

Full Length Research Paper

Determining the output gap and its link with price dynamics in Malawi

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Abstract

The objective of this study was to determine the level of output gap for the Malawi economy and link it to inflation dynamics. This was against the background that the link between money supply growth and inflation as portrayed by the quantity theory of money has been empirically proven to be broken. Given the uncertainty surrounding measurement of the output gap, this paper utilizes three of the most popular methodologies to estimate Malawi's potential output level and output gap namely; linear time trend, the Hodrick-Prescott filter, and the structural vector autoregressive (SVAR) model. While measures of output gap employed are not identical, they nonetheless all show a weak and not robust link between business cycle developments and inflation developments. In particular, the results show there is an unpredictable link between supply side shocks and inflation developments.

Keywords: Gross domestic product, potential output, output gap.

INTRODUCTION

Monetary policy directed at maintaining low and stable inflation employs interest rates to lean against persistent inflationary and deflationary pressures. The changes that monetary authorities make to interest rates may take several quarters before they impact on inflation. This is because it takes time for agents to react to the interest rate changes, and for agents' reactions to affect inflation. These lags between interest rate changes and changes in inflation point to the fact a monetary authorities need to have a view on the inflationary pressures that are likely to prevail in the future so that they can decide on the appropriate action on interest rates.

There are a number of factors that influence future inflation, such as agents' expectations on inflation, exchange rate movements, wage developments, and import price changes, among others. Empirically, one of the most important influencing factors is the state of the business cycle. When the economy is going through a

period in which resources are underutilised, there tends to be more disinflationary pressures than inflationary pressures. Conversely, when the economy is going through a period in which resources are heavily utilised, the balance of pressure tends to push inflation up. Indicators of future inflationary pressures play an important role in guiding monetary policy aimed at achieving price stability. The output gap is considered to be a key indicator of future domestic inflation.

To formulate the appropriate monetary policy, a measure of the state of the business cycle that shows the strain that current economic activity is exerting on resources needs to be known. There are a number of indicators of such a strain. For instance, the number of job advertisements appearing in newspapers or the difficulty that businesses are having in finding appropriately qualified workers are all indicators of such strains in the labour market, and the amount of time machines lie idle tells us about strains on equipment. The economic aggregate measure of resource strain in the economy is referred to as 'output gap'. Output gap has long been a device used by central banks to represent how 'hot' or 'cold' the economy is at any particular time and to forecast likely inflationary pressures. It is also a useful indicator about the volatility of activity in the

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economy, whether resources are alternating quickly between periods of substantial resource strain to periods of substantial resource slack, or whether the economy is moving smoothly between moderate levels of resource strain and slack.

The output gap, measuring the difference between actual output and the potential level consistent with full employment of resources in the economy, is one of the most widely used concepts in macroeconomic policy analysis. All things being equal, if the output gap is positive through time, so that actual output is greater than potential output, then inflation will begin to increase in response to demand pressures in key markets. The converse will apply if the output gap is negative. Chart 1 below summarises this argument:

Output gap can be used as a key variable in determining the evolution of prices and wages. A level of real Gross Domestic Product (GDP) above potential (a positive output gap) will often be seen as a source of inflationary pressures and monetary authorities interested in containing inflation should tighten monetary conditions. A level of real GDP below potential (a negative output gap) will have the opposite implication. The strength of the output gap concept is that the intensity of resource utilisation does seem to matter for inflation pressures, so the history of resource use is likely to be important. To pursue more countercyclical macroeconomic policies, policymakers need to assess the current state of the economy. The output gap is a key concept in assessing the economic situation and designing appropriate macroeconomic policies. Although output gap cannot be used as a sole input in the process of implementing monetary policy, it is conceptually a useful way of thinking about the inflationary pressure coming from the domestic supply side shocks and that it has a broad empirical relevance.

Claus et al., (2000) argue that measuring the level of an economy's potential output and output gap are essential in identifying a sustainable non-inflationary growth and assessing appropriate macroeconomic policies. The realisation of the above variables through such a study would therefore assist policymakers in making informed decisions that are consistent with the economy's macroeconomic objectives.

As Malawi pursues a growth strategy, a study of this nature would assist the authorities balance the policy choices to both stimulate growth without necessarily compromising on inflation. Several studies by staff at Reserve Bank of Malawi have shown mixed results on the link between price developments and money supply growth. The paper by staff in the Research and Statistics Department of the Reserve Bank of Malawi (April 2011) on money demand function, showed that broad money is negatively related to inflation. However, a paper by staff in the Financial Markets Department of the Reserve Bank of Malawi (June 2011) on money supply and inflation

reported rather a weak positive relationship between the two variables with lags of between 3-8 months.

Broadly, in many developing economies, the relationship between money supply growth and inflation is shown to be empirically weak. As such, this development has compelled researchers to investigate inflationary pressures from the supply/demand shocks. Above all, in Malawi, with a relatively stable exchange rate which is a major suspect for any changes in inflation, the output gap would offer an alternative way to trace sources of inflation. Of late, series indicate broad money supply growing with inflation trending downwards indicating that there is room for monetary expansion without compromising on inflation. This study therefore is relevant since it would confirm or refute any economic suppositions regarding money supply and output vis-à-vis inflation in Malawi.

The paper aims at contributing to the literature by exploring how output gap influences inflation developments in an economy by empirically investigating this relationship in the Malawi economy.

The rest paper is organised as follows: Section 2 highlights the output trends in Malawi; section 3 looks at what is in the literature regarding potential output and output gap; sections 4 and 5 discusses methodology and results respectively while section 6 concludes the paper.

