0506 percentage point. For crisis, when

there is a crisis in that quarter, the inflation rate is expected to decrease by 0.0027 percentage point. Plus, if the central bank did offset the inflation by increasing the interest rate, the inflation is expected to decrease by 0.0034 percentage point, otherwise, the inflation rate will be expected to remain constant. Lastly, when producer price index increases by 1 percentage point, on average, the inflation is expected to increase by 0.098 percentage points, holding other variables constant.

Towards the end of our research, we discovered all the p-value of J-statistics for GMM estimation are all more than 10%, 5% and 1% significant level. Therefore we can conclude that the overall equations are valid. Besides we also conclude that our GMM estimations are all normally distributed and free from econometric problems. However, our model has a downside which is too sensitive to the instrument variables. Based on the result in Table 4.6, we can see that the p-value of J-stat from equation 1 to equation 8 have been increasing after including additional variables into them. According to Roodman (2009), a p-value as high as 0.25 should be viewed with concern. Taken at face value, it means that if the specification is valid, the odds are only one in four that one would observe a J statistic so large. The warning goes doubly for reviewers and readers interpreting results that may have already passed through filters of data mining and publication bias.

Table 4.6 GMM Estimation Results

Equation	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable								
Sample Period	1998:1 2011:4	1998:1 2011:4	1998:1 2011:4	1998:1 2011:4	1998:1 2011:4	1998:1 2011:4	1998:1 2011:4	1998:1 2011:4
$\hat{\beta}_1$ (π_{t-1})	0.5772*** (0.0485)	0.5279*** (0.0393)	0.5336*** (0.0216)	0.5201*** (0.0326)	0.4642*** (0.0256)	0.5232*** (0.0197)	0.4779*** (0.0198)	0.4881*** (0.0091)
$\hat{\beta}_2$ (π_{t+1})	0.4214	0.4755	0.289	0.4839	0.5647	0.612	0.5703	0.4225
$\hat{\beta}_3$ (Unemployment)	-0.0361*** (0.0129)	-0.0321** (0.0146)	-0.022** (0.0082)	-0.0356*** (0.0081)	-0.0247*** (0.0068)	-0.0396*** (0.01)	-0.0483*** (0.01292)	-0.0077*** (0.0012)
$\hat{\beta}_4$ (Tax)	-	0.9120** (0.4001)	0.6071*** (0.1584)	0.7446*** (0.1932)	0.2388** (0.0901)	0.2846** (0.1287)	0.3561*** (0.1138)	0.4232*** (0.0204)
$\hat{\beta}_5$ (Consumption)	-	-	0.0964* (0.0541)	0.2404*** (0.0542)	0.1048*** (0.0351)	0.5039*** (0.1098)	0.5401*** (0.0824)	0.0999*** (0.0165)
$\hat{\beta}_6$ (LREER)	-	-	-	0.8005*** (0.2374)	0.3498** (0.1729)	0.5549*** (0.1643)	0.4986*** (0.01383)	0.1381*** (0.0150)
$\hat{\beta}_7$ (Oil Price)	-	-	-	-	0.061*** (0.0161)	0.1335*** (0.0333)	0.1464*** (0.0353)	0.0506*** (0.0030)
$\hat{\beta}_8$ (Crisis)	-	-	-	-	-	-0.0163** (0.0079)	-0.0133* (0.0071)	-0.0027** (0.0013)
$\hat{\beta}_9$ (Treasury Bill Rate)	-	-	-	-	-	-	-0.0071* (0.0041)	-0.0034*** (0.0009)
$\hat{\beta}_{10}$ (Production Price Index)	-	-	-	-	-	-	-	0.098** (0.0462)
J-stat (d.f.)	6.0048 (3)	5.9809 (3)	7.0178 (5)	7.1812 (8)	5.7245 (8)	10.2245 (16)	11.4098 (20)	10.9012 (20)
(p-value)	(0.1114)	(0.1125)	(0.2193)	(0.5172)	(0.6781)	(0.8546)	(0.9858)	(0.9487)

Note 1: The asterisks *, **, *** indicate rejection of the null hypothesis at 10%, 5% and 1% level of significance respectively, standard errors in parentheses.

