

Box 4.1: Global Deflation Risks in 2009**Background**

Just a few months ago, the prospect of stagflation loomed over the global economy. Economic growth was rapidly slowing down because of the financial crisis, while commodity prices hit unprecedented heights, creating sharp inflationary pressures in Singapore and other economies. Since then, a confluence of factors such as declining oil and commodity prices and the global economic slowdown has resulted in rapid falls in the inflation rates of many economies, thereby raising the spectre of deflation. This box discusses issues related to the causes and costs of deflation drawing from past experiences of deflation.

What is Deflation?

Deflation is typically defined as a sustained decline in the general price level, such as the consumer price index or the GDP deflator. Deflation should be distinguished from disinflation. The former refers to sub-zero percentage price change over the previous period, while the latter refers to the slowing down in the rate of price increases over time.

Prices declines can become a concern depending on their extent, cause and duration. One or two quarters of price declines, while technically constituting deflation, might not necessarily be worrying. A temporary fall in the price level resulting from a fall in the price of a specific commodity (e.g., oil) should also not necessarily be seen as deflation. However, mild but continuous deflation arising from a wide variety of factors and price trends could increase economic uncertainties and lead to sub-par growth.

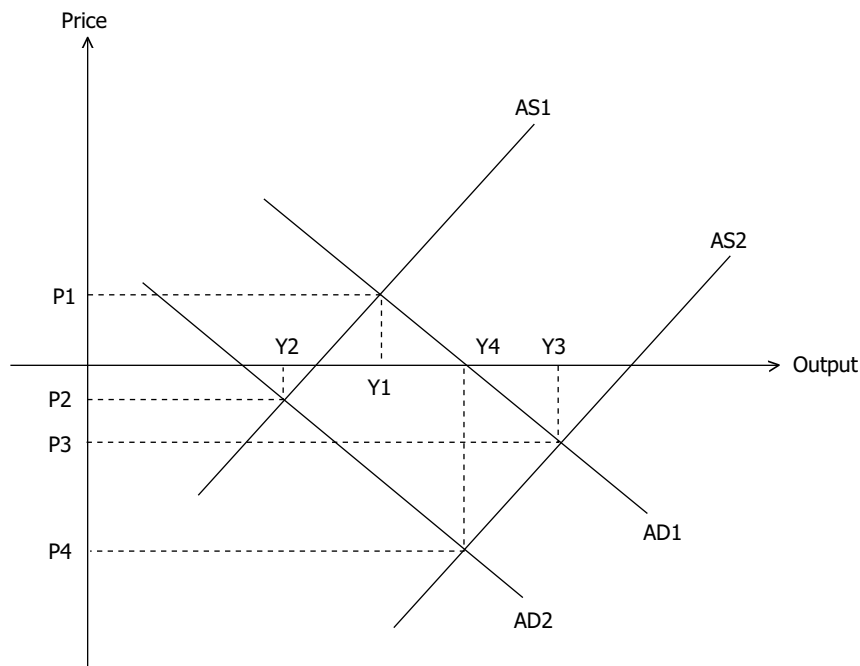
There is however no official guideline on the exact time period or specific CPI measure that should be used to determine and characterise sustained price declines as "deflation". There is also subjective contention as to the minimum time period of price declines for deflation to be seen as a potential threat to the economy, and to influence expectations of future price developments. However, economists have generally acknowledged that developed economies during the Great Depression in the 1930s and Japan and Hong Kong in the early 2000s experienced periods of deflation, with prices falling respectively by 6.6 per cent, 0.7 per cent and 2.6 per cent per annum on average.

What Causes Deflation?

Deflation in an economy can set in as a result of a supply shock, a demand shock, or a combination of both shocks.

Consider [Exhibit 1](#). If an economy is operating at full employment, with price levels at P_1 and output at Y_1 , a sufficiently large negative demand shock that shifts the aggregate demand curve to the left, from AD_1 to AD_2 , can push the economy to a deflationary region with declining prices (P_2) and lower output (Y_2). Such a shock could reflect a severe cyclical downturn, the bursting of an asset price bubble or excessively tight macroeconomic policies. Declining consumer confidence and entrenched expectations of declining prices can exacerbate the initial deflationary impulse.

Exhibit 1: Demand and Supply Shocks



This was the experience of the developed economies in the 1930s during the US Great Depression, when aggregate US consumer prices decreased by a magnitude of more than 10 per cent over several quarters ([Exhibit 2](#)). More recently, in the case of Japan, deflation, or near-zero inflation, persisted for more than 35 quarters due to a combination of weak domestic demand after the bursting of the asset bubble in the 1990s and low imported inflation ([Exhibit 3](#)).

