A closer look at...

Inflation

Monetary Authority of Singapore
Preface

The Economics Explorer aims to provide an accessible introduction to a broad selection of economic issues, ranging from monetary policy to trade to inflation. It is targeted at anyone interested in taking a closer look at the economic issues affecting Singapore.

This issue explores the topic of inflation – what its costs are, what causes it, how to measure it, and how it is related to economic growth. The pamphlet can be downloaded from the MAS website at www.mas.gov.sg.
A closer look at...

Inflation

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What is Inflation?

"Inflation means your money won't buy as much today as it did when you didn't have any." - Bank of England Quarterly Bulletin, May 1994

“I don’t believe this. The price of chicken went up by more than 10% last month, and yet the newspapers reported that inflation was only 0.1%!"

It’s not unusual to overhear such complaints in the supermarket, yet did the newspapers really get it wrong? Actually, there was nothing wrong with the news, nor with the price-tags in the supermarket. The confusion arose because many people do not understand the meaning of inflation. Inflation is defined as an increase in the general price level in the economy. The term "general" is important in the definition. It refers to inflation as a rise in the average price of all the items that we buy, and not only of one item or certain category of items. Nonetheless, there have been instances when the increase in the price of one item is so much that it pushes up the general price level. An example of this was the sharp increases in oil prices during the 1970s, which resulted in high inflation in many countries around the world, including Singapore.

But why is inflation of concern to us? Why do most central banks nowadays seem to be pre-occupied with keeping inflation down as a major, if not the only, priority of their monetary policy function? The answer lies with the undesirable economic and social consequences of inflation. Over the last three decades or so, empirical and theoretical arguments have been advanced to show that inflation is detrimental to economic growth. An environment of low inflation, on the other hand, is thought to be essential for sustainable economic growth. By "sustainable economic growth", we mean steady economic growth year after year, and not the boom-bust cycles typically associated with high-inflation countries, in which rapid economic growth alternate with deep recessions.
What Are the Costs of Inflation?

Many costs of inflation arise when we do not expect it and therefore we may not have taken it into account in our economic decisions. Even if we could predict inflation perfectly, there would still be some costs to us so long as the rate of inflation is not sufficiently low or zero. Let us examine some of these costs before turning to the more pernicious costs of inflation when it could not be anticipated.

**Anticipated Inflation**

The Shoe-Leather Cost of Inflation

The first of these costs is what economists call the "shoe-leather cost" of inflation. "Shoe-leather cost" refers to the time and effort wasted as people try to minimise their holdings of money. Since inflation reduces the value of money, people do not want to hold large amounts of cash. They will withdraw cash from their bank accounts or convert other income-earning assets into cash only when necessary. This requires people to make frequent trips to the bank or automated teller machines (ATMs), and in the process wear out the soles of their shoes - hence the term "shoe-leather cost". The higher the rate of inflation, the larger the "shoe-leather cost". To beat inflation, people may also hoard goods, in particular daily essentials such as food. This will result in shortages, which will lead to further price hikes, which in turn will be followed by more hoarding. In the end, an inadequate supply of essentials may impel people to steal and fight, leading to social unrest and anarchy.

The Menu Cost of Inflation

Another cost of inflation is the cost of constantly revising price lists. When inflation is high, firms and restaurants have to frequently adjust the prices of goods or services that they sell. As a result, they incur costs in reprinting and reissuing their product catalogues and menus - hence the term “menu cost”. Constantly changing prices also mean we can never be sure of the true value of our money, as one dollar tomorrow may not get us as far as one dollar today. In extreme cases of high inflation, money may not even be worth the paper it is printed on. When this occurs, people may shift away from using the local currency to
a more stable foreign currency, usually the US$, hence giving rise to a phenomenon called the "dollarisation" of the economy in some countries.

The Interaction of Inflation with Taxes
The more significant cost of anticipated inflation comes from administering a tax system that does not fully account for the effects of inflation. For example, in countries where wage increase is linked to price increase, inflation may add to people's tax burden if the tax system is not similarly indexed to inflation. This arises when a taxpayer's income is boosted by inflation that pushes her into a higher marginal tax bracket and hence subjects her to a higher tax rate, even though her real income (i.e. income after adjusted for prices) may have remained unchanged. As a result, her inflation-adjusted after-tax disposable income will be reduced, thereby making her worse off than before. This effect is given the name "bracket creep".