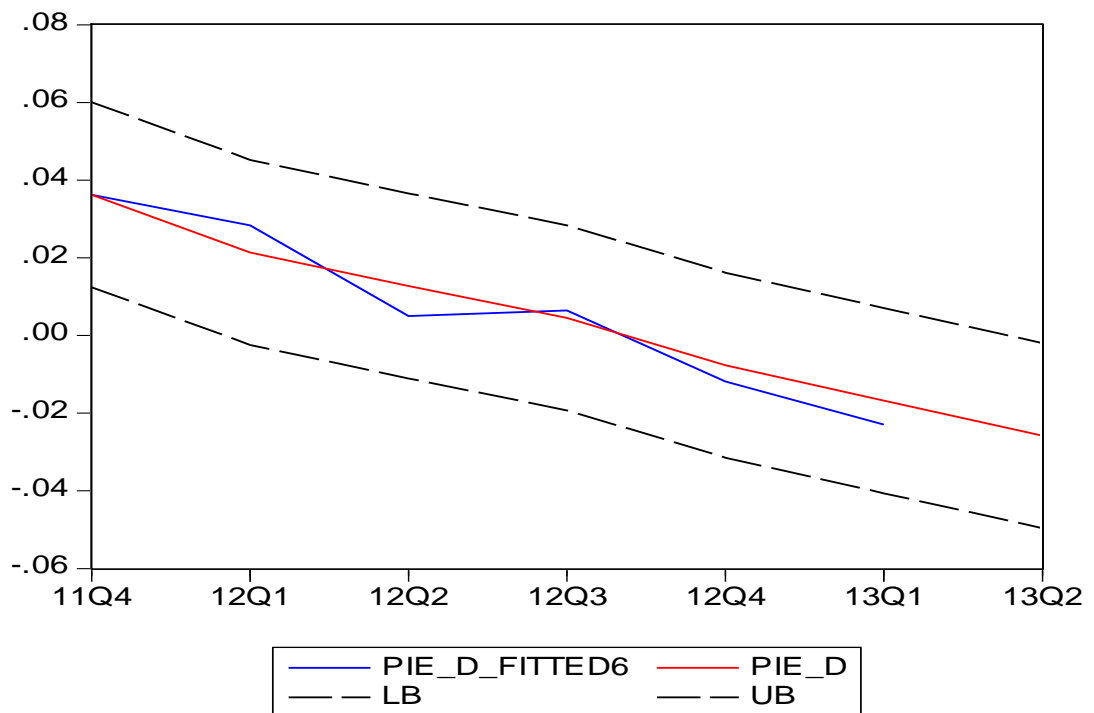
4.4 Robustness

In order to test for the robustness of the basic results, we have conducted sensitivity analysis from different perspectives. First, we utilize alternative econometric techniques like OLS estimation and GMM estimation. From Table 4.1 to Table 4.6, we have shown that our research consists of several estimations. As noted earlier, the OLS results are likely to be biased and inconsistent because this method misleads us with the wrong explanatory variable's data. Secondly, the data set we used starts from 1998Q1 which means it is post Asian financial crisis. Therefore it will not cause problem to our estimation results. Lastly, we have included sales and services tax per consumption into our final equation. This is because it can be the proxy for GST and help us to find out the inflationary effect.

4.5 Forecasting ability of the model

The estimated inflation rate is shown in Figure 4.1. We have plotted the forecasted inflation rate that started from 2011Q4 until 2013Q2 and compared it with the actual inflation rate to showcase the modest forecasting ability of the model.

Figure 4.1 The forecasted and actual inflation rate of Malaysia from 2011Q4 to 2013Q2



Note: PIE_D_FITTED6 is the forecasted inflation rate (GDP deflator). PIE_D is the actual inflation rate. LB and UB are the lower bound and upper bound, respectively, of PIE_D.

4.5.1 Evaluation of the forecasted inflation rate

Figure 4.1 shows the estimated inflation rate and the actual inflation rate from 2011Q4 until 2013Q2 by using the original model. The original model refers to Equation 8 in Table 4.6, which is the main model used in this research.

The figure shows that the estimated inflation rate falls within the upper and lower bound of the actual inflation rate. From 2011Q4 to 2012Q1, the estimated inflation rate is slightly higher compared to the actual inflation rate. Nonetheless, it still follows the downward trend of the actual inflation rate. However, starting from the middle of 2012Q1, the estimated inflation rate deviates from the actual, demonstrating a relatively sharp downward trend, up until 2012Q2, where it starts to move closer to the actual inflation rate. Thereafter until 2013Q1, the forecasted inflation rate, impressively, illustrates the actual inflation rate almost perfectly, with only negligible differences between the former and the latter. Most importantly, during the entire estimation period (2011Q4 till 2013Q1), the forecasted inflation rate never wanders off the upper and lower bound.

This goes on to show that this model possesses sufficiently modest forecasting ability. Therefore, the results prove that although the model is very sensitive to instrument lists and the period of adjustments, it is still a good model for forecasting.

4.6 Comparison of the inflation rate on the countries that imposed GST

Based on results in Table 1.3, we discovered that countries with the implementation of GST will cause have a great impact to their inflation rates.

