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Asymmetric Behavior of Goods and Services Inflation in Malaysia

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The aim of this study is to investigate whether the gap between goods and services inflation has widened over the period 1980-2006 in Malaysia. It is hypothesized that when there is a gap between the two types of inflation, goods inflation will fall to restore equilibrium. We employ a two-variable vector error correction method (VECM) to test the hypothesis and measure the size of the gap. The findings indicate that due to the negative and significant error correction term, goods inflation takes the burden of adjustment in the long run. Therefore, rapid increases in services inflation will be moderated by the decline in goods inflation in the long run.

JEL Codes: C22, C32 and E31

1. Introduction

The literature has documented evidence of the existence of sectoral inflation differentials, or inflation gap, between goods and services inflation over the past two decades (Esteve et al. 2006). Moreover, over the years, the growth rates between these two sectors has widened considerably in the industrialized countries. This dual inflation has raised concern that it could influence the level of inflation in the long run.

The gap could be explained by factors such as the productivity growth and the degree of competition. The reason is that higher prices could be attributed to low productivity growth, or high mark-ups due to low competition. Theoretically, services sectors tend to exhibit lower productivity growth and lower degree of market competition than goods sectors. The higher inflation in services sector might also be determined by increase openness to foreign trade, changing value of domestic currency, faster growth in the demand for services and the population ages (Sanchez, 2008).

However, there is little empirical evidence documenting sectoral inflation differentials in the emerging economies. In this paper, we extend the work of Esteve et al. (2006) to further investigate the behavior of goods and services inflation in Malaysia. Specifically, this paper addresses the following questions: (1) does the gap exists and has it widened over time; (2) how long does it takes to close the gap; and (3) which sector bears the burden of adjustment in the long run. This paper is organized as follows. The literature review is briefly discussed in section 2 followed by an overview of the trend and composition of inflation in Malaysia in Section 3. Section 4 describes the research method employed and Section 5 discusses the research findings. Finally, section 6 concludes the discussion and offers some policy recommendations.

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2. Literature Review

The gap between services and goods inflation has attracted considerable attention due to its tendency to persist over time. The persistence of such a gap implies that there would be a permanent shift in services and goods inflation. The literature proposes five explanations why there is a rapid increase in service prices. Firstly, service inflation is statistically more difficult to be observed and measured in output and hence price changes. Secondly, continued economic prosperity has increase demand for services thus pushing up their price. Thirdly, unbalanced sectorial growth contributes to the dual inflation rate in goods and services sector. Fourthly, many services are categorized as untradeable and therefore are not subjected to foreign competition than tradables. Lastly, increased competition from emerging economies will lower prices for manufactured goods in rich countries, hence increase their spending on other goods and services thus raising their prices.

Peach et al. (2004) find a linear cointegration relationship between combination of goods and services inflation in the long run for the United States economy over the period 1968-2002. Their results indicate the tendency for the two sectors inflation towards equilibrium in the long run. Rappoport (1987) and Brauer (1993) examine the mismeasurement in consumer service prices. Their basic assumption is that some consumer expenditure categories contain goods and services that are complementary. Consequently, demand growth for goods and for services should be changing at about the same rate leading to about the same inflation rates. However, if quality adjustment differs between the two sectors, there would be inflation differentials between goods and services.

