



TD Economics

Special Report

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A PRIMER ON POTENTIAL OUTPUT: *How a nebulous economic concept affects monetary policy in Canada and the United States*

One of the factors minimizing the economic slowdown in the U.S. and Canada is the expectation that both the Federal Reserve and the Bank of Canada will cut their benchmark interest rates over 2007. In recent weeks, this outlook for monetary policy on both sides of the border has been complicated somewhat by revisions to potential output – possibly one of the most arcane topics in economics. In Canada, a downward revision to the growth rate of potential output allowed the Bank of Canada to lower their forecast for economic growth through the second half of next year without signalling a corresponding policy response in the form of lower interest rates. In the United States, the minutes from the last two Federal Open Market Committee (FOMC) meetings noted a downward revision to U.S. potential output. While the Federal Reserve has not released an updated economic forecast, this downward revision has reduced the likelihood of imminent rate cuts.

With such a powerful influence on monetary policy, it has become increasingly apparent that in addition to forecasting actual economic growth, a thorough understanding of potential output is necessary for predicting future interest rates moves. TD Economics first drew attention to this issue in October 2005 when revisions to potential output altered the outlook for monetary policy in Canada (see “Key issues arising from the Bank of Canada’s October Monetary Policy Report” available at www.td.com/economics). More than a year has passed, and the conclusion is the same. So, it is time for a more formal exposition of potential output and its effect on monetary policy.

HIGHLIGHTS

- **Recently, revisions to potential output, which is one of the lesser understood concepts in economics, has had a significant impact on the outlook for monetary policy in Canada and the United States**
- **Potential output provides the benchmark for gauging the degree of capacity pressures in the economy – a key input into the monetary policy decision making process**
- **The fundamental difficulty in understanding potential output is that it cannot be directly observed and therefore must be estimated using economic models. There is also considerable judgement added to the final estimate so replicating the procedure used by central banks is extremely difficult.**
- **In Canada, the recent revision to potential output was due to a change of assumption for the trend growth rate of labour productivity. There is a risk that this change may underestimate the trend in labour productivity over the next two years and therefore motivate the Bank of Canada to lower their key lending rate slightly by the second quarter of 2007.**

What potential output is and why it matters for monetary policy

Simply defined, potential output is the maximum level of output that can be generated by an economy without

triggering an increase in inflation. This level of output represents the long-term equilibrium implied by the maximum sustainable utilization of the economy's fundamental components such as the labour force and capital. If the actual level of output were to rise above this level, shortages of labour and materials would eventually arise, pushing prices higher and eventually fuelling inflation. Similarly, if output drops and stays below its potential, excess capacity would steadily grow, leading to lower levels of employment, idle factories, and downward pressure on prices. The same relationship applies to growth rates, so that if actual output growth were to exceed that of potential, the economy would be, all things equal, *moving towards* a higher rate of inflation. From the perspective of maintaining a stable rate of inflation, the growth of potential output represents the Goldilocks of growth rates – not too fast and not too slow.

Central banks use the concept of potential output to help gauge the relative position of the economy over the economic cycle. To assist in this analysis, the concept of an “output gap” was developed. Defined as the difference between actual and potential output, the output gap acts as both a signal of future inflationary pressures and as a guide to the direction of monetary policy. For example, a positive output gap (occurring when the level of economic activity exceeds its potential) corresponds to higher future inflation which, all things equal, would motivate the central bank to raise interest rates today. Higher interest rates would then curtail economic activity, pulling actual economic growth below potential, thereby eroding the positive output gap. Conversely, a negative output gap is