At the time of Singapore's GST introduction, the country has increased around 2.4% annual inflation rate. Meanwhile in Japan, the interest rate increased 1.9% per annum. Lastly, based on our forecasting results, the estimated inflation rate of +0.8% for Malaysia, and it is the lowest among the Asia countries.

As we compared the inflation rate between year before and year after implementation of GST, we found that Malaysia has increased only 1.5%, it is also the lowest compared with the countries like Japan and Singapore. This is mainly because Malaysia is one of the developing countries and the cost of living is not as high as the country we compared earlier. Therefore, she increased only 1.5% after the implementation of GST. For instance, developing countries like Indonesia and Thailand faces deflation after the implementation of GST. The statement above provides a valid evidence to prove that if GST is implemented in a developing country, it will not increase too much in terms of inflation rate.

CHAPTER 5: CONCLUSION

5.0 Introduction

The objectives of our study are to examine the relationship between the inflation rate and the impending implementation of Goods and Services Tax (GST) in Malaysia and the short term and long term impact of GST on inflation in Malaysian context when GST is implemented. We had accomplished our analysis by using the backward and forward-looking Ordinary Least Square (OLS) method and Generalized Method of Moments (GMM). In this chapter, we had included the summary and discussion of our major findings, policy implications, and limitations and recommendations for future improvement.

5.1 Summary and Discussion of Major Findings

After identifying our objectives, we had preceded our study by reading some journals and books regarding the impact of GST on inflation. From those previous studies, we had discovered that most of the researchers found that the implementation of GST will significantly increase the inflation rate but this inflation will only have a short term impact on the economy. On the other hand, there are also a minority of researchers that conclude that the GST will only have a small impact on the inflation, but this statement had been refuted by other researchers as there will be a second round effect whereby the workers demand for higher wages in order to offset the higher living cost. As a result, the cost of production for the firm will increase and cause the firm to set a higher price to maintain its profitability. Hence, the price has increased twofold and inflation rate has become higher. Besides, there are also some portion of researchers asserting

that there is no difference before and after GST is implemented. This is because personal income tax rate is expected to reduce following the implementation of GST. Therefore, the increase in inflation that is caused by implementation of GST will be offset by the reduction of personal income tax rate.

In the preliminary stage, we had applied the Ordinary Least Square (OLS) method to estimate inflationary effect of the implementation of GST but we discovered that OLS method is not suitable to be implemented in our study. This is because after we applied OLS in our study, we found that OLS estimator ignore the error-component structure of the model. Therefore, it will be inefficient. Plus, things are quite different when the model includes a lagged dependent variable. Moreover, OLS estimator for this model has serious biased problem because the correlation of the lagged dependent variable with the individual specific effect either random or fixed. Hence, there will be heteroscedasticity and autocorrelation problem. Therefore, we had used the Generalized Method of Moments (GMM) in our research.

In GMM, due to the error term is always be zero, there will be no heteroscedasticity and autocorrelation problem. Besides, GMM estimators can be constructed without specifying the full data generating process which is required by the Maximum likelihood estimator. This characteristic has been exploited in analyzing partially specified economic models, in studying potentially misspecified dynamic model designed to match target moments, and in constructing stochastic discount factor models that link asset pricing to sources of macroeconomic risk. As a result, GMM will give us a more appropriate result for the estimation of the inflationary effect on the implementation of GST.

By using the GMM to estimate our model, we had discovered some major findings. Firstly, we found that in the short term, the inflation rate will increase by approximately 0.8 percentage point when GST is implemented, while in the long term, the inflation rate will increase by approximately 1.6 percentage point when

GST is implemented. From the data we get, we discovered that the average sales and services tax to consumption is approximately 4%. Due to the government had announced that the GST will be taxed at a rate of 6%, we will need to multiply the result we get from the GMM by two as there is a 2% jump in the tax rate.

Secondly, we found that central bank had increased the interest rate in order to offset the inflation rate. This can be shown through the negative expected sign of the interactive term of tax and interest rate. The negative expected sign of the interactive term indicates that when the sales and services tax revenue increase, the inflation rate will also increase. In order for the central bank to control the inflation, central bank will implement contractionary monetary policy by increasing the interest rate. Hence, people tend to borrow less money from the bank. As a result, the consumption in the economy will decrease and cause the supply to be more than the demand. Therefore, the price of the goods will decrease and inflation rate will also decrease.

Thirdly, we found that our model is suitable for forecasting purposes. From Figure 4.1, we discovered that the estimated result that we get is within the upper and lower bound of the actual data. This indicates that our model is a good model for forecasting purposes. Besides, from Figure 4.1, we also discovered that our estimation is close to the actual data. Hence, this shows that our model is robust and can be trusted.

