

Special Feature B

Mind the Gaps! Output Gaps for Monetary Policy and Financial Stability Assessments

by Douglas Laxton¹

Introduction

It is critical to make a clear distinction between the concepts of output gaps that are relevant for monetary policy and those measures that are relevant for analysing financial stability. The policy relevance of this distinction is closely related to the “leaning against the wind” (LAW) debate, which has been at the fore in recent years. The proponents of LAW argue that monetary policy should also focus on financial stability objectives, and specifically, should systematically react to the financial cycle by raising interest rates to discourage excessive credit expansions. The antagonists argue that the costs of low inflation and depressed output exceed the potential benefits of trying to rely upon higher interest rates to reduce the probability of financial crises.

The first measure of the output gap we consider is the standard Okun’s measure that is used by inflation forecast-targeting central banks to communicate how they are managing the short-run output-inflation trade-off.² The second measure is the output gap relevant for assessing financial stability, based on a simple atheoretical model that incorporates information on the growth rates of real credit and real property prices. See Chart 1 for a comparison of the two measures for the US.

The monetary policy output gap is constructed from a small Monetary Policy Model (MPMOD) that includes a Phillips curve; a dynamic Okun’s law equation; a monetary policy reaction function; a term-structure equation; and an equation that links the economy-wide output gap to measures of capacity utilisation in the manufacturing sector. The exact model specification is based on a simplified version of a model presented in Alichì *et al.* (2018).

To construct the measures of output gaps for assessing financial stability, we specify a simple atheoretical model that includes a cyclical and trend decomposition for output. Specifically, we use information on real credit growth and real property price growth to help measure the lower-frequency cyclical component in US GDP. We refer to this simple atheoretical model as the Financial Cycle Model (FCMOD). For clarity, the underlying output measure in FCMOD will be referred to as “trend output” to distinguish it from the concept of potential output, which is based on the notion of imbalances between aggregate demand and supply in the goods market. We emphasise that FCMOD is an atheoretical model, as there is no accepted theory to support a structural link between deviations of aggregate demand and supply in the goods market and growth in these two financial variables.

¹ Douglas Laxton is an Adjunct Professor at the NOVA School of Business and Economics in Portugal and Director of Saddle Point Research. He was formerly Division Chief of the Economic Modeling Division in the IMF’s Research Department. Douglas Laxton visited MAS in July 2019 as a consultant to EPG, MAS. This Special Feature is based on Laxton *et al.* (2019) and the views in it are solely those of the author and should not be attributed to MAS. The author thanks the Rockefeller Project for financing some of the development of the models described.

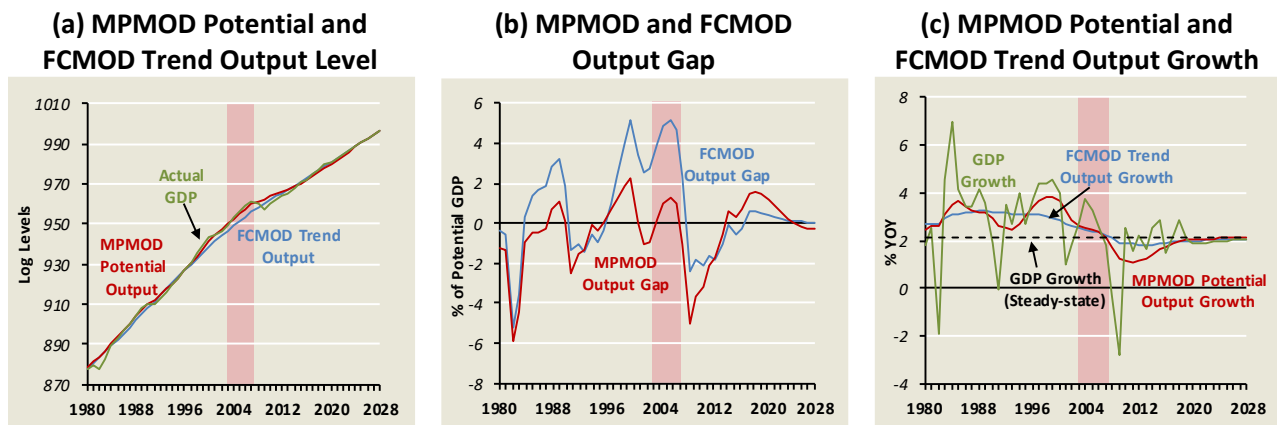
² See Clinton *et al.* (2015) and Adrian, Laxton and Obstfeld (2018).