Exhibit 2: Deflation During the US Great Depression

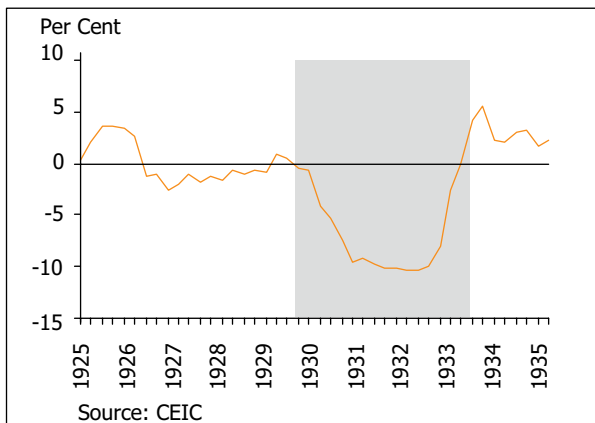
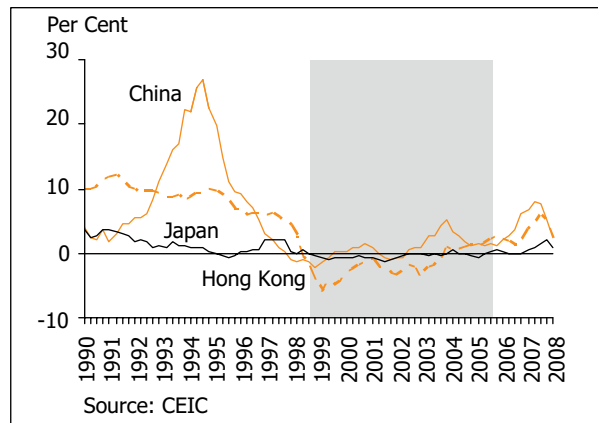


Exhibit 3: Asia Deflation in the 2000s



Positive supply shocks arising from a variety of factors such as technology innovation and productivity growth and gains from trade liberalisation can also lead to the onset of deflation. This is depicted as a rightward shift in the aggregate supply curve from AS1 to AS2 in [Exhibit 1](#), where output is higher (Y3) but prices are declining (P3). This was what occurred in China in the late 1990s and during 2002-03, when it saw mild but persistent deflation. In China's case, both transitory and longer-term supply factors caused prices to fall. Transitory factors included lower commodity prices and cheaper foreign products arising from tariff cuts as a result of China's World Trade Organisation commitments and restraint in administrative price increases. Long term factors reflect productivity gains arising from reforms undertaken by China and the adoption of new technology by Chinese businesses.

A combination of both demand and supply shocks can result in a situation where the deflationary impulse is much larger while the impact on output is moderated (Y4, P4). This reflects the deflation experience in Hong Kong from 1999 to 2004 (Exhibit 3). First, greater economic integration between China and Hong Kong resulted in a price equalisation process, putting downward pressure on prices in Hong Kong¹. Second, deflation was also thought to reflect a process of internal price adjustment in response to cyclical shocks caused by the bursting of the property bubble. In addition, the pegged foreign exchange system had prohibited the devaluation of the Hong Kong dollar to combat imported deflation.

The role of expectations plays an important role in the persistence of deflation. Well-anchored inflation expectations make self-sustaining deflationary spirals less likely. If an adverse demand or supply shock unanchors inflation expectations and consumers expect future prices to decline, they would refrain from spending today. The weakness in economic activity could then increase downward pressure on prices. A deflationary spiral can form as declining prices reinforce expectations about future price developments.

What are the Costs of Deflation?

The costs of deflation depend on its source as well as on its extent and duration. Supply-driven deflation may not create significant costs, particularly if it is accompanied by strong output growth. In this scenario, deflation can be seen as an adjustment to a new equilibrium.

However, aggregate demand-driven deflation is likely to impose at least three significant costs on the economy when it is unanticipated and large in magnitude. (See Appendix A for a diagrammatic portrayal of the costs of deflation).

- a. Reduced employment and output. The role of nominal wage rigidity is important in explaining the reduction in employment and output. When nominal wages cannot be adjusted downwards, the decline in prices causes real wages to rise and profit margins to fall. As a result, employers cut jobs which may result in further declines in aggregate demand and prices. It has been estimated that with a 1 per cent annual rate of deflation and in the presence of downward rigidities in nominal wages, unemployment in the US could rise from a long-run equilibrium rate of 5.8 per cent to 10.8 per cent².
- b. Redistribution of wealth from borrowers to lenders. In a deflationary environment, debtors who fail to index their contracts to price changes will suffer losses relative to those who did. When prices decline, collateral loses value and the real value of nominal debts increases. As a result, debt delinquency and default rates could rise. Banks could in turn become more cautious and cut back on lending, which could hurt corporate performance. If this cycle persists, it could lead to a further decrease in aggregate demand.
- c. Complicates the conduct of monetary policy. In a deflationary environment, conventional monetary policy loses its efficacy. Following an adverse demand shock, the central bank can no longer stimulate demand by lowering nominal interest rates. When an economy is in deflation, the central bank is unable to push real interest rates low enough to stimulate

¹ However, studies conducted by the Hong Kong Monetary Authority found that the effect arising from the process of price equalization across the border with China was rather weak, accounting for less than a quarter of the total decline in the Consumer Price Index between 1998 and 2001.