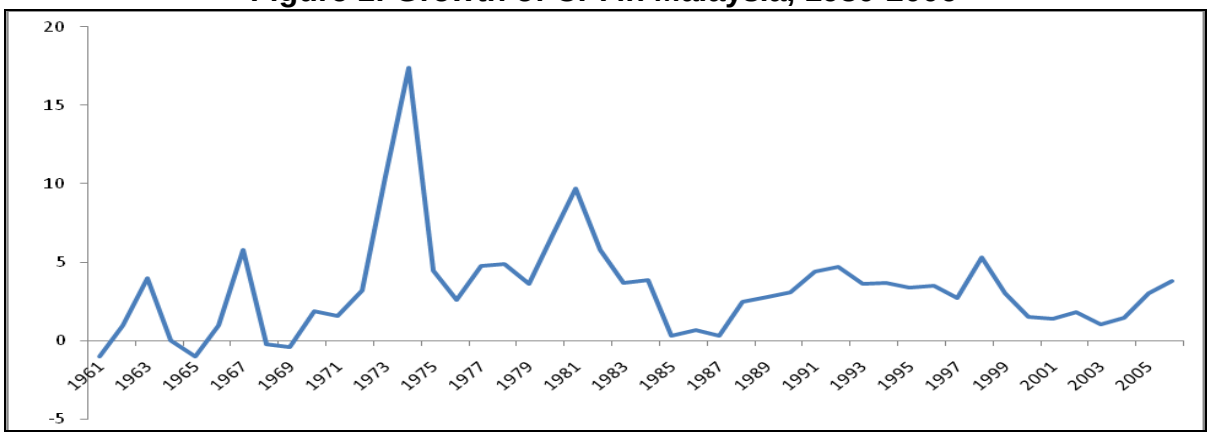
On the other hand, Baumol (1967) first proposed that service prices rise faster than goods prices because there are inherent limits to productivity growth in the service sector. According to the author, many services are labour intensive and there exists only limited room for productivity growth in these areas. Goods inflation is historically low and stable based on the international evidence as compared to the service sector inflation which is accelerating. The traditional service industries include such services as healthcare, finance, information services, legal, accounting, management consulting, security guards, employment services, janitors, advertising and so forth. Many of these services are mainly bought by businesses and tend to be labor intensive and more domestic. This paper will contribute to the literature by looking into the issue for the developing economies by extending the work of Esteve et al. (2006) in the case of Malaysia.

3. Trend and Composition of CPI in Malaysia

During 1970s, inflation rates in Malaysia were primarily imported (Semudram 1982, 1987; Rana 1984). The external sources of inflation (measured by percentage change in import price index or the percentage change in foreign inflation rate and in import-weighted exchange rate) are found to have large and significant impact on Malaysian inflation rate. On the other hand, Tan and Cheng (1995) conclude that money causes inflation in Malaysia. That is, inflation is a monetary phenomenon. Ibrahim (1996) posits that inflationary behavior in Malaysia is the consequence of both internal and external factors.

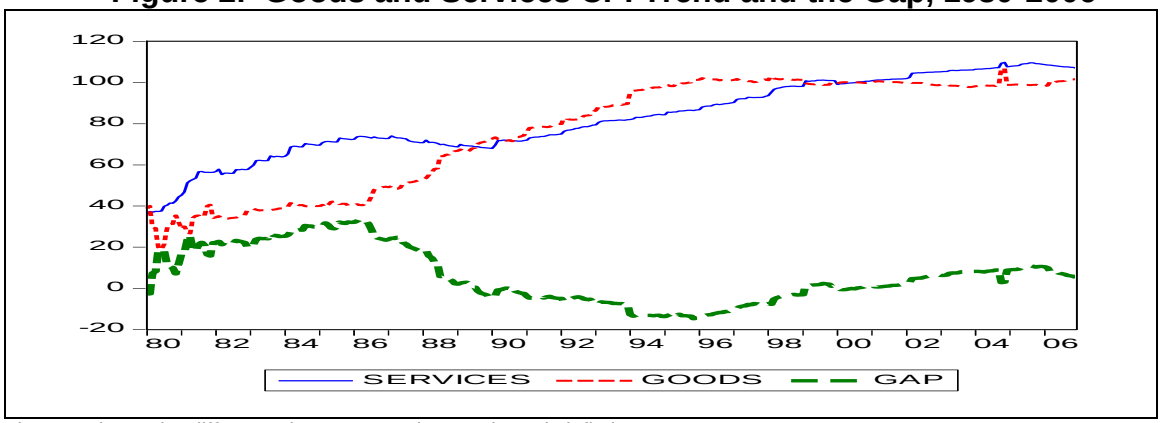
Over the past decades, the inflation rate in Malaysia has been relatively volatile. Beginning with a low average level of 1.1 percent over 1961-1971, the inflation rate increased and peaked at unprecedented high level of 17.4 percent in 1974 and again at 9.7 percent in 1981. Malaysia experiences an average domestic inflation of 4 percent in the 1980s and 3.6 percent in the 1990s (Bank Negara Malaysia, 1999). In March 2006, CPI rose by 4.8 percent, the highest rate in seven years. Inflation declines to 2.1 percent during 2000-2006. Figure 1 illustrates the country's growth in CPI over the period 1961-2006. Meanwhile, Figure 2 depicts the trend of goods and services inflation in the upper panel and the size of the gap in the lower panel. The visual plot indicates that there is a gap between the two sectors and services price inflation seems to be higher during 1980s and 2000 onwards. There is also a stable gap between goods price inflation and service price inflation since 2000.