As another example, the tax system in many countries allows companies to deduct their expenses on capital investments from their taxable income, as an investment incentive. However, because depreciation allowances are based on historical costs, and not on current replacement costs of capital, which would have increased with inflation, the investment incentive is not as large as its face value suggests. In fact, the real value of depreciation allowances could be substantially wiped out by inflation. This will result in a rise in companies' tax burden, which, in turn, could act as a disincentive for productive investment.

Inflation can also affect the real value of tax burden when there are significant time lags between tax assessment and tax collection, although in a direction opposite to the previous two examples. In many countries, taxes are assessed in one year but only collected the year after or even later. As a consequence, any increase in inflation in the interim would reduce tax burden. This phenomenon is what economists call the "Olivera-Tanzi effect". However, it could lead to the following vicious cycle: an increase in the government's budget deficit leads to a rise in inflation, which reduces tax revenues via the "Olivera-Tanzi effect"; lower tax revenues, in turn, worsens the budget deficit, and so on. This
process contributed significantly to the high inflation experienced in many developing countries during the 1980s.

**Hyperinflation Stories**

Hyperinflations are episodes of extremely high inflation, of more than 50% per month. This is equivalent to a compounded annual rate of 13,000%! While such episodes might seem like freak events, they are unfortunately not rare in modern times. In fact, seven cases of hyperinflation were recorded during the second half of the 1980s. The following are some interesting, albeit depressing, snippets of hyperinflation stories.

**Worthless Coins**

In 1994, the central bank in Russia decided to withdraw all kopek coins, after they were made worthless by hyperinflation.

**Fares Not Enough**

During the Christmas of 1989, people in Brazil were unable to make long-distance journeys on buses. Fares set at the start of the month were no longer enough to cover costs by then, so buses were left in the garage and all drivers took a holiday, leaving passengers stranded.

**Money Cheaper Than Wood**

During Germany’s hyperinflation period in the 1920s, the value of its currency fell so much that people started using money, in place of firewood, for fuel.

**Not Money, But Wheelbarrow Please**

There was a story about people bringing their money around in a wheelbarrow and upon leaving it unattended for a short period, returned to find the money untouched but the wheelbarrow stolen!

**Record Inflation**

The all-time high inflation appears to have occurred in Hungary between August 1945 and July 1946, when prices rose by approximately $10^{27}$ times. During the peak month, prices tripled every day on average.
Unanticipated Inflation

Much more significant costs of inflation arise when it cannot be anticipated. Empirical evidence has shown that countries with high inflation also tend to experience greater variability in inflation. It appears easier to stabilise inflation at low levels possibly because this creates a virtuous cycle of low inflation leading to low inflationary expectations and vice versa. As variability increases, inflation becomes harder to predict.

Sending the Wrong Signals

In a market economy such as ours, prices provide important signals to producers in their production decision. For example, when a producer sees that the price of his product has increased faster than the prices of other goods and services, he would infer that the demand for his product has gone up much more than the demand for other goods and services. As a result, he would devote more resources to produce a larger quantity of that product. It is through this price mechanism that the market efficiently allocates the economy’s resources to their most productive uses. Unexpected inflation, however, makes it difficult to distinguish between changes in the price of a specific item and changes in the general price level. As such, the producer could mistake an unanticipated rise in the general price level for a rise in the price of his own product, and hence erroneously devote more resources to produce it. This misallocation of resources, if widespread, may lead to slower growth of the economy.
Introducing Uncertainty
Unexpected inflation also hinders growth by introducing uncertainty. When households are unsure of the future value of their savings, lest the interests earned are completely wiped out by unexpected inflation, they will have less incentive to save. As a result, the economy will end up with a lower level of savings and hence a lower level of investment and growth. In addition, when firms are uncertain about the future prices of their products, and hence the rates of return on their investments, they will be less willing to take risks and invest, especially in long-term projects. Instead, both households and firms may be pre-occupied with short-term, unproductive activities such as investing in properties, which tend to yield attractive returns in an inflationary environment. Such activities do not benefit the economy but only fuel an unsustainable rise in property prices. Exaggerated expectations of gains from investing in properties will encourage people to borrow to finance their investment. This can lead to instability in the banking system when property prices eventually collapse and borrowers default on their loans.