² See Akerlof, Dickens and Perry (1996). The authors estimated the impact on unemployment for the US economy as a result of alternative inflation targets (zero inflation and 3 per cent inflation) pursued by the monetary authority. The US economy was assumed to start with both unemployment and inflation at 6 per cent. For an inflation target of 3 per cent, the target was reached after 3 years, with a long run equilibrium rate of 5.8 per cent reached by the 5th year. For an inflation target of 0 per cent, the target is reached after 6 years, with an unemployment rate of 10.8 per cent at that point. The unemployment rate stabilizes at 8.4 per cent by the 10th year.

demand due to the zero bound in nominal interest rates. For an economy with nominal interest rates close to zero per cent, the greater the deflationary pressures, the higher the real interest rates will have to be. This will have a negative impact on investment.

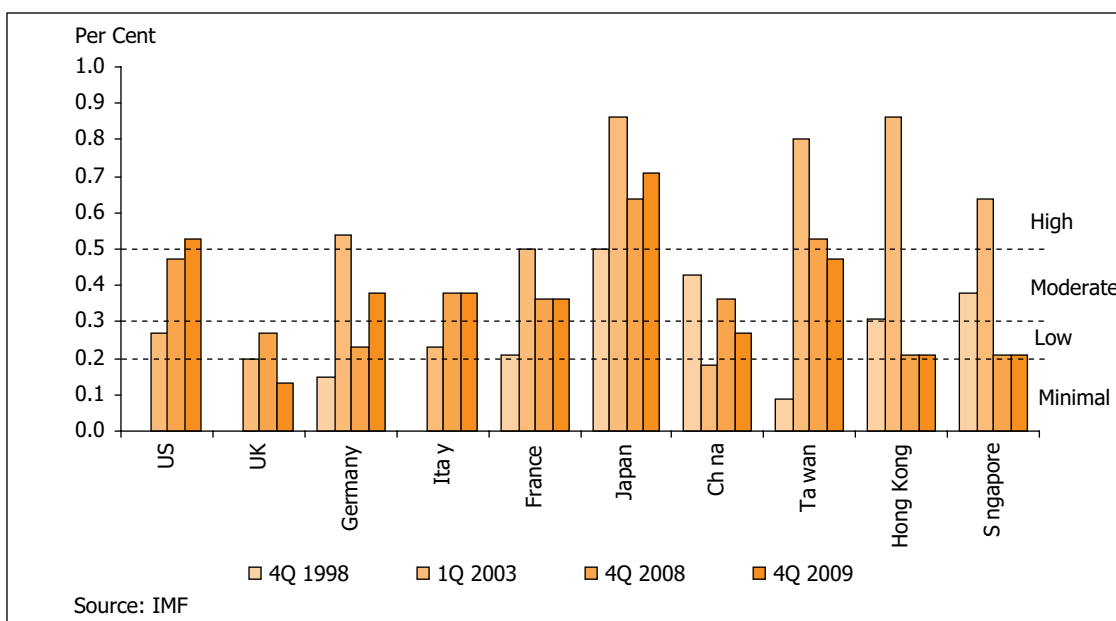
Outlook

In its latest paper "Gauging Risks for Deflation", the International Monetary Fund (IMF) assessed the possibility of sustained deflation in 35 countries for 2009. Using the index of deflationary vulnerability³, the IMF showed that the index had moved above 0.3, from the "minimal" to "moderate" risk category over the course of 2008, which was the same risk category for 2002-2003 when there were concerns about deflation arising from the global economic slowdown brought about by the large corrections in the equity market arising from the dotcom bust.

However, the IMF has also noted that the risks of deflation in the current context relative to previous episodes of deflation scares may be underestimated as the index has not fully accounted for the weakness in housing markets and the current financial conditions. As such, deflationary risks for the world in the fourth quarter of 2008 are now perceived to be somewhat higher compared to 2002-2003. The much faster pace at which the index increased in 2008 compared to 2002-2003 also indicated that the current disinflation scenario and possibly deflation have a large unexpected component, which would be costly for growth.