Figure 1: Growth of CPI in Malaysia, 1980-2006



Source: BNM Statistical Bulletin, various issues and IFS CD ROM, 2006.

Figure 2: Goods and Services CPI Trend and the Gap, 1980-2006



The gap shows the difference between services and goods inflation CPI.
Source: BNM Statistical Bulletin, various issues and author's calculation.

Table 1 shows the weight assigned to goods and services components in CPI for four different base year ranging from 1980 to 2005 in Malaysia. All three goods components (durable, semi-durable and non-durable goods) show declining trends. The services component averages approximately 43 percent over the period 1980 to 2005. By 2005, the basket contains approximately half services component. Even-though services are generally regarded as nontradable, the source of economic growth is shifting towards the production of weightless goods (Cameron 1998). Some examples of weightless goods are telecommunication, computer software, the

Internet, financial products, and management consultancy services. These items are traded across borders similar to tradable goods.

Table 1: Changes in CPI Weight of Goods and Services Component, 1980-2005

	Weight (100)			
Base Year	Durable Goods	Semi-Durable Goods	Non-Durable Goods	Services
1980	14.9	8	44.5	32.6
1994	10	5.5	41.2	43.3
2000	9.4	5.4	40.2	45
2005	7.8	4	38.4	49.8
Average	10.53	5.73	41.08	42.68

Source: Economic Indicators and National Account Statistics, DOS, various issues.

In 2005, there are three added items in the CPI basket leading to an increase in the non-tradable items. The basket was revised by giving smaller weight to food, beverages and tobacco component. New items comprise of education and restaurant and hotel are added to reflect changes in the standard of living. However, the weights attached to CPI subcomponents do not differ substantially from 1980 until 2000 as shown in Table 2. This means that there are no major changes in the trend and composition of CPI basket for the period under study.

Table 2: CPI and Weight Assigned Based on SITC Commodity Section

	Weight in the Base Year					
SITC Section	1980	1990	1994	2000	2005	Average
1. Food	36.2	33.7	34.9	33.8	31.4	34
2. Beverages & tobacco	4.9	4.3	3.6	3.1	1.9	3.56
3. Clothing & footwear	4.7	4	3.6	3.4	3.1	3.76
4. Gross rent, fuel & power	18.2	20.2	21.1	22.4	21.4	20.66
5. Furniture, furnishings & household equipments etc.	5.9	5.8	5.6	5.3	4.3	5.38
6. Medical care & health expenses	1.3	1.8	1.9	1.8	1.4	1.64
7. Transport & communication	16.6	18.6	17.9	18.8	21	18.58
8. Recreation, entertainment, education & cultural services	6.7	5.2	5.8	5.9	8.0	6.5
9. Misc. goods & services	5.5	6.4	5.6	5.5	6	5.8

Note: In 2005, SITC No. 6 was renamed Health; item 7 was divided into subcomponents of transport (15.9) and communication (5.1); item 8 was assigned individual weight of 4, 1.9 and 3 for recreation services and culture, education and restaurant and hotel, respectively.
Sources: BNM Statistical Bulletin and National Account Statistics, DOS various issues.

4. Method

We use monthly data of durable goods (*GOODS*) and services (*SERVICES*) inflation. Data are monthly ranging from 1980:1 to 2006:12 and sourced from Bank Negara Malaysia (BNM) Statistical Bulletin and the Department of Statistics, Malaysia. The data are selected based on data availability and are not extended beyond 2006 to minimize the impact of outliers due to the 2007 financial crisis. The variables are expressed in their logarithmic transformation, denoted by small letters. Δ denotes the first difference operator and $E(\cdot)$ denotes the expectation operator. The base year is 2000.

The equation is modeled after Esteve et *al.* (2006) in which a vector error correction model (VECM) with one cointegrating vector and asymmetric threshold effects

based on error correction term is utilized. The threshold level is set at $ect_{t-1} \leq 0$. We write a *p*-dimensional vector error correction model (VECM) as follows:

$$\Delta y_t = \sum_{i}^{k-1} \Gamma_i \Delta y_{t-i} + \Pi y_{t-1} + \mu + \varepsilon_t, \quad t = 1, \ldots T$$

where y_t is the set of *I*(1) variables discuss above; $\varepsilon_t \sim niid(0,\sum)$; μ is a drift parameter, and Π is a (*p* x *p*) matrix of the form $\Pi = \alpha\beta'$ where α and β are both (*p* x *r*) matrices of full rank, with β containing the r cointegrating vectors and α carrying the corresponding loadings in each of the *r* vectors. The lag length is determined based on the observation of on residuals of VECM.