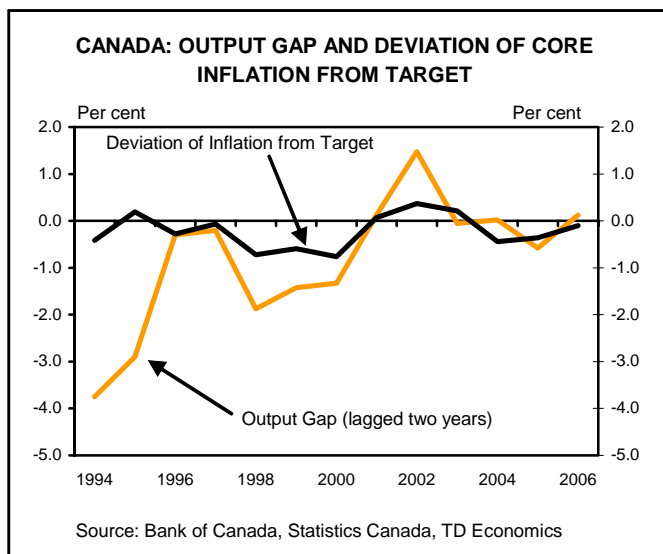
Implementing Monetary Policy when the Economy is Operating at Capacity

One of the challenges that a central bank faces when forecasting the output gap is that it must converge to zero over the forecast horizon. If the output gap were projected to do anything other than shrink, the central bank would essentially be admitting to making a policy error. When the economy is operating either well above or below its productive capacity, the direction of interest rate changes is fairly clear and the forecast can show an output gap gradually moving towards zero. However, when the economy is operating close to its capacity and the direction of rates is less clear, the forecast must show an output gap that remains small. The missing piece in this analysis is the future interest rate path – which makes the overall forecast more difficult to interpret. In recent months, the Bank of Canada has made strides to improve their transparency on this issue by stating in the communiqué accompanying the October 17th Fixed Announcement Date that “the current level of policy rates is consistent with achieving the 2 per cent inflation target.” By contrast, the Federal Reserve has been less clear regarding their comfort level with the current level of interest rates. For more information, see “Comparison of Monetary Policy in Canada and the United States: Weaker Fed Transparency the Biggest Difference” available at www.td.com/economics.

typically met with lower interest rates designed to stimulate a recovery in economic growth. When the output gap is very small or closed, the current level of policy rates is deemed appropriate.

The devil is in the details

While intuitively simple, what makes potential output extremely problematic is that it cannot be observed directly. Economists must therefore attempt to estimate its level using a variety of economic models – each with their own advantages and limitations. Many of these models are based on a two step process. The first step is to use existing economic relationships to estimate the total output of an economy. One example, which underlies some of the forecasting models used at the Bank of Canada and the Federal Reserve measures total output as a function of the economy-wide inputs of labour, capital, and produc-



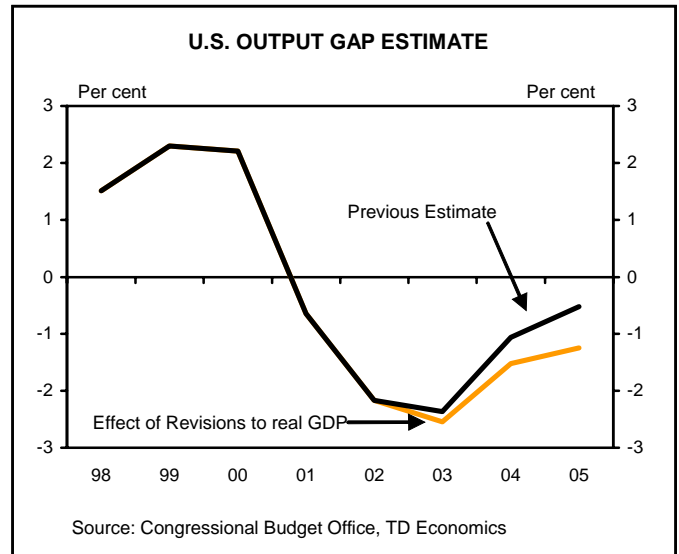
tivity (known in the economics world as a production function). Using economic theory, these inputs are then divided further into their underlying drivers such as population growth, labour force participation, the equilibrium unemployment rate, the number of hours worked, and labour productivity. The second step is to then apply statistical techniques to extract the long-term trend from each of the individual components of output. This step also requires a considerable amount of judgement and must incorporate long-term assumptions for each of the underlying variables. Once these individual trends are calculated they are then aggregated through the production function to create a rough estimate of potential output.