Redistributing Income
Another important socio-economic cost of unexpected inflation is its distributional consequences. Unanticipated inflation redistributes income and wealth among the various groups in the population rather arbitrarily. This is because most contractual agreements are specified in nominal, and not in inflation-adjusted terms. For example, when inflation turns out to be higher than expected, borrowers would benefit at the expense of lenders, as the real or inflation-adjusted value of debt and interest repaid will be less than the amount expected at the beginning of the loan period. Likewise, employers would gain at the expense of employees, as wages, which are fixed for a specified period, are not adjusted for higher inflation during the interim.

The Wage-Price Spiral
Finally, inflation can also feed on itself. When workers experience higher prices of goods and services, they will demand higher wages to maintain their purchasing power. If employers accede to this demand, they will have to charge higher prices for their goods and services in order to cover the higher wage cost. This vicious cycle of higher prices leading to
higher wages, which in turn feed back to even higher prices and so on, is known as a wage-price spiral.

**Inflation and Economic Growth**

But how large are the costs of inflation to the overall economy? Several recent studies on cross-country experiences of inflation and economic growth over the last 3 decades may shed some light. In general, these studies concluded that there was a significant negative relationship between inflation and GDP growth among countries experiencing high, double-digit rates of inflation. In other words, for these countries, the higher their rate of inflation, the lower the rate of economic growth.

For example, Robert Barro of Harvard University estimated that a 10% point per year increase in inflation would reduce real per capita GDP growth by 0.2-0.3% points per year, particularly for countries with inflation averaging above 15% per year.1 Similarly, a World Bank study2 of 127 countries from 1960 and 1992 found that loss of growth was incurred at inflation rates much above 20% per year.

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On the other hand, there is no conclusive evidence on the negative relationship between inflation and growth at low rates of inflation, such as those currently experienced in many countries. However, neither is there evidence of significant positive association between inflation and growth at low inflation rates. In other words, the once-held notion of a trade-off between a bit more inflation and a bit higher growth or employment is not empirically supported. More significantly, the most striking result of the World Bank study was that inflation has a tendency to ratchet upward. The study found the inflation threshold to be at about 40% per year above which a country is likely to go into a high-inflation, low-growth crisis. The study unambiguously established that high inflation is bad for growth, and that stabilisation to below 40% inflation is good for growth.

Notwithstanding these inconclusive results, Martin Feldstein has shown in his study of the US that the interaction between taxes and inflation can impose a large cost on the economy, even at very low rates of inflation. He estimated that reducing the inflation rate by 2% points, for example from 3% to 1% per year, would raise the level of real GDP by 1% every year in the future.

What about Deflation?

While inflation is harmful, deflation is not good either. Deflation is the opposite of inflation, i.e. a situation in which the general price level continuously falls or price inflation remains negative for a long time. Deflation is usually associated with prolonged economic recession, which occurs because of too little spending and investment, as households and businesses delay their purchases and investments in anticipation of further price decreases. A downward spiral results as poor demand forces businesses to slash the prices of their goods and services further, leading to even lower demand and output. Lower prices also cause the real burden of debt to rise. Together with tumbling asset prices, this can create a mountain of bad debt and increase the risk of bank failures. The best-known deflationary period in history is the Great Depression in the 1930s, when prices contracted at double-digit rates, accompanied by large declines in output, widespread bankruptcies and massive unemployment.

How Is Inflation Measured?

In Singapore, as in many countries, the most common measure of inflation is the annual change in the Consumer Price Index (CPI). The CPI does not measure the costs of everything in the economy, but only the cost of a fixed basket of goods and services consumed by the majority of households. A measure based on consumer prices seems the most relevant since everyone, regardless of his or her occupation, is a consumer.

How is the CPI compiled in Singapore?
The CPI is compiled by the Department of Statistics (DOS). Being a fixed basket, the types of goods and services in the CPI are kept constant. The composition of these goods and services are also unchanged and are based on the average consumption patterns of households in a given period called the base period. Data for the weighting pattern in the CPI basket are obtained from the Household Expenditure Survey, which is conducted every five years.