The lag length *k* is determined using unrestricted VAR for the empirical estimation. We employ the LR, FPE and AIC selection criteria to determine *k*. If there is conflicting results, correlogram of the residuals and the Ljung-Box statistics are alternatively inspected. Enders (2005) suggests choosing a lag length of approximately $T^{1/3}$; which is seven in this case to start the analysis. The lag length is thus set at *k*= 5.

The bivariate linear cointegrating VAR model with 5 lags *k*=5, such as:

$$\begin{pmatrix} \Delta\pi_t^{Services} \\ \Delta\pi_t^{Goods} \end{pmatrix} = \mu + \delta ect_{t-1} + \Gamma \begin{pmatrix} \Delta\pi_{t-1}^{Services} \\ \Delta\pi_{t-1}^{Goods} \end{pmatrix} + \varepsilon_t$$

where the long run relationship is defined as $w_{t-1} = \pi_{t-1}^{services} - \beta\pi_{t-1}^{Goods}$ with cointegrating vector $(1, -\boldsymbol{\beta})'$. We examine the speed of adjustment using error correction term, ect_{t-1}, and calculate the *half-life* of goods and services inflation as follows: *halflife* = ln(0.5)/ln(1+ĕ), where ĕ denotes the estimated coefficient of the ect_{t-1} term. Half-life refers to the time it takes for half the effects of a given shock to dissipate. The non-linear asymmetric behavior of the dual inflation is set at ect_{t-1}=0. We propose that the larger the size of error correction term, the faster the convergence towards equilibrium.

4.1. Data and Variables

To evaluate the integration properties of the variables, we employ the standard Augmented Dickey-Fuller (ADF) unit root test. Suppose we need to test the null hypothesis that the series x_t is characterized by the unit root process. The ADF test statistic is given by the t-ratio of the null hypothesis $a_1 = 0$ in the following regression:

$$\Delta x_t = a_0 + a_1 x_{t-1} + a_2 t + \sum_{i=1}^{p} b_i \Delta x_{t-i} + \varepsilon_t$$

If we fail to reject the null hypothesis then we conclude that the series x_t is a unit root process. Although the standard ADF test has been widely used, in the presence of the structural break this test is biased toward non-rejection of the unit root (Perron, 1989). Therefore, other unit root tests are conducted to ensure robust results.

In addition to augmented ADF test, Phillips-Perron (P-P) (Dickey and Fuller, 1981; Phillips and Perron, 1988) and Kwiatkowski, Phillips, Schmidt and Shin (KPSS) tests are performed. A variable is said to be integrated of order d, written *I*(d) if it requires differencing d times to achieve stationarity. The KPSS test (1992) differs from both ADF and P-P tests in the way the null hypothesis is presented. The variable series is subjected to stationary under null hypothesis and non-stationary under the alternative hypothesis. For cointegration, we employ the VAR based tests of Johansen (1988) and Johansen and Juselius (1990).

Table 4 displays results of the unit root tests. Since there is a conflicting results between ADF and P-P tests, the KPSS test is conducted which indicates that all variables are *I*(1) or stationary at first difference.

Table 4: Stationary Tests for Goods and Services Inflation

Variables	ADF Test	P-P Test	KPSS Test
GOODS	-2.104	-5.974*	1.863
	(0.357)	(0.076)	(0.739)
Δ*goods*	-16.889***	-15.752***	0.204***
	(0.000)	(0.000)	(0.739)
SERVICES	-5.973	-3.528**	1.958
	(0.105)	(0.0381)	(0.739)
Δ*services*	-16.273***	-17.129***	0.206***
	(0.000)	(0.000)	(0.216)

Notes: ***, **, * denotes significant at 1 percent, 5 percent and 10 percent respectively. Figures in brackets are p-values/critical values. The null for both ADF and PP tests are the hypothesis of a unit root is tested against the alternative of stationarity. The statistics include trend and intercept. KPSS test the null hypothesis of stationary against the null of non-stationary.

Assuming that each variable under investigation follow the unit root process, it is possible that they are cointegrated, that is, they have a linear combination that is stationary. Formally, variables $x_{1t}, x_{2t}, \ldots, x_{kt}$ are said to be cointegrated of order (d,b) if: (i) all $x_{1t}, x_{2t}, \ldots, x_{kt}$ are integrated of order d; and (ii) there exists a vector $ß=(ß_1, ß_2, \ldots, ß_k)$ such that $(ß_{1x1t}+ß_{2x2t}+\ldots+ ß_{kxkt})$ is integrated of order (d-b) where b>0 (Engel and Granger, 1987). Table 5 shows the result of cointegration test, which indicates that the variables are cointegrated. The plot of each variable at level and first differences are illustrated in Figure 3 and 4, respectively.