While the cyclical component of GDP from FCMOD is correlated with conventional measures of the output gap, the FCMOD output gaps covering the boom phase of the financial cycle before the GFC (shaded areas in Chart 1) were over double the size of the measures of the output gaps that are useful for conventional monetary policy analysis. This is consistent with the observation that large financial imbalances were building up before the GFC that were financing a bubble in real estate prices but with little underlying inflation pressure in core markets for goods and services.³

In addition to the importance for monetary and macroprudential policies, trend output has

important implications for fiscal policy. Information about the sustainable or trend level of output is important to obtain measures of the sustainable tax base over the medium term, a key input for fiscal policy. While not presented here, the working paper by Laxton *et al.* (2019) provides a methodology to incorporate projections of trend output during the boom phase of a financial cycle (constructed from FCMOD) into medium-term projections of potential output from MPMOD. In other words, during the boom phase of the financial cycle, this modelling framework would indicate that the longer-term sustainable tax base is smaller than what would be suggested by standard contemporaneous measures of potential output.

Chart 1
MPMOD and FCMOD Output Gaps for the US



Source: US Bureau of Economic Analysis and authors' estimates

Historical Narrative for the United States

Charts 1 and 2 provide a summary of the MPMOD results over the historical period from 1980 to 2018 for the US, as well as the model's projected paths to 2028. These projections are not realistic forecasts, but are presented simply to show the convergence to the steady state; a professional forecast would obviously use much more information than the list of variables considered in the model.

To provide a historical narrative, it is useful to divide the sample into three time periods. The first period (1980–1995) is characterised by

disinflation and the anchoring of long-term inflation expectations to around 2%. The second period (1996–2007) is characterised by anchored long-term inflation expectations and a large reduction in the variability of the output gap and inflation. Finally, the third period (2008–2018) includes the GFC and a prolonged period of economic slack, when conventional and unconventional policies were deployed very aggressively to support the economy and prevent long-term inflation expectations from ratcheting downwards.

³ Inflation in the US picked up before the GFC, but that was primarily due to high commodity prices. It is also important to note that when a financial cycle results in a large increase in investment in residential construction, this produces a flow of housing services that is measured as output in the national accounts.

Period I: Anchoring Long-term Inflation Expectations (1980–1995)

The sample starts with the Volcker disinflation in the early 1980s. Facing double-digit inflation, the Federal Reserve increased and kept short-term interest rates high enough to generate sufficient economic slack to reduce inflation and anchor long-term inflation expectations. The output and unemployment costs of reducing inflation were substantial; the output gap went below –5% of potential output and unemployment peaked at around 10%. The cumulative output gap from 1980 to 1987 was –14.9%. With inflation declining from 12.7% in 1980 to 3.5% in 1985, this was consistent with a sacrifice ratio of 1.6⁴, a number that is broadly in line with other studies that focus on that particular period. As a result, inflation gradually fell to around 3% in the mid-1980s. (Chart 2)

After inflation bottomed out in 1985, in parallel with the recovering output gap and declining unemployment, inflation started to pick up, rising to about 5% in 1990. This was partly a result of an aggressive policy response to the 1987 stock market crash, which entailed massive liquidity injections. These inflationary forces then required another disinflationary episode, where inflation was brought down to 3% by 1992. Long-term inflation expectations declined only gradually, as the build-up of confidence that inflation would remain low took time. Indeed, the MPMOD estimates suggest that the decline in long-term bond yields was a result of lower levels of both inflation expectations and inflation uncertainty. This is reflected in a gradual decline in the term premium and the expected path of short-term interest rates.

Period II: The Great Moderation (1996–2007)

This is a period with much lower output and inflation variability. MPMOD's estimates show a dramatic reduction in the variability of both gaps. Indeed, the standard deviation of the output gap

fell from 1.8% in the period 1980–1995 to 1.0% in 1996–2007. All other measures of macroeconomic variability in MPMOD were very low in this period including GDP growth, CPI inflation, unemployment, short-term and long-term interest rates.

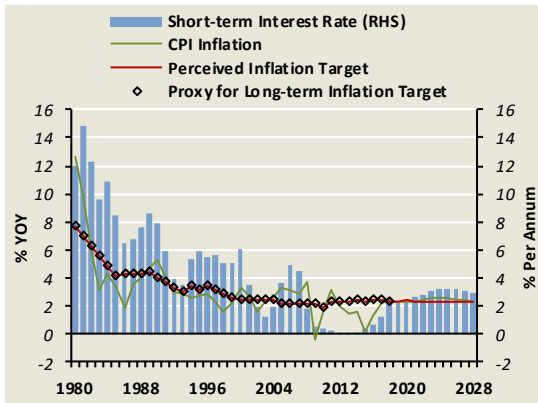
Period III: The Global Financial Crisis and Fighting Economic Slack (2008–2018)

