## ECON\*4900

## Macroeconomic Report

# Is Inflation Dead?



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### Introduction

During the early stages of his 1980 campaign for the US Presidency, then-candidate Ronald Reagan famously stated "Inflation is as violent as a mugger, as frightening as an armed robber and as deadly as a hit man." Disregarding any personal views regarding the former Republican President, this quote stands as a near-perfect embodiment of the panic that surrounded the period of abnormally high inflation in the United States and other nations between the mid-1970s and early 1980s. Inflation at the time was seen as an enemy, something to be combatted, and something that could destroy life as we know it.

However, times change. Today we see very few remnants of this defining element of the macroeconomic landscape that existed 40 years ago. Inflation rates in both the United States and Canada have more or less oscillated around the 2% targeted rate for more than two decades, exceeding 3% in only a few rare occasions during that same period. This has been the case in spite of sustained periods of expansionary monetary policy among major economies in addition to a number of other factors that may conventionally lead us to believe that inflationary pressures may be present. This is even more stunning considering that such policy actions undertaken by central banks appear to have been effective in other ways, such as reducing unemployment rates, with these trends being observed in both Canada and the United States. Taken at face value, these observations contradict the concept of the "Phillips Curve", which highlights a theoretical inverse relationship between inflation and unemployment within an economy.

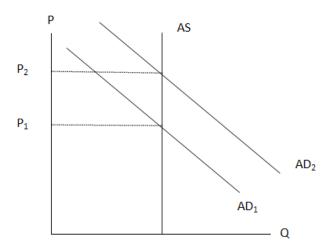
The generally accepted theoretical framework behind inflationary pressure is simple. When rightward shifts in the aggregate demand curve allow the actual output in an economy to become significantly close to potential output, or exceed it outright, then aggregate price levels will rise significantly. This is in line with the basic rudimentary economic principle of supply and demand, stipulating that under normal circumstances, the equilibrium price level will rise if there is a rightward shift in supply, assuming there is no shift in demand. With this being said, much of the debate among different schools of thought within macroeconomics surround the exact shape and behaviour of both the aggregate demand and aggregate supply curves, as well as their relationships with other indicators.

So why have inflationary pressures remained by and large minimal within both the Canadian and American economies? And why has this trend persisted so long? These are some of the most pressing questions facing central banks and economists in the world today, and the one I am seeking to resolve. However, it is highly unlikely that a simple answer exists to this question, and that is precisely why it is important to observe many factors and points of view when studying issues such as this.

### **Theoretical Framework**

Understanding the current inflationary environment requires us to first and foremost gain a thorough understanding of how inflation theoretically arises and its interactions with other indicators. While virtually all economists agree on certain points in regards to inflation theory, there are various schools of thoughts that differ in their perceptions of other forces that lead to inflationary pressures within an economy. Among these schools of thought are Keynesian economics and Monetarism.

However, before discussing these different perspectives, we must understand the classical concepts of aggregate supply and aggregate demand, or the classical AD-AS model. The original conception of the AD-AS model with aggregate price level on the vertical axis and quantity of output on the horizontal axis has some distinct features. First, it is conceptualized that aggregate supply in the long run will always be vertical. That is, long run aggregate supply will be constant regardless of the positioning of the aggregate price level. While there may be a diagonal upward-sloping AS curve in the short run, classical economic theory states that the market forces of supply and demand will always create a situation in which output ultimately returns to its long term level with the price level, or inflation, absorbing the entire effect of the short run shifts in AD and/or AS. The reasoning behind this is fairly simple to comprehend; all capital and labour inputs in an economy at a certain point in time can only sustain a certain level of production.



Another feature of the classical AD-AS model is that both aggregate demand and short run aggregate supply are generally portrayed as linear functions. That is, their slopes do not change as they approach or diverge away from the conceptualized level of long run aggregate supply. This is one of the key areas in which modern views regarding the AD-AS model have evolved away from the classical view.