Table 5: Optimal lag and cointegration tests (VAR model)

Variables in VAR	Optimal lag	Trace statistics Max-Eigenvalue(ME) Statistics			Rank of cointegration (r)
lgoods, lservices	4	Null Hyp.	Trace Stat	ME Stat.	1
		r = 0	28.71***	0.078***	
		r ≤ 1	2.67	0.008	

Notes: ***, **, * denotes significant at 1 percent, 5 percent and 10 percent, respectively.

Figure 3: Goods and Services Variables in Level

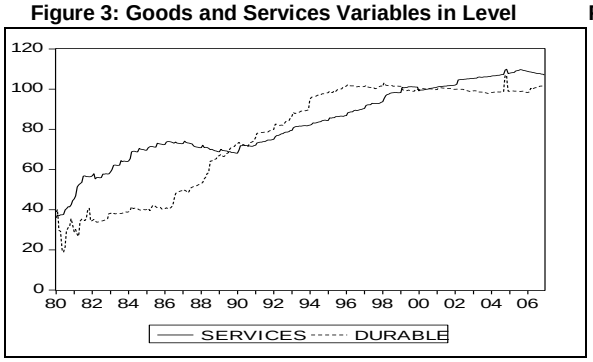
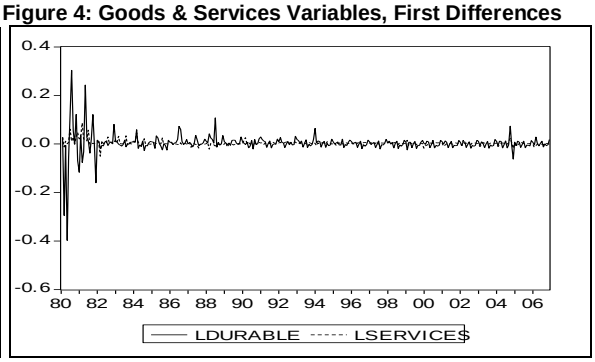


Figure 4: Goods & Services Variables, First Differences



Source: Author's calculation.

5. Results

The study posits that there is an asymmetric reactions between goods and services inflation and the error correction terms (*ect*). In other words, goods and services inflation behave differently to the positive and negative error correction terms, with the error correction term defined as the difference between the services and the goods sector: $ect_{t-1} = \pi_t^{services} - \beta\pi_t^{goods}$. The corresponding two-regime VECM results for the goods and services sector are shown below:

Goods sector:

$$\Delta\pi_t^{Goods} = -0.006_{(0.00)} - 0.098_{(0.021)}\Delta_{t-2}^{Goods} - 0.278_{(0.024)}\Delta_{t-1}^{services} - 0.13_{(0.00)}ect_{t-5} + \varepsilon_t\,, ect_{t-1} \leq 0 \quad (1)$$

$$\Delta\pi_t^{Goods} = 0.015_{(0.00)} - 0.186_{(0.00)}\Delta_{t-1}^{goods} - 0.14_{(0.06)}\Delta_{t-2}^{goods} + 1.00_{(0.01)}\Delta_{t-1}^{services} + 0.78_{(0.00)}\Delta_{t-2}^{services} + 0.48_{(0.03)}\Delta_{t-4}^{services} - 0.15_{(0.06)}ect_{t-5} + \varepsilon_t,\ ect_{t-1} > 0 \quad (2)$$

Equations (1) and (2) show the estimations result for the positive and negative *ect* term in the goods sector, respectively. We show only the significant coefficients for brevity purposes. The p-values are included in the parenthesis. The *ect* terms are negative and significant in both cases. The results suggest asymmetric behavior of goods inflation whereby the responses is slightly larger in the case of positive error correction term (in absolute value).

