Appendix 1 Index of deflation vulnerability

In recent years, economists have been increasingly focusing on deflation[1] and the consequent risk it could pose of a general economic contraction. Some regard deflation as the main cause of the persistent recent economic difficulties in Japan, where along with other parts of Asia there has been considerable downward pressure on prices. Various signs of a trend in the same direction are also being discerned in some Western countries. Massive declines in equity markets, significant excess capacity and widening output gaps and a disappointing pace of economic recovery are all causes of concern about price developments ahead.

This spring the IMF published a report on global deflation today.[2] The study attempts to evaluate the causes and consequences of deflation, the conjunctural risks in individual economies and the best policy options if danger signs emerge in them.

Three complementary approaches were used in the framework for assessing deflation risks. Firstly, it computed an index of deflation vulnerability based on a set of indicators for each of thirty-five economies included in the survey – accounting for over 90 percent of global GDP. Secondly, an expectations-augmented Phillips curve provided an estimate of the size of the deflationary shock (increase in output gap and unemployment gap) that would be required for the onset of deflation in the G-7 countries.[3] Thirdly, a case study examined China's role in transmitting deflationary impulse.

The index of deflation vulnerability reflected developments in aggregate prices, output, credit and monetary aggregates and the equity markets, on the basis of specific assumptions which were regarded as indicators of a general economic contraction. A total of 11 measurements were compiled, using binary indicators with a value of 1 reflecting possible deflationary pressure from that source, but otherwise a value of 0. The following factors were measured:

1. Whether annual inflation, measured as a change in the CPI, was less than 0.5%.
2. Whether annual inflation, measured as a change in the GDP deflator, was less than 0.5%.
3. Whether annual inflation, measured as a change in the core CPI, was less than 0.5%.
4. Whether the output gap had widened by more than 2 percentage points over the past 4 quarters.
5. Whether the current output gap was more than -2%.
6. Whether real GDP growth over the past three years was less than the annual average growth over the preceding decade.
7. Whether the broad measure of the stock market over the past three years had fallen by more than 30%.
8. Whether the real effective exchange rate had appreciated by more than 4% over the past four quarters.
9. Whether private, nominal credit growth was less than nominal GDP growth over the past four quarters.
10. Whether cumulative private, nominal credit growth over the past three years was less than 10%.
11. Whether broad money (M3) growth on a y/y basis grew slower than base money by two percentage points (or less) over the past eight quarters.

Scores were aggregated and renormalised to one to yield the index value for each country.[4] Two sets of indices were computed: one in which all 11 values had an equal weight, and another in which the financial and credit indicators were weighted according to their relative importance in the economy.

Iceland was not included in the 35 countries covered by the IMF study. However, the Central Bank of Iceland's Economics Department has calculated an

1. Deflation is defined as a persistent decline in the general level of prices, i.e. the opposite of inflation, which is defined as a persistent rise in the general level of prices. The concept is explained in more detail in Box 3 on p. 27 in *Monetary Bulletin* 2003/1.
2. "Deflation: Determinants, Risks, and Policy Options – Findings of an Interdepartmental Task Force" – http://www.imf.org/external/pubs/ft/def/2003/eng/043003.htm
3. i.e. Canada, France, Germany Italy, Japan, the UK and the USA.
4. For example, a country for which all the measurements were defined as reflecting deflation would have an index value of 11/11 = 1, etc.

Index of Deflation Risk (Equal Weight)

Risk/ Index	*Minimal*	*Low*	*Moderate*	*High*
	< 0.2	*0.2 ≤ x ≤ 0.3*	*0.3 ≤ x ≤ 0.5*	*> 0.5*
	Australia	Austria	Belgium	Hong Kong SAR
	Canada	Brazil	Finland	Japan
	Chile	China	Germany	Taiwan Province of China
	Denmark	Iceland	Norway	
	France	India	Poland	
	Greece	Italy	Portugal	
	Ireland	Korea	Singapore	
	New Zealand	Malaysia	Sweden	
	Russia	Mexico	Switzerland	
	Spain	Netherlands	Thailand	
	United Kingdom	South Africa		
	United States			

Index of Deflation Risk (Weighted)