The Output Trends in Malawi

Gross domestic product (GDP) in Malawi has been increasing robustly in the past five years with real GDP growth averaging 7.6 percent and hitting 8.9 percent in 2008. Over the same period, inflation has decelerated markedly registering an average inflation of 7.4 percent in 2010, from an average of 14.0 percent in 2006. What is not known, however, is whether the economy has been operating above or below its potential output and how this relates with falling inflation Chart 2.

Sectoral contribution to GDP

Malawi is an agro-based economy with the agricultural sector accounting for over 30.0 per cent of GDP, employing about 84.5 percent of labour force and accounting for 82.5 percent of foreign exchange earnings. Agriculture is characterized by a dual structure consisting of commercial estates that grow cash crops and a large smallholder sub-sector that is mainly engaged in mixed subsistence farming. Maize, the staple food, accounts for 80 percent of cultivated land in the small-holder sub-sector. The main agricultural export crop is tobacco, followed by tea, sugar and coffee. The manufacturing sector accounts for 11 percent of GDP and comprises mainly agro-processing activities in

Chart 1. Output gap with an aggregate demand shock

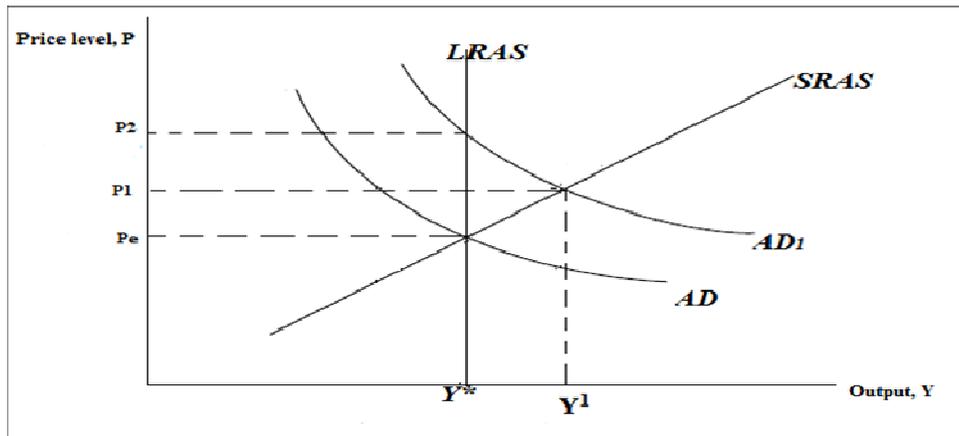
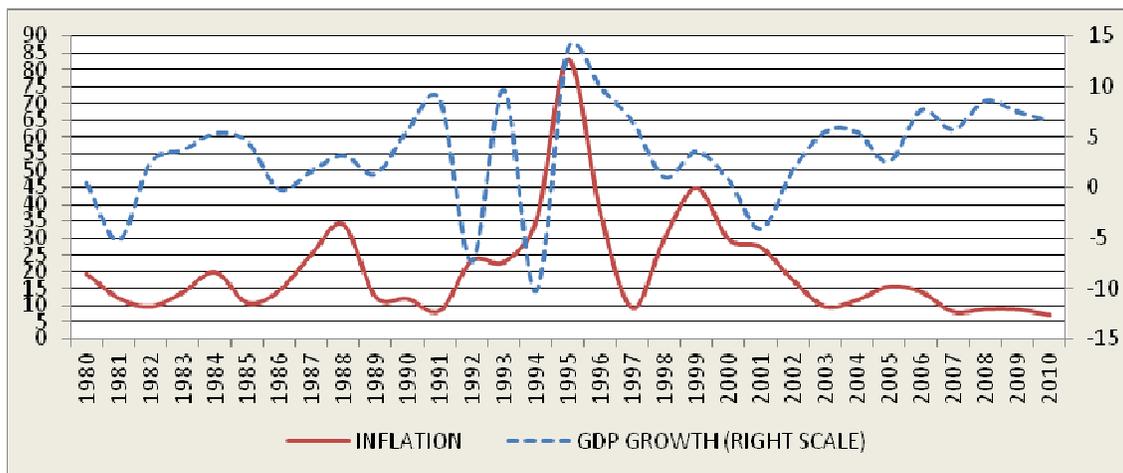


Chart 2. Economic Growth and Inflation in Malawi



Source: IMF World Economic Outlook database and National Statistics Office

the tobacco, tea and sugar industries. Distribution and services represent about 22 percent of GDP. Chart 3

Agricultural sector has been registering a positive growth rate for a better part of the last decade except in 2005 and 2006. The slumps in these years also affected the growth of overall GDP from 5.4 in 2004 percent to 3.3 percent in 2005 and 4.7 percent in 2006. When the sector registered a resounding growth of 11.2 percent in 2007, the overall GDP growth also jumped from 4.7 percent in 2006 to 9.6 percent in 2007.

