Economic commentaries

Asset prices, investment and credit - what do they tell us about financial vulnerability?

Magdalena D. Riiser, Senior Advisor, Norges Bank Financial Stability

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In this commentary we examine whether a number of historical indicators can predict financial vulnerability over the past 150 years in Norway. Using a Hodrick-Prescott filter, we estimate the gap between actual observations and the trend for real house prices, real equity prices, gross fixed capital formation and credit on Norwegian data back to 1819. We find that all the gap indicators are useful in predicting earlier episodes of financial instability in Norway. The indicators show with few exceptions a common pattern, with widening gaps in the six years ahead of the banking crises, and a subsequent fall. As a rule, at least two of the gap indictors have high values ahead of the banking crises, suggesting that combinations of indicators may strengthen the analysis. The indicators point to an increase in financial vulnerability in 2007.

A high degree of optimism during an upturn can drive up asset prices and investment and lead to high credit growth. This can contribute to building up financial imbalances. Optimism will diminish when the economy is exposed to a disturbance. Asset prices and investment fall. The quality of banks' portfolios is put to the test. Furthermore, the value of bank collateral will be eroded. Debt-servicing problems arise and bank losses increase. Minsky (1977) and Kindleberger (1978, 2000) explore in greater depth the hypothesis that financial fragility is a cause of financial crises. They find that long periods with high rise in debt and asset prices can sow the seeds of future financial instability.

Riiser (2005) uses macroeconomic gap indicators to analyse financial imbalances and banking crises in Norway since 1819. Studies of causes behind banking crises often reveal relationships between asset prices and credit on the one hand and financial stress on the other. However, they provide few quantitative indicators that central banks and the authorities can use in assessing the financial situation. The calculation of gap indicators for Norway has been an attempt to quantify such relationships. This analysis presents updated calculations of the gap indicators in Riiser (2005).

Developments in the gap indicators – an updated analysis

We have estimated annual gaps in real house prices, real equity prices, investment as a percentage of GDP and credit as a percentage of GDP using updated figures from Historical Monetary Statistics in Norges Bank and the national accounts.[i] The gaps are measured as percentage deviation from trend, with the exception of the credit gap, which is measured as the difference in percentage points from trend. We use the same method as Borio and Lowe (2002), i.e. we calculate the trend using a Hodrick-Prescott filter (HP filter)[ii] and a recursive method[iii]. This means that only the data up to each year are included in the calculation of the trend value for that year. This allows us to analyse the same

information as the decision-makers faced at each point in time.[iv]

Charts 1-4 show development in the gap indicators for Norway. The figures for 2008 are based on preliminary estimates and should be interpreted with caution. In the charts, the banking crises in 1857, 1864, 1880-1890, 1899-1905, 1920-1928 and 1988-1993 are marked in grey. They are dated based on Rygg (1954), Gerdrup (2003) and Moe, Solheim and Vale (2004).

Chart 1 Real house price gap[1]. 1831-2008. Per cent
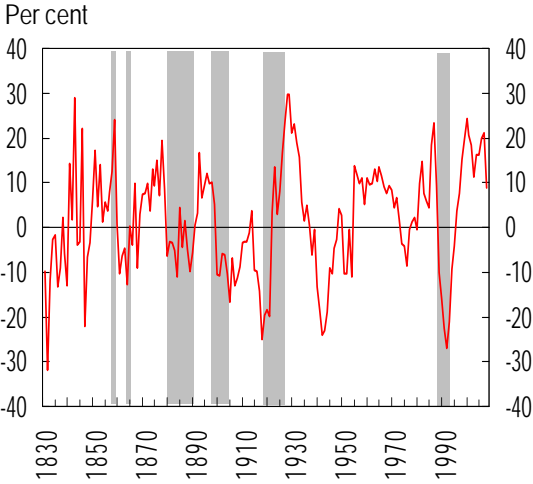
[1] Percentage deviation from trend for house price index deflated by consumer price index. Projections for 2008
Sources: Statistics Norway and Norges Bank