The GFC erupted after the failure of Lehman Brothers on September 15, 2008. It resulted in a massive contraction in output followed by persistent economic slack and high unemployment. The cumulative size of the output gap was similar in magnitude to the Volcker disinflation, but this masked the large downward level adjustments to potential output growth. These large downward adjustments in potential growth were to a large extent associated with excessively optimistic expectations about sustainable output growth before the crisis, the underpricing of risks and a large bubble in property prices. After a large coordinated fiscal expansion in 2009 and 2010 by the G20 countries, the Federal Reserve was left with the primary responsibility of fighting economic slack with unconventional monetary policies. The large expansion of the Federal Reserve's balance sheet and unconventional forward guidance resulted in a dramatic reduction in term premia on long-term bonds and expectations that short-term interest rates will stay low for many years. The Federal Reserve was eventually successful in eliminating the large economic slack and reducing unemployment to low levels. Inflation gradually increased to numbers that are consistent with its 2% inflation target.

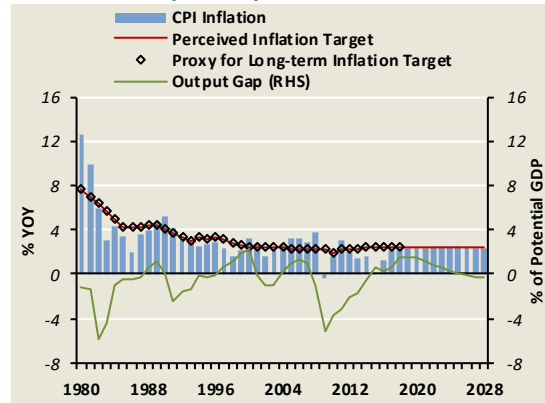
⁴ Calculated as $14.9/(12.7-3.5)$.

Chart 2
MPMOD Detailed Results

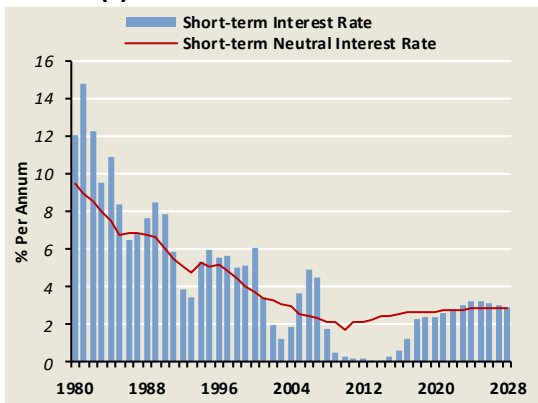
(a) Short-term Interest Rate and CPI Inflation