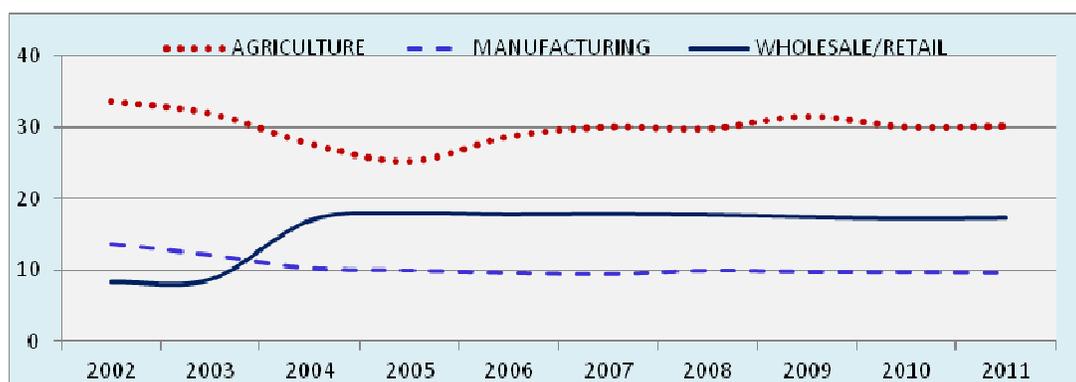
Other sectors that have been growing robustly recently are Mining and quarrying and Manufacturing sectors. Mining sector for instance, registered an exponential growth rate from a meagre 4.9 percent in 2009 to a resonant 80.2 percent. However, all these developments have not helped us figure out whether Malawi economy is operating above or below the

potential output. It is from this background that this study intends to determine the level of the output gap in Malawi economy. To the best of our knowledge, no study in this direction has been done in Malawi. It is believed that the findings of the paper will bring to light an alternative and/or auxiliary input during macroeconomic policy process.

The study uses both annual and quarterly data that spans from 1980 to 2010 sourced from Reserve Bank of Malawi database and International Monetary Fund's World Economic Outlook database.

LITERATURE REVIEW

The importance of understanding the link between the real economy and inflation in monetary policy formulation

Chart 3. Major contributors to GDP

Source: National Statistics Office

need not be overemphasized. In conventional macroeconomics, the concept of the output gap is an important component of that link. Used in this context, the output gap provides a useful way of thinking about inflationary pressure in the economy.

There is no unanimous definition of potential output, however. From a purely statistical viewpoint, potential output is thought to be trend output. From a theoretical perspective, potential output is based on the supply side of the economy and is often defined as the production level at normal utilization of factors of production at the current state of technology. This reflects the idea that potential output is akin to sustainable long-term growth, which implies that the output gap (the transitory component of output) is a consequence of demand shocks. Due to the presence of nominal rigidities, a demand shock will cause output to differ from its supply side level, but as these begin to weaken and prices adjust, the transitory shocks will dissipate and output will revert to its long-run potential. Hence, potential output is the steady state level of output associated with the long-run aggregate supply curve.

The definition of potential output differs depending upon the time horizon being examined. In the short-run, physical capital is assumed to be fixed and the gap is determined by how much demand can develop without inducing supply constraints and subsequent inflationary pressures. In the medium-term, investment is assumed to be endogenous implying that a demand expansion may be accommodated. In the long-run, full employment potential output is primarily determined by technological progress and growth of potential labour.

Before proceeding, a note on the terminology used is required. Output in period t is given as y_t^t , potential output in period t is given as y_t^* and the output gap, y_t^{gap} , is calculated as $(y_t^t - y_t^*)$. It is assumed that we can use the terms 'potential' and 'trend' output interchangeably but

the definition will be clarified by the context in which they are used. Statistical methods of calculating the gap deliver 'trend' output, whereas the production function method produces an estimate of 'potential' output. Also, by custom, the term 'cycle' is used to represent the gap even though it is not periodic.

There are a number of studies that have attempted to estimate potential output and output gaps in the literature. Different measures of the output gaps could be evaluated based on how well they actually predict inflationary pressures. Coe and McDermott (1997) test the output gap model for a group of thirteen developing countries, new industrialized and the industrial Asian economies including New Zealand, and using annual data, found that for New Zealand, the change in inflation is closely related to the change in the output gap, where the output gap is based on non-parametric estimation procedure.

Araujo et al., (2004) calculated different measures of potential output and output gap for the Brazilian economy, and found that the potential output estimated by the different models exhibited low and high variance trend, and that the forecasts from the unobserved components models were more inaccurate than those generated by the simple univariate models. In addition, their findings indicated that the deterministic trend, moving average, Hodrick- Prescott, Beveridge-Nelson and production function models have strong short term co-movements, appearing to be moving upward and downward at roughly the same time. Finally, they also found that the Beveridge-Nelson methodology outperformed all the models at the forecast horizons.

On their part, Cerra and Saxena (2000) reviewed a number of different methods that can be used to estimate potential output gap for Sweden, and found evidences of large negative output gap. Similarly, Dupasquier, Guay and St. Amant (1997) used different methodologies to estimate the spectra of output gaps in the United States.

They found that only a structural vector autoregression (VAR) methodology with long-run restrictions generates an output gap with a peak at business cycle frequencies, lasting between 6 and 32 quarters.

Claus (1999) used quarterly data from 1970 to 1998 on real production Gross Domestic Product (GDP), full-time employment and a survey measure of capacity utilization to estimate potential output for New Zealand employing a structural VAR methodology. He obtained good results, finding that prior to the economic reforms, the New Zealand economy was in excess demand with generally poor productivity growth and high inflation. Serju (2006) also found that the best model for estimating the output gap for the Jamaican economy is the structural VAR because of its relatively good predictive power and its consistency with economic theory when compared to the other models.

Osman (2008) estimated the potential output and output gap of four East Africa countries, namely, Kenya, Ethiopia, Tanzania and Uganda, using different statistical methodology with annual data from 1975 – 2004. The results show that the estimations of the output gaps of these countries are generally in agreement about the historical boom bust cycles of the countries, and demonstrate that the business cycles display sharp turning points rather than exhibiting smooth patterns that are typical for the advanced economies. They are of the view that estimates of the output gap should not be based on one measure as this could lead to policy failure.