The central advantage of this representation is that it allows economists to use observable developments in a wide range of economic indicators to make inferences about the economy as a whole. This attribute is especially useful when the economy is undergoing structural changes. For example, the effect that an aging population will have on the economy is captured by including population growth in the labour input of the production function. By contrast, this interaction between population growth and economic activity would not be immediately recognized or accurately attributed by looking at output growth alone.

Fuzziness ensues

Unfortunately, estimating potential output is not without its limitations. For one, it is based on a stylized view of the economy and, therefore, is an imprecise measure and subject to considerable judgement. Compounding this problem is a lack of consensus on the best estimation technique, especially in the second and more statistically rigorous step. In a practical sense, this makes the estimates used internally by central banks extremely difficult to replicate in the private sector. While both the Bank of Canada and the Federal Reserve have made great strides in enhancing transparency, the inner workings of their estimation procedure for potential remain fairly mysterious.

A second concern regarding the estimation of potential output is that the process is heavily reliant on accurate data. As a result, the quality of the underlying data and the potential for revisions can have a strong influence on the final product. In fact, the recent downward revision to potential output growth in the United States was attributed to a downward revision to real gross domestic product (GDP) over the period 2003 through 2005 from an average annual growth rate of 3.5% to 3.2%. What accen-



tuated the effect of this revision is that it was due in large part to downward revisions of investment in equipment and software, translating to a smaller stock of capital equipment, which is another factor affecting the estimation of potential output. Using the estimate of potential output calculated by the Congressional Budget Office, the revisions to real GDP growth widened the negative output gap by nearly three quarters of a percent in 2005. Unfortunately, the Federal Reserve does not release their estimate of potential output so the effect that the announced revision to potential output has on the output gap remains unknown at this time. So while revisions to historical economic data are typically met with a yawn by financial markets, their effect on potential output may warrant a closer examination since it can have a significant impact on the conduct of monetary policy.

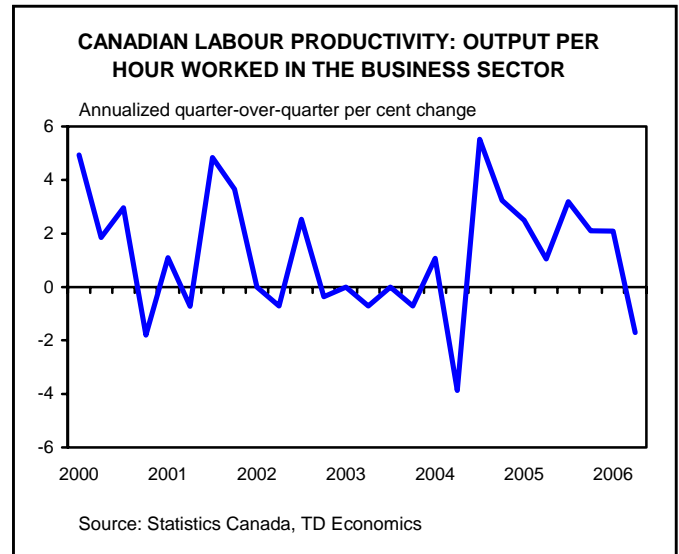
Not as stable as you might think

While potential output is typically thought of as a long-term concept, which implies that it should be fairly stable, it actually shows a considerable amount of variation over the economic cycle output. In our report last year we found that a 3-year moving average of *actual* output tracked the Bank of Canada's estimate of Canadian potential output reasonably well. In fact, the Bank's estimate of potential has ranged between 4% and 2.5% over the last seven years. These changes correspond to the various developments in each of the components used to estimate potential output. While many of the labour market trends remain fairly constant, one input that accounts for a lot of the short term variability is labour productivity. For example, during the

mid 1990s economists noted that the pace of output growth in the U.S. economy was increasing at a much faster rate than in previous expansions without a corresponding increase in inflation. This led to the belief that the underlying structure of the economy had changed, as the surge in high-tech investment over this period translated to a higher level of labour productivity and the creation of the so-called “new economy”. As a result, the estimates of potential output rose significantly during this period in the United States. Following the equity market correction and the short-lived U.S. recession in 2001, it became clear that the rise in trend labour productivity had been at least partially overblown. As a result, estimates for the growth rate of potential output since then have moderated. In Canada, estimates of potential output were also raised in reaction to the IT boom and then reduced. However, the growth rate of potential output in Canada has underperformed that of the United States, reflecting the anaemic pace of labour productivity in Canada during this period.