There are seven broad categories of goods and services in the CPI basket: food, housing, transport & communications, clothing, health, education and miscellaneous. They include items such as hawker food, books, bus fares, water tariff, cars, telephone charges, clothes, medical consultation fees and holiday tours. The index does not include non-consumption items such as purchases of financial assets (e.g. shares and stocks). The purchase price of houses is also excluded because houses are considered capital investment and not consumption goods, as they last longer than consumer-durables such as cars and refrigerators. Instead, the cost of accommodation is calculated based on imputed rentals, as if homeowners were tenants of their own homes.
To compile the monthly CPI, DOS collects price data on important consumer items from a sample of retail outlets, either through personal or postal enquiry. In general, outlets that are commonly patronised by households are selected. For example, prices at markets, provision shops, mini-marts and supermarkets in highly populated areas, especially large public housing estates, are used for the food category. Prices of regulated items such as public transport fares and utility charges are obtained from the relevant government agencies. For cost and practicality reasons, not all consumer items are included in the CPI. Also, the frequency of price collection depends on the type of goods and services. The CPI is computed by combining the prices for different items, sections, sub-groups and groups according to their weights in the basket. Thus, price changes in items with larger weights will have a greater impact on the CPI than those with smaller weights.

Measurement Biases in CPI Inflation

The CPI has proven to be a reliable and widely accepted yardstick of price changes over the years. Nonetheless, all price indexes have their shortcomings, and the CPI is no exception. As the CPI is based on the consumption pattern of the average household, it may not reflect the inflation experience of individual households with different consumption patterns. It is for this reason that the Singapore International Chamber of Commerce compiles an Expatriate CPI for the expatriate community in Singapore. Compared with the CPI for Singaporeans, the Expatriate CPI is more heavily weighted towards accommodation and education, and less towards food.
Besides the above compositional difference, there are also some measurement biases in the CPI due to several hard-to-measure factors. One measurement bias may occur as the quantities of the various items in the basket are fixed, although in reality, consumers tend to buy less of an item whose price has risen and more of a cheaper substitute. This would lead to what is known as substitution bias. DOS attempts to alleviate this problem by updating the CPI basket every five years. Another measurement problem arises with the emergence of new retail chains, discount stores and on-line shopping. The so-called new outlet bias refers to an overstatement in the CPI as a result of not including price data from these new outlets, which may offer lower prices.

At times, prices of goods and services rise because of quality improvement, rather than because of pure price increases. Biases may also occur because of the introduction of new products, which usually show rapid price declines in the first few years of their introduction. Even for existing products, the introduction of new brands provides consumers with more substitutes that may help lower their cost of living. As quality improvement, new products and increased variety in consumer choices are not perfectly reflected in the CPI, inflation as measured by the CPI may be overstated. This problem is referred to as new product/quality change bias.

In the US, researchers have estimated that such measurement biases in the CPI overstate the true cost of living by about 1-2% per year.

What Causes Inflation?

In a market economy like Singapore, prices are determined by the interactions of supply and demand in the market place. As such, economists generally attribute the causes of inflation to either supply or demand factors. These two major and distinct causes of inflation have different implications for the conduct of monetary policy.
Supply-Side Factors
Supply-side factors refer to sharp price changes or price shocks that result from shifts in the supply potential of the economy. These shocks can be classified into two types: those that have only a passing effect on both prices and inflation, and those that have a permanent effect on prices but a temporary one on inflation. An example of the first is poor harvest in a particular year due to inclement weather. An illustration of the second type is the introduction of a value-added tax. In either case, central bankers would tend to allow the effect of these one-off shocks on inflation to pass through to consumers as this reflects either the reality of the new situation, i.e. a scarcity, which consumers must confront, or policy intent, which should not be counteracted.

Demand-Side Factors
Demand-induced inflation is due to a faster rise in aggregate demand relative to supply. It is often due to large increases in money supply, leading to a phenomenon of "too much money chasing after too few goods". This usually stems from persistent government budget deficits, which have to be continuously financed by printing money. In small open economies like Singapore, demand pressures can also come from abroad. For example, when there is a large increase in export demand, manufacturers will have to hire more workers to fill the export orders. As they compete for Singapore's limited pool of workers, manufacturers will inadvertently bid up wages. As we have seen before, higher wages can lead to higher prices in a vicious inflation cycle. More significantly, once inflation dynamics set in, inflationary expectations get set in people's mind and become difficult to wring out. It is this type of persistent inflation that central bankers are particularly concerned with.