Adam et al., (2010) estimated the potential output and output gap for Nigeria. The results were fairly satisfactory and surprisingly, the linear trend method gave better results than the Hodrick-Prescott filter and the structural vector autoregressive (SVAR) model. A comparison of the empirical results obtained from the methods studied suggests that, apart from the trend model, the measure of output gap obtained from the SVAR model is likely to provide the most reliable predictor for inflation in Nigeria. Njuguna A. et al., (2005), using different methods attempted to estimate potential output and output gap in Kenya. Although various methods were used, they however provided a broad consensus on the overall trend and performance of the Kenyan economy. The results revealed that potential output growth was declining and that the economy was operating below its potential which meant that there was room for expansionary monetary policy without inflationary pressures building up.

In Uganda, Musinguzi (2002) found out that the output gap was statistically significant and negative in the short- and long-run determination of annual food inflation; and also a significant factor in the short-run determination of annual composite headline inflation, but insignificant in the long-run. In a study by Castle J. (2003), to establish the impact of excess demand on inflation, the output gap, based on a composite measure using principal

components analysis, is found to have a substantial impact upon inflation in United Kingdom.

Claus et al., (2000) reported from their study that despite their inherent uncertainty, estimates of the output gap are a useful source of information in the process of setting monetary policy. The estimates of New Zealand's output gap were found to be statistically significant determinants of changes in near-term inflation and are relatively proficient at predicting the direction of future inflationary pressures. Model simulations also suggested that the output gap has a valuable role to play in setting policy, even in the presence of plausible uncertainty.

METHODOLOGY

A large literature has developed to address the question of how trends and cycles should be extracted from data series but there is still no clear consensus. Different methods give rise to variations in the cyclical component in terms of duration, amplitude, auto covariance function, spectrum and whether the cycle is stationary or not. In this study we use the three most common methods of estimating potential output and output gap namely; linear trend method and Hodrick-Prescott filter method with different smoothing parameters and Structural VAR approach. We simply out the various mostly used methodologies below are as discussed by Claus et al (2000) in their paper, The Output gap measurement, comparison and assessment.

Linear Trend

The linear trend happens to be the simplest way to estimate output gap and potential output. The underlying assumption of this technique is that potential output is a deterministic function of time and the output gap is a residual from the trend line. The methodology takes for granted that output is at its potential average level, over the sample period. The trend in output which represents potential output may be estimated as;

$$Y_t^* = \phi_0 + \phi_1 trend \quad (1)$$

Where y_t^* is output trend, ϕ_i are estimated coefficients from the regression of the actual output on time trend variable. Output gap is specified as;

$$y_t^{gap} = y_t^* - y_t \quad (2)$$

Where y_t^{gap} is the output gap, y_t is the actual output, y_t^* is the potential output from and $t=1, 2, \dots, T$ is a time index.

Smoothing GDP using a Hodrick-Prescott (HP) filter

The GDP smoothing approach using an HP filter fits a trend through all the observations of real GDP, regardless of any structural breaks that might have

occurred, by making the regression coefficients themselves vary over time. This is done by finding a trend output estimate that simultaneously minimises a weighted average of the gap between output and trend output, at any point in time, and the rate of change in trend output at that point in time. Given an adequately chosen, positive value of λ , there is a trend component that will minimize:

$$\Lambda = \sum_{t=1}^T (y_t - y_t^r)^2 + \lambda \sum_{t=2}^{T-1} [(y_{t+1}^r - y_t^r) - (y_t^r - y_{t-1}^r)]^2 \quad (3)$$

Where y_t is the log of actual output and y_t^r is its trend. The first term is the sum of squared deviations of trend output from actual output. The second term penalises variations in the growth rate of trend output. The parameter λ is a smoothness constraint that determines the degree to which those variations are penalised. The smaller the value of λ , the smaller the penalty on changes to trend output and the more closely trend output follows the actual output series. Conversely, the larger the value of λ , the larger the penalty on changes to trend and the smoother the estimate of the trend.

For quarterly output data λ is usually set equal to 1600. Hodrick and Prescott chose this value on the basis of their prior views about the magnitudes of cyclical volatility and trend growth rates in US macroeconomic aggregates. In the context of estimating potential output, the value of λ reflects, at least implicitly, the relative importance of supply and demand shocks in the evolution of actual output. The larger the value of λ , the smoother the estimate of potential output (aggregate supply) and the larger the proportion of output variability ascribed to the output gap (aggregate demand).

The extensive use of the HP filter in decomposing time series into trend and cyclical components has motivated research examining the accuracy of such decompositions. Harvey and Jaeger (1993), for example, show that setting $\lambda = 1600$ is suitable for US real gross national product (GNP), but might not be an appropriate parameter value for developing countries like Malawi, where the trend might be much less smooth and therefore require a smaller lambda. Following Canova (1998), we use lambdas 100 and 1600 in this study to see how sensitive the measured output gap is.

Cogley and Nason (1995) observe that when applied to persistent time series, the HP filter, can generate business cycle dynamics even when they are not present in the original data. Monte Carlo evidence presented in Guay and St-Amant (1996) implies that under plausible assumptions about the evolution of actual output, the HP filter may not accurately decompose output into its trend and cyclical component. These considerations suggest that the HP filter estimate of trend output may not be an ideal estimate of potential output.