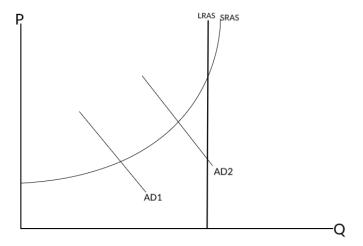
#### **Keynesian View**

The concept of Keynesian economics arises from the works of John Maynard Keynes, a renowned British economist who rose to prominence during the Great Depression. Among Keynes' most well known views were the perceived benefits of expansionary fiscal policy during periods in which aggregate demand falls, and the view that monetary policy is less effective in doing this.

When applying the broad principles of Keynesian economics, the changes in the AD-AS model from its classical conceptualization are significant. Under the Keynesian model, a distinctly-shaped short run aggregate supply curve is introduced. This curve is noticeably non-linear; in fact, there are instances of the curve being nearly horizontal (when it is far to the left of long run aggregate supply) and instances in which it is nearly vertical (when it is to the right of long run aggregate supply.

The theoretical vertical long-run aggregate supply curve remains, and represents potential output within an economy. However, this level is viewed in a different way. In most visualizations of the Keynesian AD-AS model, the short run aggregate supply curve is already seen as quite steep, or having a high slope. This signals that around this point, the aggregate price level is very sensitive to shifts in the aggregate demand curve, likely to a greater extent than the sensitivity of aggregate output. Or put more simply, pushing output to its potential level (presumably by increasing aggregate demand) may result in unwanted inflationary pressures. With this being said, many economists and policymakers using this model have determined that an ideal equilibrium would not manifest as actual aggregate supply equaling long run aggregate supply or potential output, but rather a level of actual output that is slightly below potential. This would ideally be a point that is sufficiently large

to allow for economic prosperity, while also being sufficiently small to prevent inflation from exceeding a targeted range.



The Keynesian view of aggregate supply and aggregate demand is what motivated the initial conception of the Phillips Curve. If the unemployment rate is presumed to have a direct inverse relationship with the level of output, then it logically follows that inflation, or the *increase* in the price level will in turn have an inverse relationship with the unemployment rate.

We can hypothesise a number of reasons why this may be the case. First and foremost, economic theory stipulates that the potential level of output, or the level of output at the long run aggregate supply curve, is consistent with what is referred to as the natural rate of unemployment (later rebranded by several economists as the Non-Accelerating Inflation Rate of Unemployment or NAIRU). The natural unemployment rate is commonly defined as the level of unemployment that allows for everyone in the labour force to be employed, save for those barred due to systemic or "structural" factors. Intuitively, we know that a shift in output towards a point that is at or close to potential, and consequently a shift in unemployment towards a point that is at or close to the natural rate, will result in employers having fewer options on who they can conceivably hire. This will in turn theoretically raise workers' bargaining power, which they can in turn translate into higher wages, creating "cost-push" inflation as firms raise prices on consumers to compensate for higher wage expenses.

We can also use the concept of "demand-pull" inflation to justify the existence of a downward sloping Phillips Curve. A rightward shift in the aggregate demand curve would mean that consumers are increasing their level of spending, allowing firms to raise their prices. This is consistent with the basic concept of supply and demand.

#### **Monetarist View**

A more recent economic school of thought that presents a distinct view on the emergence and behaviour of inflation is known as monetarism. Widely associated with American economist Milton Friedman, monetarism rose to prominence in the 1970s and had significant influence on monetary policy, particularly in the United States.

The monetarist economic theory puts the money supply front and centre as the primary driver of short run fluctuations in output and the aggregate price level. Underlying the monetarist view is what is referred to as the quantity theory of money. This theory stipulates that the product of the money supply and the velocity of money (how many times it changes hands) is equal to the product of the price level and the level of output. It is therefore apparent that an increase in the money supply will by definition translate into an increase in the price level, an increase in the level of output or both. Monetarists therefore argued that targeting the money supply is the ideal way to combat runaway inflation or increase output during a recession.

