Estimating Malaysia's Potential Output

Potential output reflects the productive capacity of the economy. It is the maximum amount of goods and services an economy can produce over the long term without exerting downward or upward pressure on prices. The output gap is a measure of the difference between the actual output of the economy and its potential output. Policymakers closely monitor the potential output and output gap for two main reasons. First, the estimates of potential growth not only inform policymakers of the long-term sustainable growth rate of the economy but also the underlying drivers of growth. Second, the output gap reflects the extent to which economic resources are being overutilised or underutilised, and therefore, provides insights into demand-driven inflationary trends. For example, a negative output gap suggests that there is slack in the economy and price pressures will be weak on account of the weak demand conditions. Conversely, with a positive output gap, the economy is operating above its potential. If this condition persists, the prevailing excessive demand will exert upward price pressure on factors of production and subsequently cause an increase in the general price level.

This article highlights three different approaches of assessing Malaysia's potential output and output gap[1] (Table 1). These approaches comprise of statistically-based filtering methods, macroeconomic model-based multivariate filter methods and structural methods. The approaches complement the existing estimation method using the production function approach, and have further improved the understanding of the relationships between potential output, output gap and economic activity.

Table 1		
Various Methods in Estimating the Output Gap		
Estimation Methods		
Univariate	Linear Trend	
	Univariate State Space	
	Hodrick-Prescott	
Multivariate	Multivariate Kalman Filter (MVKF)	
	Multivariate Filter (MV)	
Structural	Structural Vector Autoregression (SVAR)	
	Cobb-Douglas production function (CDPF)	

In the past, potential output was estimated through mechanistic linear trends which assume that the potential output grows at a constant rate through time. Increasingly, estimation techniques have advanced to use more sophisticated approaches which incorporate economic relationships, and thus are able to capture the dynamics and drivers of potential output. The macroeconomic model-based multivariate filter establishes more robust linkages between the estimated potential output and output gap with other key macroeconomic variables, including inflation and the non-accelerated inflation rate of unemployment (NAIRU). The structural vector autoregression (SVAR) approach allows price shocks to be decomposed into demand- and supply-side shocks which would have important policy implications. Meanwhile, the Cobb-Douglas production function (CDPF) approach allows growth to be decomposed into contributions from the various factors of production. Notwithstanding the progress that has been made, estimating the potential output and the output gap remains challenging as it cannot be directly observed and it can change significantly when an economy experiences structural changes.

Each competing model is different conceptually and will therefore produce different results. Nonetheless, the various estimation results can be used for cross-checking and therefore, contribute to more rigorous understanding of the economy's potential output and output gap.

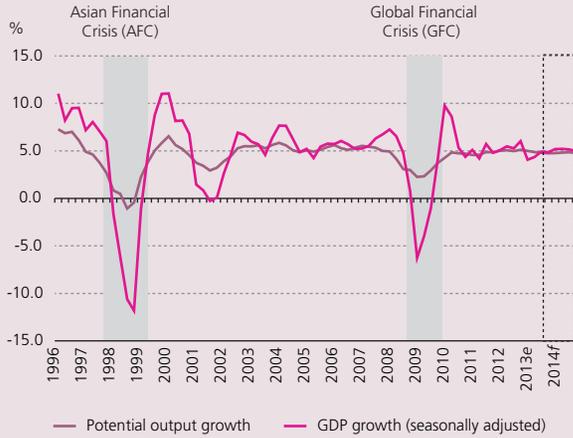**Estimates of the Malaysian Economy's Potential Output**
Based on the three different approaches, the potential output growth is estimated to be in the range of 4.7% to 5.1% in 2013 (a simple average of 4.9%) and to range between 4.6% to 5% in 2014 (a simple average of 4.8%) (Chart 1). Based on the projected economic growth, the output gap is estimated to be a small positive of 0.3% and 0.5% in 2013 and 2014, respectively.

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[1] An in-depth discussion of the various estimation techniques can be found in the forthcoming BNM Working Paper on Estimating Malaysia's Potential Output.

In terms of the quarterly time profile, both the univariate (Chart 2) and multivariate filters[2] (Chart 3) indicate that the economy registered a small negative output gap in the first two quarters of 2013, which turned marginally positive in the third quarter of the year. This small posi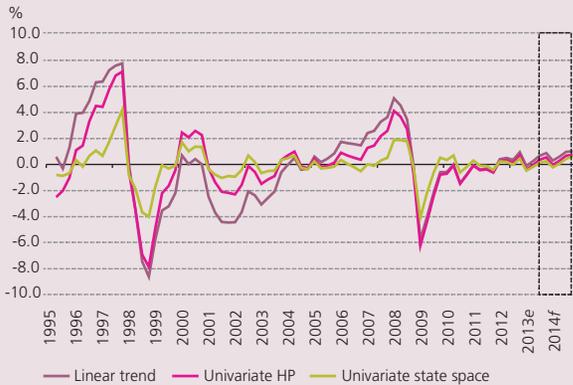tive output gap is likely to persist in 2014. The estimates produced by filtered-based methods appear to give a plausible representation of Malaysia's historical business cycle and remain close to the range of the structural model estimates[3]. In particular, both filters estimated large positive output gaps during the periods leading up to the Asian Financial Crisis (AFC) and the Global Financial Crisis (GFC) and negative output gaps during the crises. These trends are further supported by the comparable output gap profiles from the structural models, namely the production function approach and the SVAR model (Chart 4).