According to IMF's projections for 2009, Japan is the only country that exhibits clear high risk⁴. 13 countries display "moderate" risk of deflation⁵, including the US, Germany, Italy and France (Exhibit 4). It is estimated that several Asian economies, namely, Hong Kong, South Korea, China and Singapore, are in the "minimal" and "low" risk categories.

Exhibit 4: Deflation Vulnerability – 1998, 2003, 2008 and 2009



³ The IMF indicator of deflation vulnerability covers a range of indicators including various price indices, GDP growth, output gap, real exchange rate, equity prices, credit growth and monetary aggregates. Based on historical deflationary episodes, this index tries to capture malign deflation in 35 countries. A higher value on the indicator indicates a higher risk of sustained deflation.

⁴ However, the IMF noted that risks of a debt-deflation spiral in Japan are lower than 10 years ago due to improved balance sheets of the banks and the nonfinancial corporate sector.

⁵ In the IMF's index, the presence of negative output gaps raises the likelihood of deflation. Going forward, credit growth and headline inflation are expected to decline, and are likely to put further upward pressure on the deflation indicator.

Another measure the IMF analysed was the persistence of actual inflation and inflation expectations. Entrenched expectations of declining prices can result in sustained deflation, causing monetary policy to lose its efficacy. Hence, using quarterly data on core, headline and consensus forecast inflation starting from 1994 or later, the IMF showed that inflation persistence varies widely across countries (Exhibit 5). A 1 percentage point shock to inflation in the US and Japan takes around 3 quarters for the effect to be reduced by half. In Hong Kong, this effect is much more prolonged. There, a 1 percentage point shock to inflation takes around 13 quarters for the effect to be reduced by half. Forecasting one year ahead, inflation expectations are expected to decline by 0.5 to 2 percentage points in almost all countries. Some countries are expected to see temporary price declines but the probability for expectations of significant deflation is low for most countries, especially in view of the massive fiscal stimulus packages that many deflation-prone countries, like the US, have rolled out.

Exhibit 5: Inflation Persistence for Selected Countries

	Average Inflation Persistence*	Following a 1% shock to inflation, number of quarters for the effect to be halved
US	0.77	3
France	0.81	3
Japan	0.80	3
Italy	0.88	5
Taiwan	0.88	5
Singapore	0.91	7
Hong Kong	0.95	13

* The average inflation persistence is derived by averaging the inflation persistence coefficients obtained from regressions run using headline, core and consensus forecast data respectively.
Source: IMF

Based on its findings, the IMF concluded that the risks for sustained deflation, particularly for the G7 economies, are greater than in 2002-2003. However, the IMF also highlighted that the world is now better equipped with knowledge on the role of policies and frameworks to handle financial crises and deflation. As such, the world as a whole is likely to avoid sustained deflation.

For Singapore, a counter-cyclical exchange rate policy ensures price stability. Moreover, the risk of sustained deflation according to the IMF deflation indicator is low (Exhibit 4). Inflation is also estimated to be relatively persistent in Singapore, taking around 7 quarters for the effect of a 1 percentage point shock to inflation to be reduced by half. The IMF projected inflation expectations in Singapore to drop below the 1 per cent level in the fourth quarter of 2009. Such a projection is well within our inflation forecast for 2009 of -1.0 to 0 per cent, which implies some negative inflation towards the end of 2009, driven by an adjustment in global commodity prices from the peaks reached in 2008. While these adjustments constitute disinflationary pressures, they do not constitute deflation.

Contributed by:

Ms Jasmine Zheng, Economist
Economics and Strategy Division
Ministry of Trade and Industry

With inputs from:

Malcolm Cai, Economist
Economics and Strategy Division

Ministry of Trade and Industry

References

Akerlof, George A.; Dickens, William T. and Perry, George L. (1996), "The Macroeconomics of Low Inflation", *Brooking Papers on Economic Activity*: 1, pp.1 - 59.

Bordo, Michael and Filardo, Andrew (2005), "Deflation in a historical perspective", *BIS Working Papers* No. 186.

Decressin, Jörg and Laxton, Douglas (2009), "Gauging Risks for Deflation", *IMF Staff Position Note* 09/01.

Ha, Jiming and Fan, Kelvin (2002), "Price Convergence between Hong Kong and the Mainland", *Hong Kong Monetary Authority, Research Memorandum*, June 2002.

Kumar, Manmohan; Baig, Taimur; Decressin, Jörg; Faulkner-MacDonagh, Chris and Feyzioglu, Tarhan N. (2003), "Deflation: Determinants, Risks, and Policy Options", *IMF Occasional Paper* 221.

Appendix A

Costs of Deflation