Measures of Underlying Inflation
When dealing with inflation, central banks are more concerned with the underlying trend in prices caused by demand pressures on production capacity and changing inflationary expectations, and disregard temporary fluctuations in inflation due to supply shocks. However, distinguishing between (supply-induced) temporary changes in inflation and (demand-induced) persistent or underlying changes in inflation is easier in theory than
in practice. For this reason, most central banks do not just look at the "headline" CPI inflation, but also rely on several measures of underlying or core inflation. In Singapore, the Monetary Authority of Singapore (MAS) monitors and analyses both the "headline" CPI inflation and an underlying inflation measure that excludes the cost of private road transport and accommodation from the CPI. Several other measures of core inflation, such as the volatility-adjusted, median and trimmed-mean inflation, also serve as useful indicators. (For more information, please refer to MAS Occasional Paper No. 10: "Measures of Core Inflation for Singapore", Dec 98)

**Singapore's Inflation Experience**

Since its independence in 1965, Singapore has attained a record of high economic growth and low inflation. Between 1965 and 1998, Singapore's real GDP growth averaged 8.8% per year. Brisk economic growth was not achieved at the expense of high inflation, as CPI inflation averaged 3.3% per year during the period.

**Singapore's CPI Inflation**

![Graph showing Singapore's CPI Inflation](image)
This compared with an average CPI inflation of over 8% per year in developing countries, and 6% per year in industrial countries. In the 1990s (1990-98), Singapore’s CPI inflation was even lower at an average 2.2% per year, while its real GDP growth was sustained at 8.0% per year. In the following pages, we highlight four major episodes of Singapore’s experience with inflation and the corresponding monetary policy measures taken.

Dealing with Stagflation: 1974-75

When the first oil crisis hit in late 1973 with a quadrupling of oil prices, Singapore’s imported inflation surged. CPI inflation rose to nearly 30% in the first half of 1974. At the same time, the global economy was headed for a slowdown. Singapore faced the prospect of stagflation: a combination of high inflation and low growth.

As a matter of priority, monetary policy was aimed at curbing inflation. In this respect, the MAS imposed credit ceilings on banks and finance companies, together with selective credit guidelines. With inflation moderating in the second half of 1974, monetary policy was gradually eased to support growth. The economy avoided recession and managed to grow by 4% in 1975, while inflation averaged 2.5%.

Second Oil Shock & Advent of Exchange Rate-Centred Monetary Policy: 1980-83

In 1980, CPI inflation accelerated to 8.5%. This was partly due to external factors, namely the second oil price shock and a rise in world commodity prices. A significant domestic source of inflation was the high rate of wage increase that began in 1979. Capital inflows were also particularly high in 1980, adding to inflationary pressures. Monetary policy was tightened in response.

Amidst this inflationary environment, the MAS shifted the focus of monetary policy to managing the exchange rate, instead of money supply or interest rates. By allowing the exchange rate to appreciate in the inflationary environment of the early 1980s, the MAS was able to prevent
the kind of import price pass-through that occurred during the first oil shock in 1973-74. Inflation in Singapore averaged about 6% per year during 1981-82, well below the OECD average of nearly 11% per year. In 1983, inflation in Singapore eased further to 1.2%, reflecting a gradual decline in global inflation and continued appreciation of the S'pore Dollar.

Recession & Recovery: 1985-87
In 1985, Singapore experienced its first post-independence economic recession. The government implemented a package of cost and tax-cutting measures to help restore Singapore's international competitiveness and boost exports. A 15% point reduction in the employers' contribution rate to the Central Provident Fund (CPF), coupled with a two-year wage restraint, helped bring down unit labour costs. This, together with the decline in inflationary pressures from abroad, allowed the MAS to ease exchange rate policy during 1986-87, thereby lending support to the government's efforts to revive the economy. GDP growth rebounded strongly, recording 9.7% in 1987 and 11.6% in 1988, while CPI inflation remained subdued at 0.5% and 1.5% respectively.

Asian Financial Crisis: 1997-98
The Asian Financial Crisis was precipitated by the devaluation of the Thai baht in July 1997. Despite its sound economic fundamentals, the Singapore economy was not immune to the crisis, reflecting the economy's openness and outward-oriented nature. Singapore’s real GDP growth moderated sharply to 0.3% in 1998, from an average 9.7% per year in the previous 5 years. In the same year, overall CPI contracted by 0.3%. In the absence of inflationary pressures, the MAS' exchange rate policy in 1998 sought to cushion the rapidly decelerating economy from the adverse impact of the crisis, without undermining confidence in the Singapore Dollar. The easier monetary policy also reinforced the government’s $2 billion off-budget packages and $10.5 billion cost-cutting package of measures to facilitate the recovery of the economy.
The Economics Explorer series

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