Services sector:

$$\Delta\pi_t^{Services} = 0.002_{(0.15)} + 0.23_{(0.00)}\Delta_{t-4}^{services} - 0.07_{(0.00)}\Delta_{t-2}^{goods} + 0.03_{(0.07)}\Delta_{t-3}^{goods} - 0.04_{(0.00)}ect_{t-1} + \varepsilon_t\,, ect_{t-1} \leq 0 \quad (3)$$

$$\Delta\pi_t^{Services} = 0.004_{(0.00)} - 0.15_{(0.08)}\Delta_{t-1}^{services} - 0.07_{(0.06)}\Delta_{t-1}^{goods} - 0.09_{(0.01)}\Delta_{t-3}^{goods} - 0.02_{(0.00)}ect_{t-1} + \varepsilon_t\,, ect_{t-1} > 0 \quad (4)$$

For the services infaltion sector, the results are displayed in equations (3) and (4). The p-values are included in the parenthesis. The *ect* terms are both negative and highly significant albeit at a much smaller coefficients than that of the goods sector. In the case of the services sector, the negative *ect* term has a bigger speed of adjustment (in absolute value). An interesting pattern emerges if one inspects

equations (2), (3) and (4) closely. It appears that the goods sector is driven by the lagged values of services sector and vice-versa in the immediate period. This probably indicates the complementary nature of the goods and services items as suggested by Rappoport (1987) and Brauer (1993).

Overall, the results indicate that the error correction terms are negative and significant. Based on absolute values, the goods error correction terms are larger in size. It is expected that the adjustment is faster when the $ect_{t-1} \leq 0$ and is true only in the case of services inflation. The interpretation is that when the ect_{t-1} is negative, it is mean-reverting. On the other hand, when the term is positive, it is either already near equilibrium position or it explodes. Figure 5 plots the ect_{t-1} of both sectoral inflation. It shows widening gap prior to 1984 and after 1997 onwards. In general, the finding supports our conjecture that there is a gap between goods and services inflation. Over the period under study, the error correction term for the goods inflation continues to decline while that of the inflation services rises. This trend seems to persist since 1996 onwards and is likely going to continue in the future. However, since *ect* term is bigger in the goods sector, it is expected that there will be a stable and narrowing gap through a decline in goods inflation and an increase in service inflation in the future.

Figure 5: Error Correction Terms of Goods and Services Inflation, 1980-2006

Based on the estimates of the error correction term, we calculate the half-life period for each sector. For the goods inflation, it takes approximately 6 months and 5 months, respectively for the negative and positive ect_{t-1} to close the gap. On the other hand, the half-life period for the services sector is much higher at approximately 1.5 years (or 18 months) when the $ect_{t-1} \leq 0$ and 3 years (or 35 months) when the $ect_{t-1} > 0$. The finding suggest that if the half-life is indicative of the size of the gap, other things equal, the goods inflation takes the burden of adjustment in the long run.

However, the results should be interpreted with cautions subject to the limitations of the research. First, changes in the quality of goods and services for each sector might not be captured accurately and subjected to mismeasurement and upward biased. Second, during the sample period, the CPI basket has been revised four times, in which there is a considerable difference between the weights attached to the services sector. However, our earlier investigation suggest that these impact is minimal.

6. Conclusion

This study investigates whether the gap between goods and services inflation has widened over the period 1980-2006 in Malaysia. This is due to the rising concern that there exist sectoral inflation differentials during recent years. The hypothesis being tested is when the gap between goods and services inflation is above its long term trend, goods inflation will rise and services inflation will decease to restore equilibrium. The study employs a two-variable vector error correction method (*VECM*) method to test the hypothesis and measure the size of the gap. The findings indicate that the gap between goods and services inflation are closed in the long run since the two variables are cointegrated. Due to the magnitude of the error correction terms, goods inflation takes the burden of adjustment in the long run.

The estimates of the half-life period indicate that it takes approximately 6 months for the goods inflation to close the gap. On the other hand, the services sector takes approximately longer period ranging from 1.5 to 3 years to move towards equilibrium. The finding suggests that increases in services inflation will be moderated by the decline in goods inflation in the long run for the period under study. The gap offers useful information for understanding the behavior of the two sectors inflation for policy makers.

Although a number of causal forces could be at work in explaining the inflation gap, the past decade fall in goods inflation could be explained by the increase in the degree of openness in Malaysia and the growing demand for services over the years as indicated by rising weight attached to the services sector in Malaysia's CPI basket. The growing demand for services is an explanation supported by Brauer (1993) and others to explain the gap. However, the gap is expected to return to a more normal level in coming years. The present research finds that the low inflation environment, itself induced by a credible monetary policy, is the dominant factor in stabilising the inflation gap. Future research in this area might utilize a wavelet based approach at a more disaggregated level in measuring and forecasting the size of the gap.

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