In conclusion, we found that there will be an increase in the inflation after the implementation of the GST in April 2015. Besides, this increase in the inflation rate will also bring the second round effect to the economy and cause a higher inflation rate in the long term. Moreover, the response of central bank is also very important because if the central bank increases the interest rate to offset the inflation, the inflation rate will become lower. On the other hand, if the central bank accommodates the inflation, the inflation will become higher.

5.2 Policy Implications

GST can increase government revenues and rein in the budget deficit. Because our government debt has reached such alarming level that Fitch Ratings downgraded Malaysia's sovereign credit rating outlook from stable to negative, it spurs the government to hasten the implementation of GST in Malaysia. Although the idea of implementing GST has been brought up several years ago, progress has been glacial at best.

In addition to that, GST can overcome the deficiencies in the tax collection system. With GST, the possibility of any party to the contract defaulting is significantly decreased. As mentioned earlier, GST is a multi-stage consumption tax. Thus, it is fairly safe to say that no party will be able to void the tax. Even if one or more parties manage to evade the payment of tax, the government can still collect a portion of the GST in the chain.

5.3 Limitations and Recommendations

There are three major limitations for our study. Firstly, the instrument lists that are included in our model are very sensitive. When there is a slight change in the instrument lists, the coefficients and expected signs change greatly. For instance, when we increase or reduce the instrument lists even by a little, most of the coefficients become insignificant and we also obtain wrong expected signs. This necessitates numerous trial and errors to find out the best instrument lists for our model. Consequently, this iterative process is very time-consuming, which becomes one of the major obstacles in conducting our research. Future researchers

can further the scope of study by including other macroeconomic variables or increasing the sample size.

Secondly, the J-statistic in our model is very high, almost close to 1. This indicates that we may have a problem of overfitting resulting from putting too many instruments. As a consequence, we can get a J-statistic with almost perfect p-value of 1. From our results, it is clear that we suffer from this problem since a significant proportion of the J-statistics approximates 1. To illustrate the severity of this problem, a J-statistic of 0.25 should already be viewed with concern.

This brings us to our third limitation of this research. The putting of too many instrument lists greatly reduces the degree of freedom. This violates the rule of thumb of econometrics that a model should be parsimonious. Therefore, we suggest future studies to further explore the possibility of reducing the instrument lists in order to have a parsimonious model.

5.4 Conclusion

What constitutes an ugly truth? The conventional definition of an ugly truth is ‘a reality that is painful to accept, but because it is known to be true, one must accept it’. What then constitutes a beautiful lie? The conventional definition of a beautiful lie is ‘something one really wishes it is true, but one knows it is not’. From the government’s perspective, the government have been trying to convince the public that replacing sales and services tax with GST will not result in price hike, even when they are aware that it might not be the case. This will create an ex-post behavior where people believe that prices of goods and services will not increase, triggering the disappearance of inflation expectations. If there is little or no increase in inflation rate following the implementation of GST, this will be the beautiful lie that we are implying.

All told, is GST in Malaysia an ugly truth or a beautiful lie? Our results point to the former. GST in Malaysia is an ugly truth. Let us reemphasize on two points. Firstly, the government has been claiming that the 6% GST will replace the 16% sales and services tax. On paper, this sounds too good to be true. One would think there is indeed a 10% reduction in tax. However, the truth is there will be a 2% jump in tax from 4% to 6%. Secondly, the government has been insisting that the prices of goods and services would not increase. People will still spend and economy will grow as forecasted. Yet our results show that the prices will increase both in the short term and long term, precipitating in a fall in domestic consumption. Economic growth will then be stunted.

Then again, one cannot help but wonder, since there is a 10% reduction in tax, how is the government going to achieve its objective of reining in the public debt? Understanding the taxation structure of both tax regimes is a subject of paramount importance to avoid confusion. Although sales and services tax is 16%, it is only collected at the final part of the supply chain. There is the possible evasion of tax, which would not be nigh on impossible, resulting in loss of revenue collection. On the contrary, GST is more comprehensive in the sense that it is taxed at every stage of the supply chain. As a consequence, the possibility of tax evasion is significantly diminished, leading to greater efficiency in tax collection. Ultimately, this generates more revenue for the government and goes a long way towards assisting the government in accomplishing its aim.

Finally, it must be noted that what we have done thus far is barely the tip of the iceberg. Although our study may suffer from various limitations, it can be served as a guideline or contribution of literature for future researchers who conduct similar area of interest. In addition, future researchers can consider the limitations that we mentioned in order to obtain a better empirical analysis of this study in the future.

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