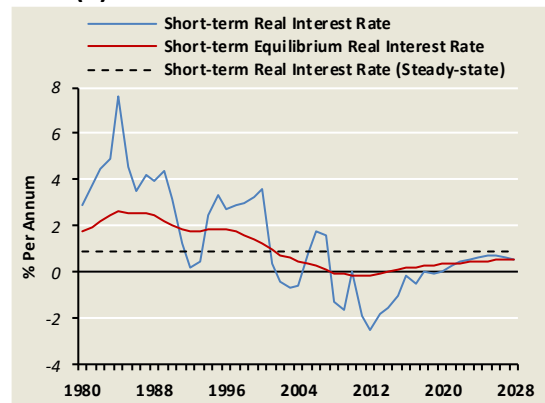
(b) Output Gap and CPI Inflation



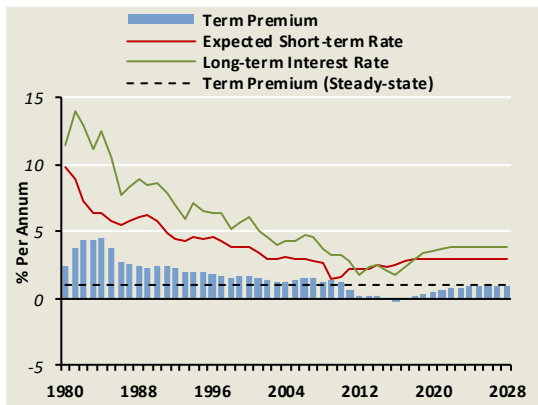
(c) Short-term Interest Rates



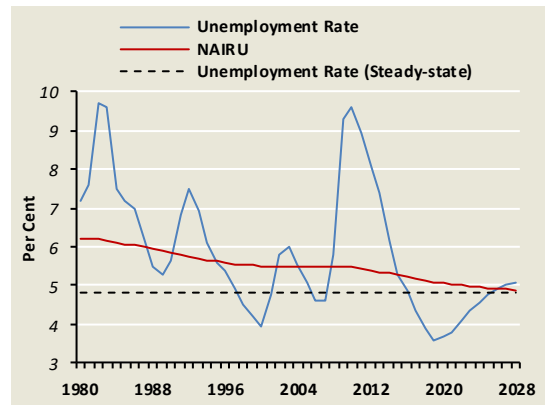
(d) Short-term Real Interest Rates



(e) Long-term Interest Rate, Expected Short-term Interest Rate and Term Premium



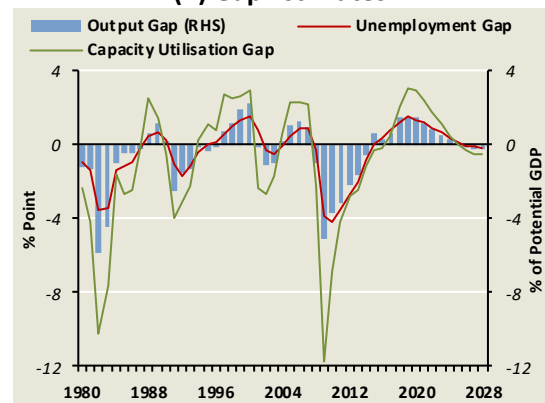
(f) Unemployment



(g) GDP Growth



(h) Gap Estimates



Source: US Bureau of Economic Analysis, US Bureau of Labor Statistics, Federal Reserve System and authors' estimates

A Simple Atheoretical Model of the Financial Cycle (FCMOD)

We now describe the simple atheoretical model used to create measures of the financial cycle and trend GDP. This work builds on Borio, Disyatat and Juselius (2014), henceforth referred to as BDJ (2014), in the sense that it uses the same BIS measures of real credit and property prices.⁵ The concept of trend output that BDJ (2014) used is based on a simple notion of sustainability and lower-frequency financial cycles. While understanding the causes of lower-frequency cycles in the economy is obviously important for thinking about where potential output is converging to over the medium and long term, it is not sufficient for thinking about output gaps that are useful for managing the short-run output-inflation trade-off. The concept of the output gap dates back to Okun (1962) and is based on balancing aggregate demand and supply in the goods market and labour market.⁶

It is important to emphasise that we should not expect a simple one-way causal relationship between these two financial variables (credit and property prices) and the difference between aggregate demand and supply. Indeed, in structural models, shocks to credit supply will cause both aggregate demand and supply to increase and typically put upward pressure on property prices. In addition, positive shocks to potential growth that are extrapolated into the future will drive property prices up, but may result in aggregate demand and supply increasing roughly together, resulting in little inflationary pressures in the goods market. This is why we will be careful and refer to FCMOD explicitly as an atheoretical model and not a model of potential output.

Getting the concepts down correctly is critical if central banks and other policymaking institutions are going to use such measures for policymaking.

The empirical literature suggests that the best two variables for estimating the probability of a financial crisis are real growth rates in credit and property prices.⁷ We will not be estimating probabilities, but instead will be focusing on developing simple models of trend GDP and the financial cycle as well as forecasts of actual GDP that gradually converge to these trends over the medium and longer term. In Laxton *et al.* (2019), we show how it is straightforward to impose information about these trends on the forecasts of potential output from MPMOD.

The three observable variables of the model require data on GDP, and the growth rates of credit and house prices. Unlike BDJ (2014), we will not be estimating all of the model's parameters. The reason for this is simply that the sample is too short to do meaningful estimation and statistical inference. For example, BDJ (2014) have to impose strong priors on the parameter on the lagged output gap in the output gap equation. The unrestricted likelihood function clearly wanted high values for this parameter which BDJ (2014) constrained to be a maximum of 0.95. Our basic research strategy is to write down very simple models that are motivated by large-sample multi-country empirical evidence on financial cycles, develop experience using these models in real time and then eventually implement a pooled cross-country estimation process.

⁵ The difference is that we will use BIS annual data for property prices and credit to the non-financial sector while Borio, Disyatat and Juselius (2014) used quarterly BIS data.

⁶ In an earlier paper that maps out the proposed empirical methodology, Borio, Disyatat and Juselius (2013) argue that inflation should not be used to help measure the output gap because there is no tight simple relationship between the output gap and inflation. Interestingly, the more successful central banks are at managing the short-run output-inflation trade-off and eliminating the positive correlation between the output gap and inflation, the more difficult it will be to find evidence that simple Phillips curves exist. Successful central banks have learned to deal with this uncertainty as well as other forms of uncertainty in the monetary transmission mechanism.