Another problem associated with using the HP filter to measure an economy's level of potential output is the

instability of estimates near the end of the sample period. Since the persistence of recent shocks to output is unclear, the HP filter cannot distinguish accurately permanent and temporary shocks at the end of the sample period. This can result in substantial revision to end-of-sample measures of potential output. This 'end-point problem' is common to all filtering techniques that use 'future' data.

If one is only interested in the properties of the cycle, the end of sample bias is not that bad: one simply has to omit the trend values at the end of the series. However, if the trend is used for economic policy, then the last point is likely to be the one which is particularly interesting. The usual way to solve this end-point bias problem is to extend the series with forecasts. Thus the interesting point is no longer at the end of the series. The usefulness of this approach is limited, however, by the quality of the forecast.

These problems have not prevented the widespread use of Hodrick and Prescott's filter to identify the cyclical component of output. Arguments commonly made to justify its use are that it extracts the relevant business-cycle frequencies of output and closely approximates the cyclical component implied by reasonable time-series models of output.

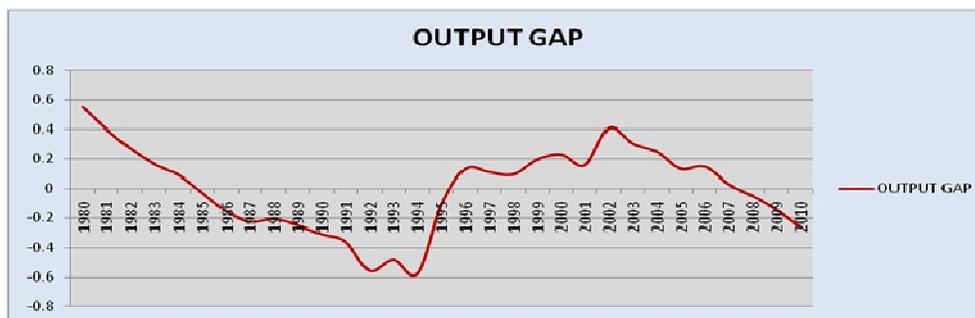
Structural Vector Auto regression Approach

Potential output can also be estimated from a structural vector autoregression (SVAR) model. The SVAR model combines economic theory with statistical techniques to differentiate between permanent and temporary movements in output. The innovations in the SVAR are decomposed to recover structural shocks. The advantage of this method is that the model has a stronger reliance on theory but it allows the data to determine the short-run dynamics.

The structural vector autoregression (SVAR) method is adjudged superior to univariate techniques because it combines economic theory with statistical techniques to make a distinction between permanent and temporary movements in output. In particular, we shall adopt the structural vector autoregression methodology with long-run restrictions first proposed by Blanchard and Quah (1989).

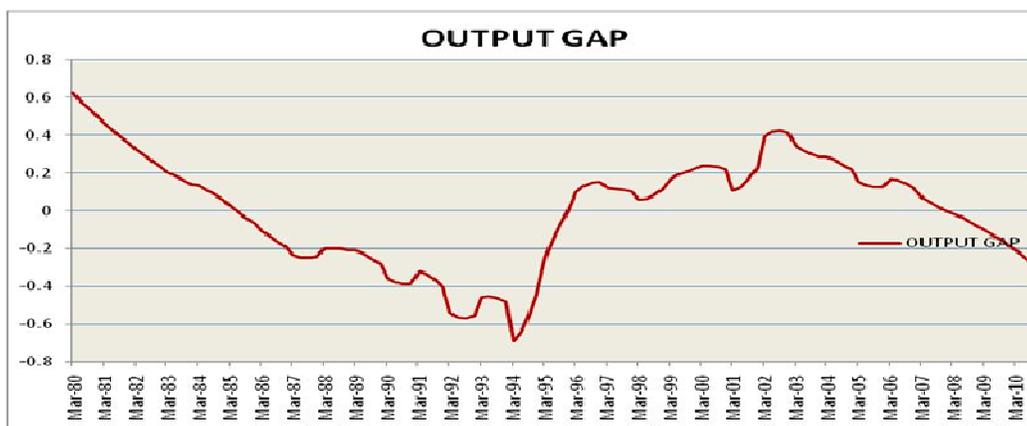
Using the SVAR framework, the assumption that movements in output are the result of cyclical shocks arising from demand-side developments and productivity shocks emanating from supply-side developments gives a set of identifying restrictions. The main advantage of this methodology is that the approach is clearly based on theory while it also allows the data to determine the short-run dynamics. In this paper, the vector autoregression methodology with long-run restrictions is employed to estimate potential output for Malawi.

Chart 4. Linear Trend Output Gap



Source: Author estimation

Chart 5. Linear Trend Output Gap



Source: Author estimation

We assume real GDP is influenced real exchange rate and broad money. Using a three variable VAR, with real GDP (y_t), broad money (m_2) and real exchange rate ($reer$) we impose restrictions to the following model:

$$\begin{bmatrix} \Delta y_t \\ reer_t \\ m2_t \end{bmatrix} \begin{bmatrix} S_{11}(L) & S_{12}(L) & S_{13}(L) \\ S_{21}(L) & S_{22}(L) & S_{23}(L) \\ S_{31}(L) & S_{32}(L) & S_{33}(L) \end{bmatrix} \begin{bmatrix} v_{1t} \\ v_{2t} \\ v_{3t} \end{bmatrix} \quad (4)$$

Where $S_{ij}(L)$ are polynomials in the lag operator, v_{1t} , v_{2t} and v_{3t} are uncorrelated white noise disturbances.

PRESENTATION OF RESULTS

Linear Trend filter

We run the linear trend equation (1) using the Malawi data and the results are shown in chart 4 above.