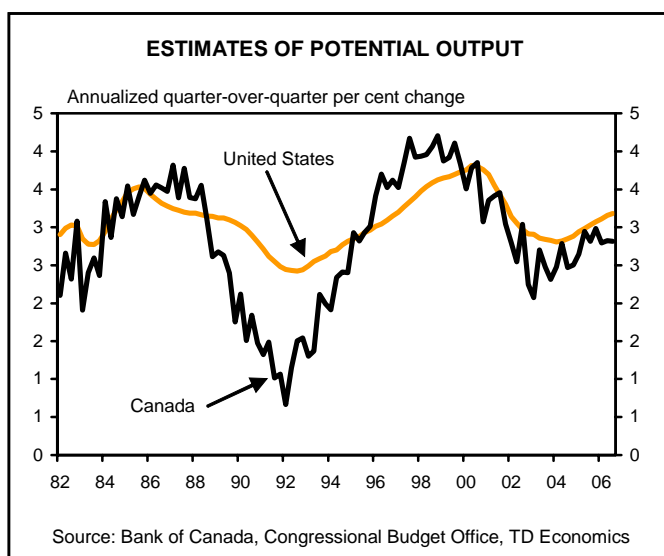
Forecasting the uncertain

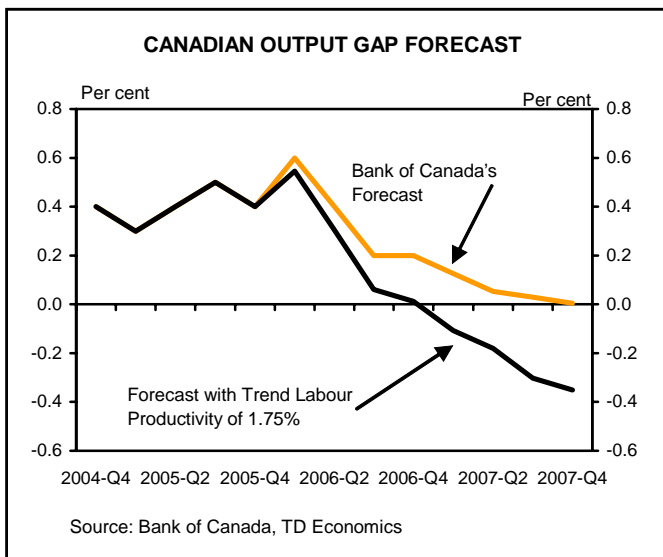
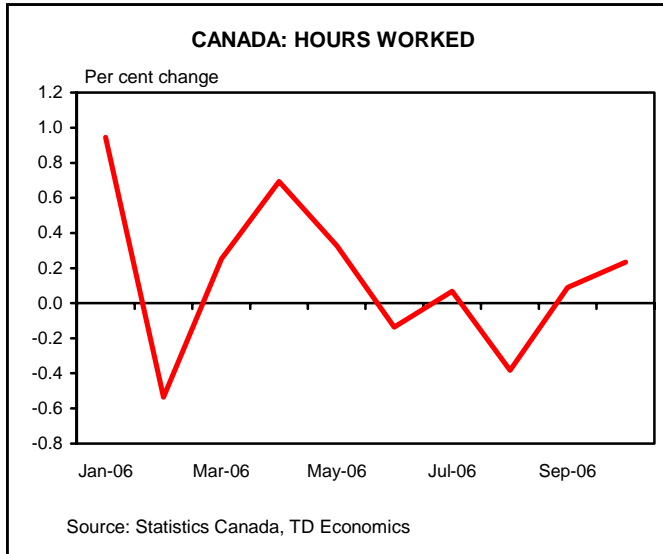
An added complication arises when central banks attempt to forecast potential output. Not only do they require a forecast for actual output (typically real GDP growth), but they also require accurate economic forecasts for each of the individual components that feed into the estimation process. These forecasts are typically carried out using separate economic models and frequently result in an additional layer of judgement. The resulting forecast for potential output is affected by changes based on