⁷ For a discussion of this empirical literature and structural models of the financial cycle that feature endogenous money creation, see Benes, Laxton and Kumhof (2014a, b) and Benes, Laxton and Mongardini (2016).

Chart 1 depicts the FCMOD estimates of the output gap and trend output growth based on the sample period 1980–2018. The output gap estimate serves as a measure indicating the position of the economy through the financial cycle. It can be observed that the FCMOD output gap shows more prolonged cycles with higher volatility compared to its MPMOD counterpart. This comes as no surprise taking into account the stylised fact that financial cycles last longer than typical business cycles. In addition, financial variables incorporated into the FCMOD output gap contribute to its more prolonged build-ups and sharp drops.

Some Concluding Thoughts

This Special Feature argues that the relevant output gap for monetary policy is conceptually and quantitatively much different from the financial cycle. Indeed, failure to make this important distinction could lead to misguided policies where central banks allow long-term inflation expectations to ratchet downwards. In situations where monetary policy is constrained by the effective lower bound on interest rates, it is critical that fiscal policy be prepared to support the economy to prevent it from falling into a low-inflation trap.

References

Adrian, T, Laxton, D and Obstfeld, M (2018), *Advancing the Frontiers of Monetary Policy*, International Monetary Fund.

Alichi, A, Al-Mashat, R, Avetisyan, H, Benes, J, Bizimana, O, Butavyan, A, Ford, R, Ghazaryan, N, Grigoryan, V, Harutyunyan, M, Hovhannisyan, A, Hovhannisyan, E, Karapetyan, H, Kharaishvili, M, Laxton, D, Liqokeli, A, Matikyan, K, Minasyan, G, Mkhattrishvili, S, Nurbekyan, A, Orlov, A, Pashinyan, B, Petrosyan, G, Rezepina, Y, Shirkhanyan, A, Sopromadze, T, Torosyan, L, Vardanyan, E, Wang, H and Yao, J (2018), “Estimates of Potential Output and the Neutral Rate for the US Economy”, *IMF Working Paper No. 18/152*.

Benes, J, Laxton, D and Kumhof, M (2014a), “Financial Crises in DSGE Models: Selected Applications of MAPMOD”, *IMF Working Paper No. 14/56*.

Benes, J, Laxton, D and Kumhof, M (2014b), “Financial Crises in DSGE Models: A Prototype Model”, *IMF Working Paper No. 14/57*.

Benes, J, Laxton, D and Mongardini, J (2016), “Mitigating the Deadly Embrace in Financial Cycles: Countercyclical Buffers and Loan-to-Value Limits”, *IMF Working Paper No. 16/87*.

Corresponding to the more volatile output gap, the FCMOD trend output growth rate is much smoother compared to its MPMOD counterpart. By definition, the FCMOD trend output is neutral to the cyclical fluctuations in the financial system. As Borio, Disyatat and Juselius (2013) argue, the main distinctive feature of finance-neutral trend output is sustainability. Even when output is at its non-inflationary path (which is captured in MPMOD as potential output), it might still be unsustainable if financial imbalances are building up.

Interestingly, in cases where monetary and fiscal policies are well-coordinated and comprehensive, this will be consistent with more favourable growth, inflation and debt dynamics. This will be the case for example in economies where policymakers are successful in delivering inflation rates that are, on average, close to their targets. Effectively, systematic negative deviations from the target results in lower cumulative nominal GDP growth, which puts upward pressure on the government debt-to-GDP ratio.

Borio, C, Disyatat, P and Juselius, M (2013), "Rethinking Potential Output: Embedding Information About the Financial Cycle", *BIS Working Papers* No. 404.

Borio, C, Disyatat, P and Juselius, M (2014), "A Parsimonious Approach to Incorporating Economic Information in Measures of Potential Output", *BIS Working Papers* No. 442.

Clinton, K, Freedman, C, Juillard, M, Kamenik, O, Laxton, D and Wang, H (2015), "Inflation-Forecast Targeting: Applying the Principle of Transparency", *IMF Working Paper* No. 15/132.

Laxton, D, Kostanyan, A, Liqokeli, A, Minasyan, G, Nurbekyan, A and Sopromadze, T (2019), "Mind the Gaps! Financial-Cycle Output Gaps and Monetary Policy-Relevant Output Gaps", *LSE Working Paper*, forthcoming.

Okun, A M (1962), "Potential GNP: Its Measurement and Significance", *Cowles Foundation Paper* 190.