In terms of the drivers of growth, the production function approach suggests that potential output in 2014 will continue to be supported by firm private investment and favourable labour market conditions.

While output gap profiles for the filter-based and the structural models remain broadly similar, the

Chart 1

GDP and Potential Output Growth, 1996-2014*f*

e Estimates
f Forecast
Source: Bank Negara Malaysia estimates

Chart 2

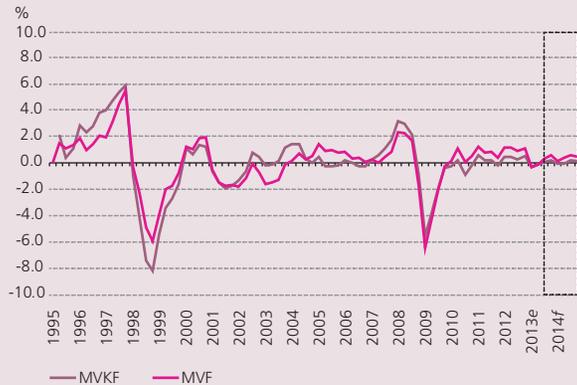**Univariate Filter Output Gap Estimates, 1995-2014*f***

e Estimate
f Forecast
Source: Bank Negara Malaysia estimates

Chart 3

Multivariate Filter Output Gap Estimates, 1995-2014*f*

e Estimate
f Forecast
Source: Bank Negara Malaysia estimates

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[2] Multivariate Kalman filter exploits the information on the excess demand in the labour market which is used as a proxy for demand in the product market. On the other hand, the multivariate filter, which takes into account the interaction between price, output, unemployment and capacity utilisation, improves further the estimation of the potential output.

[3] When the sample is truncated in 2008, the out-of sample forecast produced by the model-based multivariate filter for Malaysia show that the profile of the gap estimates remained consistent with the full-sample estimates.
Benes et al conducted ex-post forecasting exercises for numerous countries and they found that the multivariate filter performs well relative to a random walk (see Benes, J. et al. (2010). *Estimating Potential Output with a Multivariate Filter*, IMF Working Paper, WP/10/285).

size of the output gap estimated by the two classes of models differs[4]. The univariate and multivariate filtered-based models estimate the output gap to be in smaller range compared with the structural models (0.04%-0.7% and 0.4%-1.3%, respectively) (Table 2). This is attributable to the key differences in how the two classes of models are specified. By construction, estimates from the structural models are governed by the theoretical relationship between the level of labour, capital and technology advancement in the economy. Of importance, in generating the estimates, the magnitude of the inter-linkages between these variables is assumed to be unchanged across time. The structural model hence, provides a good estimate of the economy's potential output over a longer run horizon. However, it may overestimate the output gap in the short-run as it does not explicitly account for the recent changes occurring in the economy. In contrast, the filter-based models combine the information from the latest underlying trend and the theoretical relationship among the macroeconomic variables. For example, the multivariate filter-based models generate the output gap estimates by capturing the latest trends from macroeconomic variables such as inflation, capacity utilisation and unemployment. To ensure consistency, information about the trend trajectory from these variables is linked together with a set of conditional relationship backed by economic theory such as Phillips curve that relates the output gap to inflation; a dynamic version of the Okun's law that relates unemployment and output gap; and a capacity utilisation equation that links capacity utilisation rates to the output gap. In other words, by construction, the filter-based models are more adept at picking up the recent short-run dynamics that are taking place in the economy. In this instance, it is likely that the potential output has been lifted by the robust growth of investment in recent years.

Table 2

Output Gap Estimates, 2014*f*

Estimation Methods	Range (%)
Univariate	0.2 - 0.7
Multivariate	0.04 - 0.4
Structural	0.4 - 1.3

f Forecast

Source: Bank Negara Malaysia estimates

Chart 4

Structural Models' Estimates of Output Gap, 2000-2014*f*

SVAR (LHS)   CDPF (RHS)

e Estimate
f Forecast

Source: Bank Negara Malaysia estimates

Conclusion

Although the estimated size of the output gap differs across models, the output gap profiles remain broadly similar and all point towards the economy operating close to its potential level in 2013 and into 2014. Going forward, the evolution of the potential output will be determined both by the structural features of the economy and the economic environment in which the economy operates. While the increases in the quantity of capital and labour may raise potential output, sustainable long-term growth critically depends on the quality of capital and labour as well as how efficiently these factors are used. Total factor productivity, which is associated with technological innovations and knowledge, will also be important in determining the country's long-term potential growth. Thus the successful creation of an ecosystem that promotes competition, skills, knowledge and innovation will play a key role in ensuring that productivity gains are reaped.

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[4] For example, in the case of New Zealand, Claus et al. indicate a greater amplitude of output gaps from structural VARs and the Kalman filter than of those from the HP and HP multivariate filter (see Claus, I. et al, (2000). *The Output Gap: Measurement, Comparisons and Assessment,* Reserve Bank of New Zealand Research Paper, no. 44). In contrast Mc Morrow and Röger find that the HP filter generates larger output gaps than the Kalman filter in the EU countries (see Mc Morrow K, and Röger, W. (2001). *Potential Output: Measurement Methods, ``New´´ Economy Influences and Scenarios for 2001-2010,* ECFIN Economic Paper, no. 150).