adjustments made to any of the underlying forecasts. This is what happened in Canada with the release of October’s Monetary Policy Report. Given recent information and a change of assumption, the Bank elected to lower their forecast of labour productivity over the 2006 to 2008 period from 1.75% to 1.50%, which, in turn, reduced their estimate for potential output. The same type of revision had occurred a year earlier, which gave rise to our original missive. So with changes in view of labour productivity driving the last two revisions to potential output by the Bank of Canada, the question then becomes if they now have it right.

Since the start of the decade, labour productivity has averaged an annualized growth rate of just 1.2%. A large part of this low estimate was due to virtually zero growth through 2003 and 2004. Since then, labour productivity has recovered strongly, increasing by an average annual growth rate of 2.4% in 2005. Looking over 2006, productivity growth started the year of on solid footing (+2.1% in the first quarter) before tumbling by 1.7% in the second quarter. The prospects for the remainder of 2006 are respectable. While hours worked fell in the third quarter (which has the effect of boosting labour productivity since it is formally defined as output per hours worked), real GDP growth will likely remain in the neighbourhood of 2.1%, lifting labour productivity towards 2.5%. But a rise in hours worked observed in October suggests reduced productivity growth in the fourth quarter, especially when coupled with the anticipated arrival of the peak impact from the slowing U.S. economy. So for 2006 as a whole, growth of labour productivity could end up around 2.0%,





well above the Bank's trend estimate of 1.75%

In order to understand this recent volatility in labour productivity, it is important to acknowledge, as the Bank of Canada does, that the Canadian economy is in the midst of a significant structural change. Both the price of commodities and the value of the Canadian dollar have increased dramatically in the last couple of years, necessitating a readjustment of resources both within and across firms. This type of behaviour is typically associated with

periods of lower productivity as resources are reallocated. However, in recent months commodity prices have fallen somewhat from the peaks recorded in the summer but remain elevated by historical standards. At the same time, the dollar is now trading in a fairly tight trading range. Going forward, both of these trends are expected to persist through the end of 2008, which will give firms additional time to adapt without facing the same degree of movement in either the dollar or commodity prices. Firms are also in a position to take advantage of the higher value of the currency to import productivity-enhancing capital equipment – a trend that has begun to materialize in the merchandise trade data. An argument can therefore be made that labour productivity should remain reasonably robust over the next two years

The risk that a higher-than-expected growth rate of labour productivity poses to both trend productivity growth and potential output has significant implications for monetary policy in Canada. As the accompanying graph shows, assuming a trend growth rate of labour productivity of 1.75% in 2006 and 2007, which is not unreasonable given a 2.0% forecast for actual labour productivity in 2006, would drive the output gap to zero by the end of this year and to -0.4% by the end of 2007 – giving a justification for the Bank to cut rates. However, if the trend growth rate of labour productivity remains at the Bank's estimate of 1.5%, the case for rate cuts becomes considerably more difficult to make as the modest amount of excess capacity is gradually worked off by the end of 2007. So taking the Bank's forecast for real GDP growth as given, the risks are tilted towards the creation of some excess capacity over the coming quarters. As such TD Economics sees that the odds are in favour of the Bank delivering a touch of monetary stimulus by spring of 2007. It is important to recognize that this move will not represent the start of a significant easing campaign, but rather it provides a modest insurance policy against the risk of either a more severe U.S. slowdown or an unexpected moderation in domestic activity in Canada. Indeed, the overnight rate is forecast to return to its current level of 4.25% by the end of 2008.

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