From the results presented in chart 4 above, actual output is found to be marginally below its potential by about 2.0 percent of the actual GDP in 2010, 1.1

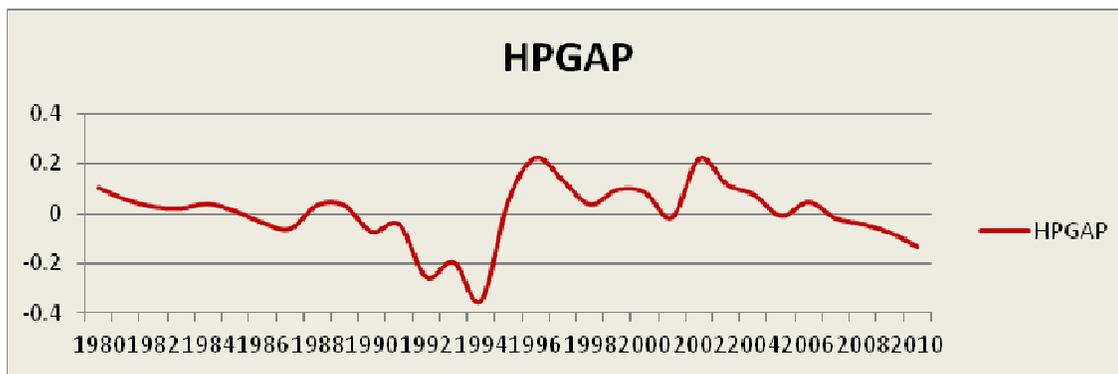
percent 2009 and 0.4 percent in 2008. This methodology and its results therefore suggest that the Malawi economy has been operating below its potential output level since 2008. The results also reveal that the Malawi economy underwent a similar experience of operating below capacity continuously from 1985 to 1995. Output however was above potential level from 1980 to 1984 and from 1996 to 2007.

We also rerun a trend regression using quarterly data to find out if the frequency has significantly affected the performance of the model. However, the results from the quarterly data are not different from those computed using annual data, evidence that our extrapolation of quarterly GDP has been harmless to the behaviour of the model. The results are presented in a chart 5 above.

HP Filter

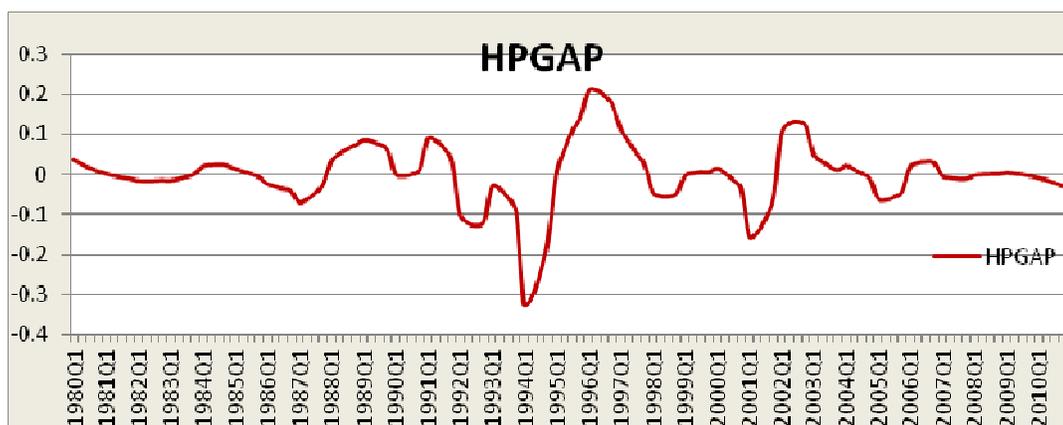
Having estimated the potential output and output gap by linear trend technique, we proceeded to estimate the same using HP filter. The parameter lambda determines

Chart 6. HP Filter Output gap



Source: Author estimation

Chart 7. HP Filter Output gap



Source: Author estimation

to what extent variability in the trend as compared to the cycle is allowed for; the higher the lambda, the smoother the trend. Since this study is using annual data, we calculate the value of lambda λ to be use as:

$$\lambda = \left(\frac{p}{4}\right)^2 * 1600 \tag{5}$$

Where p is frequency of our data in a year. Since we are using annual data in this study, we use λ as 100. chart 6

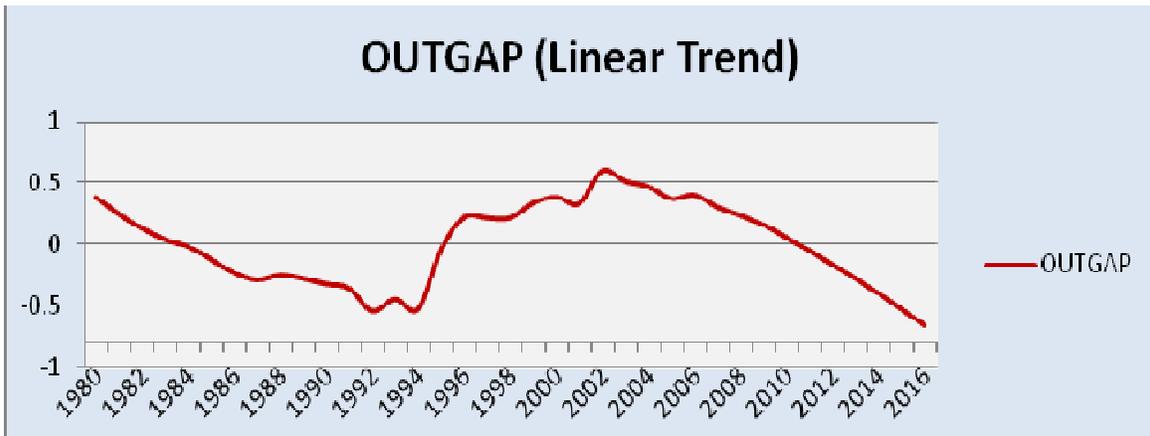
The results from HP filter is not very much different from those obtained from linear trend in the sense that both methods give an impression from 2007 output in Malawi has been slightly below its potential. The two methodologies also give similar output gap paths, that is, where linear trend method is depicting a positive gap, so does the HP filter. According to this method, it is revealed that output gap in 2008 was just 0.3 percent of GDP below the potential output, 0.5 percent of GDP 2009 and only 1.0 percent in 2010 pointing to a near-potential level.