The indicators show with few exceptions a common pattern, with widening gaps from one to six years ahead of the banking crises, and a subsequent fall. The series for the house price gap and investment gap go farthest back in our sample. Both provide, as a rule, positive signals ahead of the banking crises. The credit gap and the equity price gap also provide important information about the vulnerability of the financial system. The data series for credit and equity prices are however short and cover few crises. It is therefore difficult to draw any conclusions as to which gap

indicators provide the best signals of the build-up of financial imbalances. The causes for the imbalances may vary from crisis to crisis. Moreover, the imbalances may arise in markets other than those included in this analysis. The value of all the gap indicators may therefore not necessarily be high ahead of each crisis.

Chart 2 Investment gap for investment excl. changes in inventories and statistical deviations[1]. 1840-2008. Per cent
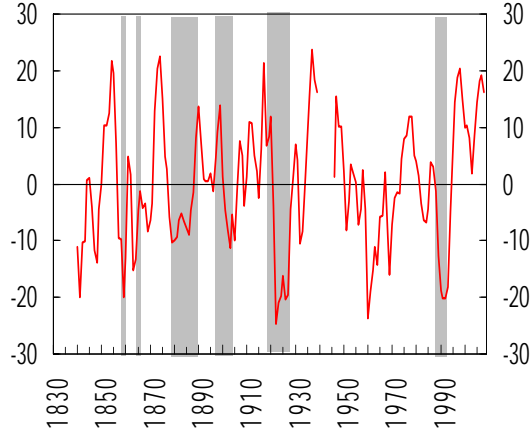
[1] Percentage deviation from trend for total gross fixed capital formation excl. changes in inventories/statistical deviations measured as a percentage of GDP. From 1970, mainland gross fixed capital formation as a percentage of mainland GDP (market value). No data available for 1940-1945. Projections for 2008
Sources: Statistics Norway and Norges Bank

Chart 3 Credit gap[1].1910-2008. Percentage points
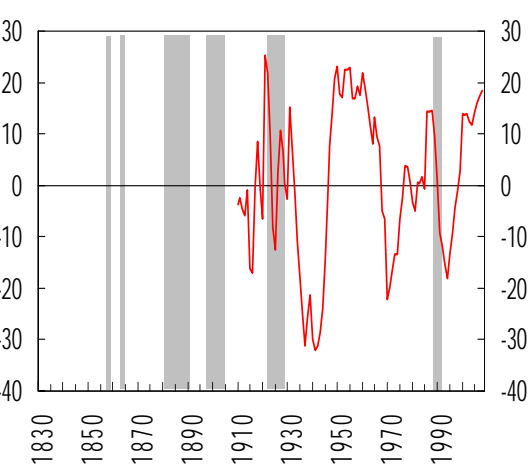
[1] Deviation from trend for total credit to municipalities, non-financial enterprises and households measured as a percentage of GDP. From 1995, total credit to mainland Norway as a percentage of mainland GDP (market value). GDP data for 1940-1945 are not available. Projections for 2008
Sources: Statistics Norway and Norges Bank

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There are also periods where several gap indicators are high without an ensuing banking crisis. One such period is 1936-1937 when both the investment gap and the equity price gap reach a peak. These are the years directly preceding the Second World War. The war represents such a major breakdown of historical relationships that we have not attempted to analyse why the gap indicators provide "false" signals.

The other period is the 1950s and 1960s, when the credit gap and the house price gap are relatively high. Riiser (2005) offers some hypotheses of why a banking crisis did not occur. The housing market and the credit market were regulated at that time. Furthermore, the trend in this period is affected by low activity during the Second World War so that the gaps are misleadingly high.