Risk/ Index	*Minimal*	*Low*	*Moderate*	*High*
	< 0.2	*0.2 ≤ x ≤ 0.3*	*0.3 ≤ x ≤ 0.5*	*> 0.5*
	Australia	Austria	Belgium	Germany
	Chile	Brazil	Finland	Hong Kong SAR
	Denmark	Canada	Norway	Japan
	Iceland	China	Portugal	Taiwan Province of China
	Malaysia	France	Singapore	
	New Zealand	Greece	Sweden	
	Russia	India	Switzerland	
	South Africa	Ireland		
	Spain	Italy		
		Korea		
		Mexico		
		Netherlands		
		Poland		
		Thailand		
		United Kingdom		
		United States		

Sources: International Monetary Fund and Central Bank of Iceland.

index of deflation vulnerability for Iceland using the same methodology as in the IMF report. According to these measurements, Iceland has an unweighted index score of 0.27 and a weighted score of 0.19, i.e. a low to minimal deflation vulnerability.[5] Indicators reflecting excess capacity in the Icelandic economy on the basis of these measurements were the following: (i) the GDP deflator decreased by 2.1% between Q1/2002 and Q1/2003; (ii) real GDP growth over the past three years was less than the annual average growth over the preceding decade, and (iii) the real effective exchange rate of the króna appreciated by much more than 4% between over the four quarters to Q1/2003.

According to the IMF analysis, several countries are apparently quite vulnerable to deflation at present. The unweighted evaluation yields a high risk measurement, i.e. an index score of more than 0.5, only for countries which are currently tackling deflation. The weighted risk evaluation, on the other hand, which incorporates financial market scope, indicates

5. Based on the latest available data in each category.

that Germany is also in this group. While most forecasts suggest that inflation in Germany will be in the region of 1¼% in 2003, which is a similar figure to previous years, there is nonetheless some probability of deflation emerging in the medium term, although it is thought fairly unlikely to become persistent. In Japan in particular, but also in Hong Kong and Taiwan, sustained deflation is apparently a considerable threat. Built-in expectations of falling future prices must be regarded as a strong contributing factor there.

Although deflation has already been discerned in China, the risk of an economic contraction there is low. The reason is that the indicators used are fairly demand-driven, i.e. they focus mainly on diminishing demand, while deflation in China has largely been driven by increased supply in excess of demand growth.

The United States does not appear very vulnerable to deflation according to the IMF evaluation, despite various indications of economic weakness at present. In the IMF's view, the expected narrowing in the output gap, relief provided by a recent depreciation of the US dollar, the resilience in the financial sector, the availability of policy stimulus, and the explicit willingness of policy makers to take preemptory action, will serve to dampen downward pressures on prices in the US in the coming term.

As far as Iceland is concerned, with aluminium industry investments planned for the next few years, the outlook is for ongoing rises in aggregate prices. Nonetheless, a general contraction, for example in Japan and Germany, could deliver shocks to individual sectors such as fisheries and tourism.

While the index of deflation vulnerability provides certain indications about the current economic position of the surveyed countries, its findings must still be taken with some reservations. For example, it is not entirely certain that the same measurements necessarily represent a uniform trend in all economies. Thus lower real GDP growth over the past three years than over the preceding decade could arguably in some cases reflect better balance in the economy rather than simple excess capacity. Likewise, lower nominal credit growth than nominal GDP growth over the past four quarters might not necessarily reflect excess capacity. A fall in private sector debt could just as easily indicate a more prudential outlook which would enhance financial stability and eventually result in lower lending losses by banks.

On the whole there is little sign that deflation will become a global problem in the years to come. There does not seem to be much risk of a deflationary impulse being transmitted from China, where the current situation is regarded as short-lived. Although deflation has already taken hold in Japan, Hong Kong and Taiwan, there is thought to be a minimal risk of sustained deflation elsewhere. However, the strong correspondence between national cyclical swings does pose some probability of a conjunctural drop in prices and an economic contraction in various countries.

Source:

International Monetary Fund (2003). *Deflation: Determinants, Risks, and Policy Options* – Findings of an Interdepartmental Task Force.
http://www.imf.org/external/pubs/ft/def/2003/eng/043003.htm