Likewise we rerun the HP filter using quarterly GDP as extrapolated by quadratic match sum frequency conversion technique. The results show that output has been at near-potential level as shown using annual data. Note that in this case we use λ as 1600 given equation 5. The results of the quarterly HP filter output gap model is shown above: Chart 7

Since HP filter is criticised by many econometricians for end of sample bias, one of approaches to handle this problem is to use some forecasts. In this case the interesting point is no longer at the end of the series and that it is no longer affected by the bias. We extend our series from 2010 to 2016 to include the IMF GDP forecasts for Malawi. Chart 8 below.

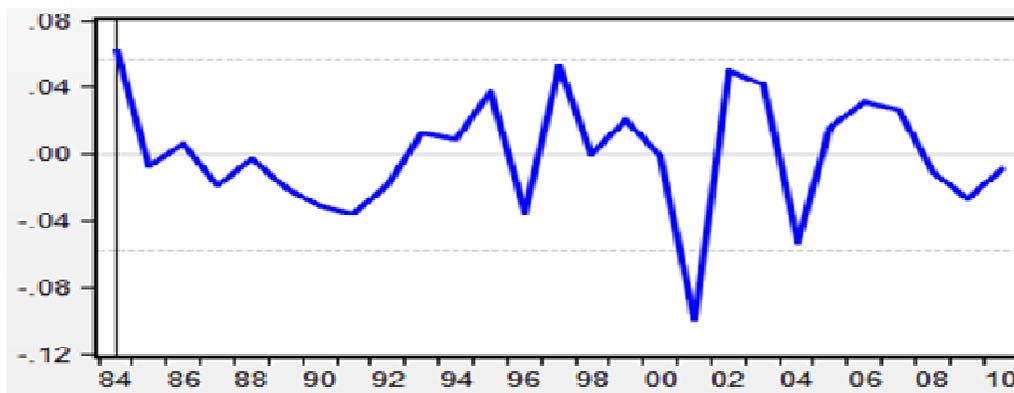
The results from HP^F show that 2008 and 2009, output in Malawi was marginally above its potential while in 2010 output was slightly below the potential level. Results from this approach is still consistent with the ordinary HP filter and linear trend because the output gap

Chart 8. HP^F output Gap (1980-2016)



Source: Author estimation

Chart 9. SVAR Output



Source: Author estimation

is insignificantly different from zero.

Structural Vector Autoregression Approach

The Structural VAR is the methodology that many econometricians have used and found to be useful in estimating potential output and output gap. In this study results from this approach are not very different from other methods, however Chart 9.

The potential output is not significantly different from the actual output at least in the past five years. In other words, the output gap is insignificantly different from zero. Running the SVAR model using quarterly data gives us results below which basically give us the same results Chart 10 below.

Output gap Vis-à-vis Inflation

The purpose of this paper was to determine the extent of the output gap in the Malawi economy and determine how these relate to price dynamics. From the results, it has been observed that the economy has been going through periods of underutilisation of resources as well as of overutilization. Below is our analysis on how the output gap relates to inflation. Chart 11(a), Chart 11(b) below.

1990-1995 (Below Potential)

Chart 9(a) shows that between 1990-1995, the economy was operating below the potential level with excess capacity and gross underutilisation of resources during

Chart 10. SVAR Output (Quarterly data)