Chart 4 Real equity price gap[1).1910- 2008. Per cent
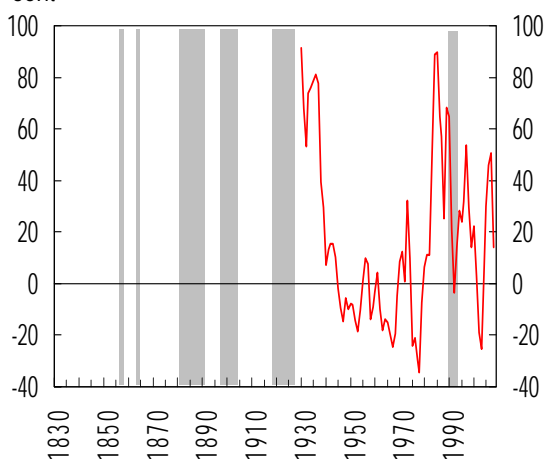
[1) Percentage deviation from trend for equity price index deflated by consumer price index. Break in 2001 in connection with change from OSEAX (all-share index) to OSEBX (benchmark index). Projections for 2008

Sources: Statistics Norway and Norges Bank

The gap indicators are also high in 1998, without an ensuing major crisis. However, we did see a period of substantial declines in equity prices and lower growth in 2001-2003.

The causes of banking crisis are often complex. Not least at present, have we been reminded of this, with the financial turmoil that started in the US housing market in summer 2007, and which evolved into an international financial crisis this autumn. Our analysis confirms that there are several factors and events that come into play when financial instability arises. As a rule, at least two of the gap indicators have high values ahead of a banking crisis. This suggests that combinations of indicators may strengthen the analysis.

The historical data indicate certain threshold values for the gap indicators that can be associated with financial vulnerability, so-called critical values.[v] Based on the peak values for the gap indicators ahead of the banking crises, it seems as though a house price gap that approaches 16-17 per cent, an investment gap of over 20 per cent and a credit gap of 14-15 per cent are signs of increased financial vulnerability.

The difference in relation to Riiser (2005) is that the critical value for the credit gap is reduced from 18 to 14-15 percentage points as a result of lower credit gap ahead of the crisis in 1988-1993 in the updated calculations. The conclusions must be interpreted with caution as the data quality may vary in different periods. A critical value for the equity price gap cannot be estimated because the historical series are too short. Similar international studies indicate that the equity price gap and the credit gap may be good indicators for predicting banking crises (see Borio and Lowe (2002)).

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Financial instability may also occur even if the gap indicators are lower than the critical values. If imbalances develop in several markets at the same time, financial vulnerability may increase even if the gap values are relatively low. Whether imbalances lead to a banking crisis will depend on the strength of the financial system. The gap indicators are meant to illustrate necessary conditions for instability in the vent of debt-financed imbalances. Financially weak financial institutions and an economic shock will represent sufficient conditions.

What do the gap indictors reveal about the current situation?

All the gap indicators had high values in 2007 (see Chart 5). The house price gap and the credit gap exceeded the critical values, while the investment gap was approaching the critical value. The gap indicators fell in 2008, with the exception of the credit gap. A lag in the credit gap is also observed in earlier periods (see Riiser (2005)). This is because credit reacts with a lag to developments in house prices and investment[vi], while GDP levels off rapidly or falls.

The gap indicators suggest that the vulnerability of the financial system increased in 2007. The financial system is put to the test when a shock occurs. Whether it can withstand the pressure depends on the resilience of banks and other financial institutions. It is therefore important to combine the analysis of gap indicators with an analysis of banks' financial strength.[vii]

If financial sector resilience is low, the probability of financial problems increases. Eventually, a triggering factor will reveal

that the situation is not sustainable over time. Financial turmoil may then arise.

Will the gap indicators signal crises in the future?

Gap indicators reveal debt-financed imbalances in the financial system, i.e. vulnerability linked to banks' credit risk. They will not provide signals for other types of risk or imbalances that develop in markets other than those included in the analysis.