## Inflation in the 21st Century

Based on our understanding of the theoretical basis behind the drivers of inflation and its behaviour, we can proceed in dissecting the inflationary situation as it exists today in Canada and the United States. We can also use this information in order to gain an idea on how inflation rates would behave if certain macroeconomic conditions become present or certain policies are implemented.

#### **Historical Context**

When the aforementioned Phillips Curve emerged as a theorized economic concept in the late 1950s and 1960s, the data seemed all but clear. In *The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957*, William Phillips used nearly 100 years of data from the United Kingdom to strongly back his assertion that an inverse relationship existed between unemployment and wage inflation. Several economists subsequently expanded on his work, using data from both the United Kingdom and the United States to find a similar relationship between overall inflation and unemployment.

However in the 1970s, a new trend emerged. In 1974, inflation in the United States rose above 11%, a significant rise from only 2 years prior in 1972, when it sat at 3.2%. This occurred despite a wider economic slowdown and rise in unemployment, which contradicted the narrative highlighted by the Phillips Curve. Inflation in Canada followed a very similar trend, also rising to nearly 11% in 1974. A period of relatively high inflation persisted in the subsequent years, culminating in a US inflation rate that exceeded 13% in 1980, and a Canadian inflation rate that peaked at over 12% in 1981. It has been argued that this data does not necessarily contradict the initial sentiment behind the Phillips Curve, as the inflationary pressures during this period were cost-push as a result of shocks in commodity prices such as crude oil, which were completely unrelated to the labour market.

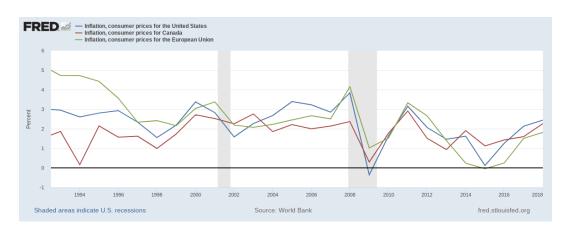
Aggressive efforts from the Federal Reserve and other central banks to combat inflation by limiting the money supply, resulting in abnormally high interest rates, ultimately proved to be successful in quickly reducing inflation in the early-to-mid 1980s. While there was an

initial economic slowdown as a result of this tightening, a strong recovery eventually took hold. In the aftermath of this period of runaway inflation, central banks including the Bank of Canada began looking to set specific inflation targets to avoid similar situations in the future. The Bank of Canada itself first set a specific inflation target of 3% in 1992 and later adjusted its target to a range between 1% and 3%. The Federal Reserve did not formally set an inflation target, however it has communicated for many years that 2% is generally a desired rate, largely in line with the views of the Bank of Canada and other major central banks such as the Bank of England.

#### **Modern Trends**

By some accounts, a new "modern era" of inflation has emerged since the beginning of widespread inflation targeting by central banks in the early 1990s. This era can be viewed as a clear contrast against the high volatility in inflation rates that existed in the previous two decades.

By most standards, inflation targeting by the Bank of Canada has been a success. Disregarding periods of recession in which inflation is artificially depressed, the CPI inflation rate in Canada has by and large remained within the range between 1% and 3%. The inflation trend observed in the United States has been similar, however annual CPI inflation in that country has exceeded the 3% threshold five times since 1993. These years were 2000, 2005, 2006, 2008 and 2011. Looking beyond North America, inflation in the European Union has also followed similar trends. In the most recent full year of data, 2018, the inflation rate in Canada clocked in at 2.27% while the equivalent rate in the United States stood at 2.44% and the rate in the European Union stood at 1.81%.



Inflation trends to date in 2019 have however included a drop, purportedly as a result of trade concerns and other factors that have depressed global GDP growth expectations. Within the 11 months of data available for 2019, only two months saw the annualized US CPI inflation rate reach or exceed 2%: April and November. In Canada, three months saw annualized CPI inflation reach the 2% threshold, and only one month saw this metric exceed it.