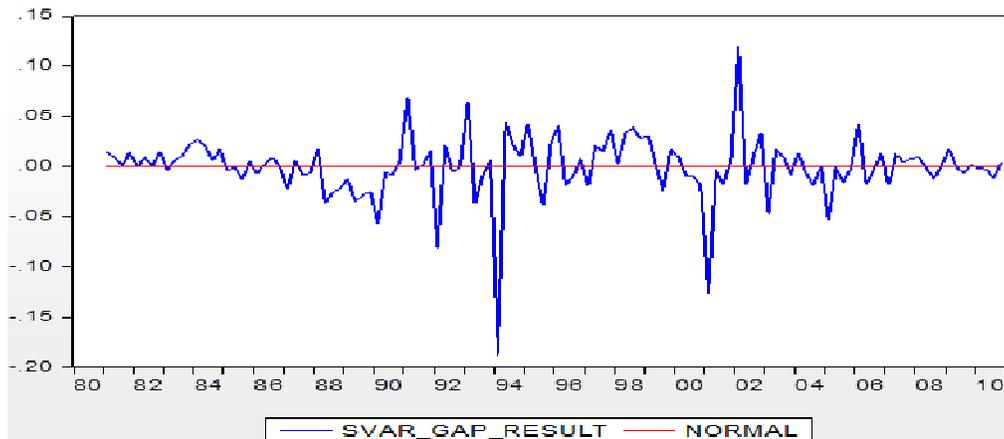
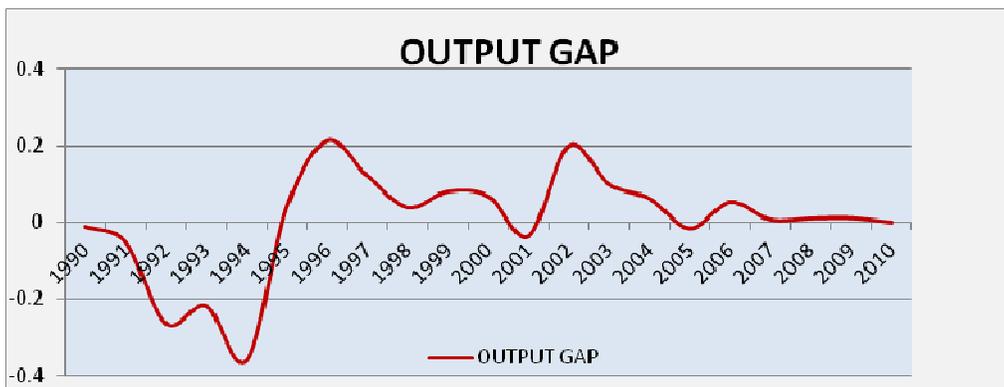
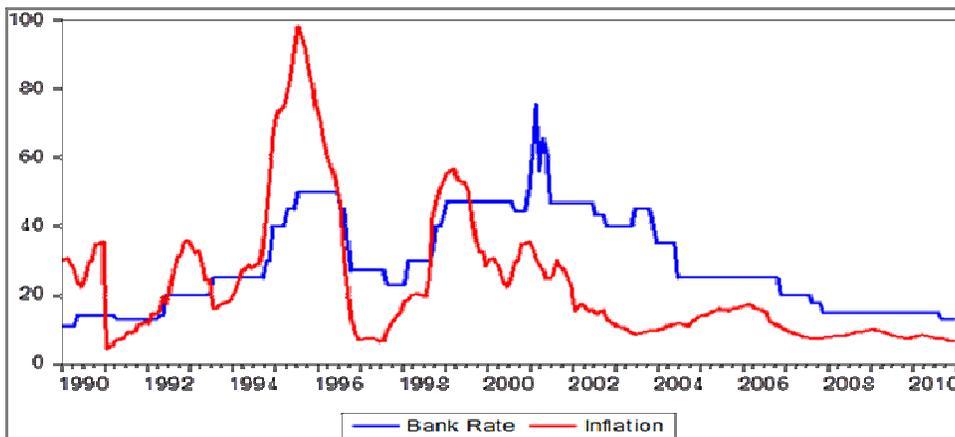


Chart 11(a). GDP versus Inflation



Source: Author estimation

Chart 11(b). Provide legend



Source: Author estimation

this period. Under such circumstances, theoretical underpinning indicates that inflationary pressure tends to ease, warranting easing of monetary conditions and other policies to stimulate demand. However, in Malawi, inflation trended upwards during this period as displayed conspicuously by chart 9(b) exhibiting a structural problem in the economy. The excess capacity would be attributed largely to the drought that heavily affected the maize production during that period. Thus, the low supply of maize greatly affected the price levels other than the economic fundamentals confirming the fact that supply factors matter in determining price dynamics in Malawi.

1995-1997 (Above Potential)

The downturn experienced during 1990-1995 was quickly succeeded by a roar in output in 1995 that prevailed until around 1997. Once again during this period, inflation defied the odds as it took a drastic downward trend until 1997. As noted in the charts above, there is an immediate response of inflation to output shocks immediately after 1997 making the output gap a reliable predictor of inflation in Malawi.

1998-2003 (Upward Output Trend)

The same story ensues when we sketch an output gap trend between 1998 and 2003 as it shows that there was a downward trend in inflation as output gap remains positive. This again suggests that inflation and output variables do move in opposite directions in Malawi.

2005-2010 (Stable GDP)

The methodologies employed in this exercise all report that from 2005 to 2010 output gap has been stable, that is, the gap has been marginally below or above zero. Interestingly inflation behaved as expected, remaining relatively stable.

CONCLUSION

The study, employing Linear trend filter, Hodrick-Prescott Filter and Structural VAR methodologies has established that output gap in Malawi has a negative relationship with inflation developments. Positive output gaps have coincided with low decreasing inflation suggesting that other factors have been behind the price dynamics. In recent years output gap has spanned around zero suggesting that the economy, given its resources, is operating at near-full capacity almost suggesting that the stability of output gaps in the recent years has guaranteed stable inflation over the years.

The negative relationship between inflation and GDP also confirms the findings in a paper by Research and Statistics Department, (April 2011) entitled 'Money Demand Function for Malawi- Implications for Monetary Policy'.

The results present a unique case for Malawi in that the inflation-GDP relationship defies the conventional theory. The conclusion to be drawn from such an observation would be that since the Malawi economy is agricultural based and most farmers practise subsistence food farming, years of high output levels happen to be years high food supply. Since food prices dominate the consumer price index basket in Malawi, falling of food prices due to abundant supply, warrants the general decline of overall inflation.

With previous studies indicating mixed results regarding drivers of inflation in Malawi this paper reports a different dimension to drivers of inflation from the supply side. In order to better inform policy, a further comprehensive study on monetary transmission mechanism is in order to clearly establish the efficient monetary policy channels in Malawi.

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