Chart 5 Gaps' maximum values prior to the banking crises in Norway and values in 2007. Per cent and percentage points[1)]
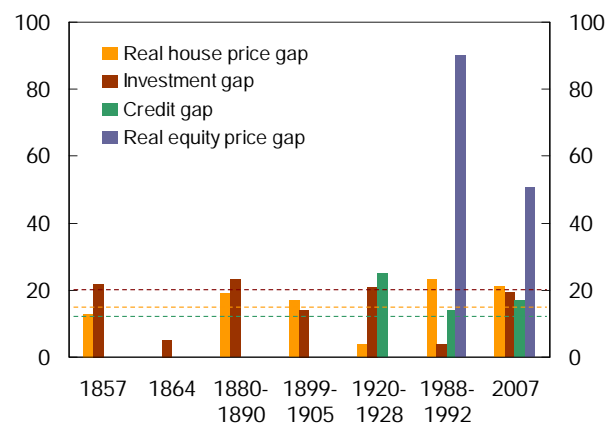
[1)] Real house price gap, investment gap and real equity price gap in per cent. Credit gap in percentage points. The dotted lines show the critical values for the various gap indicators

Sources: Statistics Norway and Norges Bank

The international financial turbulence prevailing since summer 2007 has to a large extent reflected a lack of confidence between banks, funding problems and liquidity risk. At the same time, these problems stem from a surge in asset prices, particularly house prices, and high credit growth. The new financial products developed in the US, such as subprime loans, were dependent on high house price inflation. Innovative finance involving the splitting and repackaging of mortgages into complex financial products helped finance

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credit growth in the banking sector and increased banks' liquidity risk.

Norwegian banks have not been involved in subprime products. They have nonetheless felt the turbulence via increased market risk and credit risk, but primarily through liquidity risk. It has become difficult to procure funding and the cost of funding has increased. It is hardly a coincidence that the gap indicators point to increased vulnerability in the financial system in 2007 even though the problems facing Norwegian banks are externally generated. A closer study shows that market funding in Norwegian banks has increased. Funding in foreign exchange has also increased.[viii] The driving force behind this development has been high asset prices and rapid credit growth. Growth in bank deposits has not been able to keep pace with the banks' lending growth. Norwegian banks have therefore had to find other funding sources in addition to bank deposits. As a result, banks have become more dependent on market funding, which in turn entails liquidity challenges in the event of turbulence in international money markets. Excessive optimism that leads to a surge in asset prices and credit can cause financial institutions to underestimate liquidity risk and other types of risk. This shows that there may be a relationship between debt-financed imbalances and liquidity risk. If that is the case, the gap indicators will be able to continue to signal increased financial vulnerability in the future.

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[i] Historical house prices are revised back to 1986 compared to Riiser (2005). Gross fixed capital formation, gross domestic product and mainland gross domestic product are revised from 1970 onward. Credit is revised from 1985.

[ii] See Bjørnland, Brubakk and Jore (2004) for a description of the Hodrick-Prescott filter.

[iii] In line with Borio and Lowe (2002), we use a somewhat unconventional value for λ in calculating the trend. Common practice is to use $\lambda = 400$ on annual data, while they use 1600. The idea is to give greater weight to the past and to obtain a smoother trend. This results in more fluctuations and implies that a larger share of the variation in the variable can be explained by temporary disturbances. The choice is based on the rationale that cumulative processes, which are core to the development of financial turmoil, take a long time while crises seldom unfold.

[iv] Under the recursive method, developments in the variable in the year following the year analysed are not taken into account. As a rule, the variables fall after the banking crisis erupts. Hence, under the recursive method the gaps for the banking crises may be underestimated in relation to the common method.

[v] See Riiser (2005) for the method used to determine the threshold values.

[vi] Jacobsen and Naug (2004) find that household credit in Norway adjusts with a lag to developments in house prices.

[vii] Estimated crisis probabilities for Norwegian banks may be an example of an analysis of bank resilience, see Andersen, Henrik (2008).

[viii] See Norges Bank's *Financial Stability Report* 2/08.