The sustained ability of inflation to remain within a generally desired range shows us the effectiveness of central bank policy in containing its potential negative impacts. However, it can be argued that the credit for this overall effectiveness cannot simply be attributed to monetary policy alone. In relation to this, the concept of "inflation anchoring" has recently found its way into mainstream economic dialogue in a quite significant way.

Inflation anchoring pertains to expectations that firms and households have regarding inflation rates. If an economy is regarded as being "well-anchored", this means that long-term inflation expectations are relatively unchanged and are consistent with long term trends in the actual inflation rate. While short-term actual and expected inflation rates may vary, the long-term expectations hold. In theory, firms and households have high confidence in these long term inflation expectations, and therefore adjust their spending and investment behaviour in order to meet the expected inflation levels. Therefore, when a relatively strong consensus emerges regarding long term inflation trends, and these expectations are considered reliable, the sheer power of inflation anchoring within an economy is strong. Following this logic, we can say that strong levels of inflation anchoring around 2% have allowed actual inflation rates to generally remain around this level. Some have argued that anchoring, as opposed to direct monetary policy actions themselves, has been the most effective tool in keeping inflation rates relatively stable and contained.

We can also effectively dissect inflation into different parts by looking at closely related indicators. Nominal wage growth, otherwise known as wage inflation, can be seen as a contributor in part to the overall inflation rate, as it is theoretically a key driver of cost-push inflation. In Canada, year-over-year nominal wage growth, reported monthly, has been as low as below 0% and as high as above 5% at certain points over the past two decades. Most recently, nominal wage growth for the 12 months trailing September 2019 was reported at

4%, its highest level since late 2010. It is however important to note that wage inflation does not necessarily represent the overall rate of inflation derived from wage costs, as much of the wage growth reported is in turn absorbed by GDP growth.

#### **Relationships With Other Indicators**

It is impossible to assess the overall dynamics of inflation within an economy without also looking at other key economic indicators and their potential relationships with the inflation rates reported. This is also important when trying to measure any direct impacts that monetary policy actions can have on the actual inflation rate within an economy.

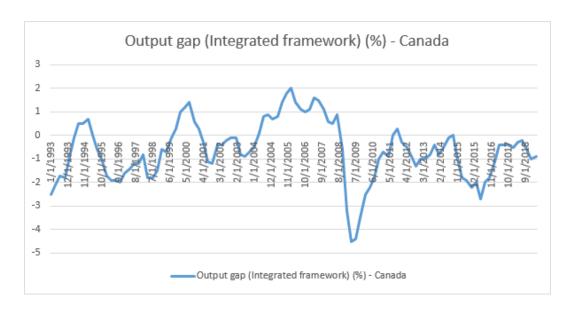
Money supply is perhaps an indicator with one of the most direct relationships with the inflation rate, especially in relation to the quantity theory of money highlighted by monetarists. Two of the most common measurements of the money supply within an economy are known as the monetary base and the M1 money supply. The monetary base is defined as the quantity of money that is in circulation in the economy at large in addition to the amount that is in the reserves of deposit-taking financial institutions, known as commercial banks. The monetary base in the United States in particular grew substantially in response to the 2008 financial crisis, as the Federal Reserve took extraordinary measures to prevent an even more catastrophic crisis and kickstart a strong recovery. The quantity of money included in this metric rose from \$848 billion in August 2008 to \$4,075 billion in August 2014, marking a stunning 381% growth rate in just six years. By contrast, the US monetary base had only risen by approximately 24.7% in the six years prior to August 2008.

However, using the monetary base as an indicator for money supply in an economy is flawed. One of the primary reasons for this is its inclusion of money held in the reserves of commercial banks. *Excess reserves* refers to the money held in the reserves of commercial banks in excess of their required reserves. Since this money is not in circulation among non-financial firms and the general public, it by definition cannot have inflationary impacts. In August 2008, deposit-taking financial institutions in the United States held only approximately \$1.9 billion in excess reserves. Six years later, this figure was at nearly \$2,700 billion, accounting for the majority of the monetary base in the United States.

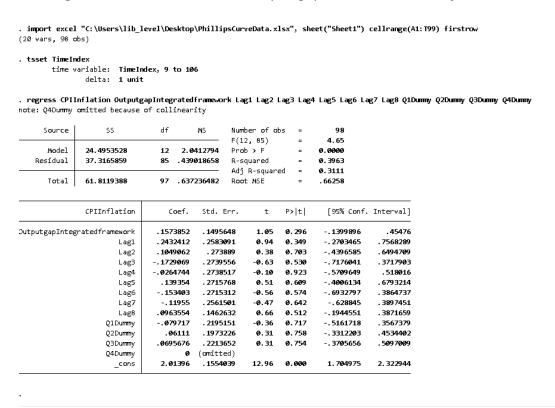
It may therefore be preferable for economists to study trends in the M1 Money Supply, which omits money held in reserve by commercial banks, however also includes other funds not included in the monetary base, such as traveler's checks and other checkable deposits. The M1 money supply in the United States has maintained a fairly steady growth rate since the 2008 financial crisis, rising from \$1,409 billion in September 2008 to \$3,876 11 years later in September 2019. This marks an approximate 175% growth rate, in comparison to an approximate 31% growth rate in the 11 years prior to September 2008. Meanwhile, the M1 money supply in Canada grew from \$435 billion in September 2008 to \$1,062 billion in September 2019, marking an approximate 144% growth rate.

Keeping the Phillips Curve in mind, it is also important to monitor unemployment rates within an economy when discussing inflation. In the aftermath of the 2008 financial crisis, the United States' unemployment rate peaked at 10.0%, while Canada's harmonized unemployment rate peaked at 8.7%. The unemployment rate in the United States has fallen dramatically ever since, while Canada's unemployment has fallen more gradually. Both nations have seen their unemployment rates reach multi-decade lows, with the US unemployment rate falling to 3.5% in November 2019, and the Canadian rate falling to 5.4% in May 2019. Given that significant recent inflationary pressures have been largely absent in both Canada and the United States, it is difficult to analyze current labour markets as an effect of the dynamic highlighted by the Phillips Curve.

In relation to the Keynesian AD-AS model, the estimated output gap within an economy can also serve as an important indicator in macroeconomic analysis, and can potentially serve as a substitute for the unemployment rate in a revised Phillips Curve model. The output gap is the estimated difference between the actual output (GDP) and the potential output level within an economy. The long-term trend in Canada's output gap estimated by the Bank of Canada is seen below. In this measurement, a negative value means that actual output is below potential, while a positive value means that the economy is operating above capacity, signaling that inflationary pressure may be imminent. According to this measurement, Canada's output has remained below potential for the vast majority of the time since the 2008 financial crisis.



In order to assess the relationship between the output gap and inflation, a regression analysis was conducted. The inflation rate is regressed on the output gap, with quarterly dummy variable and initially eight quarterly lag variables, allowing the model to account for the length of time needed for the output gap to have inflationary effects.



As is pictured, the coefficient on the estimated output gap is *positive*, which is in line with the theory of a narrower output gap being more inflationary by nature (remember that a "high" output gap is a significant negative value in this estimate). However, the relationship is not statistically significant at the 95% confidence level. When removing lag variables one-by-one from this model, the coefficient on the output gap only becomes statistically significant at the 95% level when only one lag variable remains.

#### **Actions From Policymakers**

Monetary policy is widely seen as the most potent method of controlling inflation. Central banks in the world today largely conduct monetary policy by setting interest rate targets and controlling the money supply to achieve these targets.

The post-financial crisis environment gave way to a historically abnormal period in which policy rates in the United States and Europe remained at near-zero for more than five years, however the benchmark policy rate set by the Bank of Canada stood slightly higher at 1% for most of that same period. The US Federal Reserve began a period of sustained rate hikes in late 2016, with its targeted range of rates reaching as high as 2.25% to 2.5% in December 2018, subsequently sending financial markets into turmoil as investors feared that the central bank was acting too hawkishly. 2019 saw the Federal reserve cut rates on three separate occasions, with the current target being between 1.5% and 1.75%. It remains to be seen whether these rate cuts will lead to a boost in US inflation. In Canada, rate hikes began in 2017, with the Bank of Canada's benchmark policy rate peaking at 1.75%, where it remains today.

When assessing potential monetary policy actions, one metric that central bankers often observe is what is known as the estimated neutral interest rate. The neutral rate can be defined as the interest rate that allows an economy to operate at potential output while allowing inflation to remain at targeted rates. One of the most well-known estimates of the neutral interest rate is known as the Holston-Laubach-Williams estimate. Under this estimate, the neutral interest rate observed in Canada has remained steadily above the American neutral interest rate since the 2008 financial crisis, signalling that the Federal Reserve's hawkishness throughout 2017 and 2018, ultimately resulting in policy rates

higher than that used by the Bank of Canada, was unneeded and potentially counterproductive.

It has been argued that direct monetary policy through the use of the interest rate has been ultimately an ineffective tool as a result of the strength of inflation anchoring and other factors. The most recent data currently available potentially supports this assertion, with inflation in the United States and Europe in particular being largely unresponsive to a sustained low interest rate environment that emerged in the aftermath of the 2008 financial crisis, as well as more drastic efforts by central banks such as quantitative easing. However, we know that there are other abnormal factors that could have led monetary policy to be ineffective in this period. The massive surge in excess reserves held by commercial banks in the United States is an example of this.

## **Conclusions**

In summary, we can first conclude that all participants in our modern economy have been effective in containing any runaway inflation. This includes central banks, governments, firms and households. However, one would have reason to otherwise suspect that this would not be the case, given the vast increases in the money supply in the United States in particular since 2008, as well as the noticeable fall in unemployment rates in both the United States and Canada.

There are a number of factors that can explain why significant inflationary pressures have not emerged over the past couple of decades. Firstly, using the quantity theory of money to analyze inflation and monetary policy is inherently flawed, as changes in the money supply by their very nature also have impacts on the output level and velocity of money in an economy. Therefore, we cannot assume that any direct tit-for-tat relationship between the money supply and inflation is guaranteed. Furthermore, the massive increase in excess reserves held by commercial banks in the United States has made much of the growth in the nation's monetary base largely irrelevant.

It is also highly important to be mindful of the fact that the initial conception of the Phillips Curve highlighted a relationship between *wage inflation* and unemployment. The overall CPI inflation rate accounts for far more than just wage factors, including rise in the cost of capital inputs. Inflation anchoring, or long-term consistency in dependable inflation expectations, has also been a prevalent factor that has barred significant inflationary pressures from taking hold.

With all of this being said, we cannot say conclusively that inflation is dead. What we can however say with confidence is that the current economic environment, characterized by well-anchored inflation expectations and an overall willingness from commercial banks to hold significant excess reserves, has made it very difficult for any significant inflationary pressures to take hold within the economy at large. This also does not mean that inflationary pressures that exceed the rates targeted by central banks simply cannot emerge. Unforeseen events, such as the oil price shock of the 1970s, can cause significant disturbance in economic indicators such as inflation, and are beyond the realm of what any

central bank can conceivably control. However, it can also be said that central banks and the economy at large are more well-equipped than ever to deal with situations such as that.

Expanding on these points, it can be said that inflation anchoring in particular as well as the overall consolidation in long-term expectations for other key indicators, in turn motivating the behaviour of firms and households, has reduced the overall effectiveness of monetary policy. If there is a significant effort by central banks to adjust interest rates and the money supply, participants in the economy can simply adjust their behaviour to remain consistent with their long-term expectations regarding inflation and other indicators. Lastly, the independence of central banks, and consequently their ability to make decisions that prove to be generally unpopular, is of the utmost importance in order to maintain effective monetary policy.

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