Information in Financial Asset Prices

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Wrap-Up Discussion

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The analysis and use of information in financial asset prices is an important area of research for the Bank of Canada. Many academics, private sector economists, and central bank economists have helped push forward the frontiers of knowledge in this area. And some central banks, most notably the Bank of England, the Federal Reserve Board, the Sveriges Riksbank, and the Deutsche Bundesbank, have made some use of the information in financial asset prices in the conduct of policy. At the Bank of Canada, we are also interested in extracting the information contained in asset prices and using it to help us conduct policy.

There are two elements in the process of using asset-price information in the conduct of policy. The first relates to the technical aspects of extracting the information, and I will comment on that briefly. The second relates to the interpretation and use of the information in decision-making. I will focus most of these remarks on the latter element.

It is clear from the papers presented at this conference, and from other studies, that a lot of assumptions have to be made in the course of extracting the information contained in asset prices. For example, as Levin, Mc Manus, and Watt noted in their paper, when extracting information from options prices the results depend on the assumptions about the underlying risk-neutral probability density functions. And, as Gravelle, Muller, and Stréliski noted, in the case of futures prices the results depend on the assumptions regarding the various kinds of risk premiums, which may be either very large or zero. And so on.

On the basis of the papers and the discussions at this conference, I would draw several conclusions on the technical aspects of the extraction of information. First, it is less mechanical and requires more interpretation than I had previously believed. Second, given the limited trading in certain kinds of instruments in the Canadian market, particularly options, researchers in Canada have to make use of the market prices of various assets in order to extract information on market views. Third, conclusions can be so sensitive to assumptions that it is important to draw on all the different sources of information available. (Thus, it would be useful to compare the measures of expectations extracted from asset prices with those from surveys of economists and of market participants. It would also be useful to track the various measures against the relevant outcomes, and to place increasing weight over time on those that perform well.) Fourth, all four moments of the PDFs, and perhaps the volume of trading, are of interest and should be used in the interpretation of market views.

With the introduction and development of the indexed bond, a new measure of expected inflation has become available, the differential between the rate on the conventional bond and that on the indexed. This gives us an alternative to using long-term interest rates and the assumption of constancy in real interest rates to derive inflation expectations. Unfortunately, unlike the United Kingdom, Canada has only long-term indexed bonds. This limits us to measures of average long-term inflation expectations. Moreover, the combination of potentially time-varying inflation-risk premiums and liquidity premiums on these instruments has made it more difficult to draw inferences from the level of the differential between conventional and indexed bonds (Côté et al. 1996), and has made us cautious even with regard to inferences about the changes in the differential. Here, too, it is useful to compare survey results with the information derived from market prices.

An interesting example of differences between these measures has occurred over the past year or so. The differential has declined markedly, from over 3 per cent to below 2 per cent, while the survey measure of long-term expectations has remained unchanged at about 2 per cent (Bank of Canada 1998).

While the first major element of our work program in this area is to develop the techniques needed to extract information from market price data, the second key element relates to their use in the conduct of

policy. Assuming that reasonable measures of market expectations can be derived, what can policy-makers do with them to improve policy?

In countries with inflation-control targets, Svensson (1997) and others have argued that the monetary authorities' inflation forecast acts as the intermediate target for policy and that policy actions should be taken to bring the inflation forecast in line with the inflation target. Thus, if, at the current level of monetary conditions, the forecast rate of inflation (six to eight quarters in the future) were above the target rate, monetary conditions should be tightened. Similarly, if, at the current level of monetary conditions, the forecast rate of inflation were lower than the target rate, monetary conditions should be eased. But which inflation forecast should be used as the basis of policy? Should it be the central bank's internal forecast? Or should it be the market's expected rate of inflation several quarters in the future?

The consensus in the literature, with which I totally agree, is that the basis for policy should be the central bank's forecast and not the market's expectations. Effectively, the argument against using market expectations of inflation as the centrepiece of policy is that it raises the possibility of circularity. If the central bank has gained credibility (say, by achieving its inflation target for some period of time), the market will expect the central bank to continue to achieve the target rate of inflation in the future, and will build that expectation into its pricing. Hence, there will be little or no information for the central bank in the market's inflation expectations as to whether it needs to raise, lower, or leave unchanged its interest rate instrument.

The conclusions reached by Bernanke and Woodford (1997, 655) in this context are of direct relevance.

"Unfortunately, we find that targeting the forecast of inflation, in the sense of allowing monetary policy to respond strongly to deviations between the [market's] inflation forecast and the target, is not likely to be a useful tactic for monetary policy, for two broad sets of reasons: First, somewhat paradoxically, to the extent that targeting the forecast is successful, the signal-to-noise ratio in the inflation forecast is likely to become (endogenously) small. In the limit, as perfect stabilization of the inflation forecast is approached, there is no incentive for the private sector to gather information, and the inflation forecast becomes uninformative. We show further that policies approximating stabilization of the inflation forecast are also likely to have undesirable properties....

"Second, we find that attempts to target the inflation forecast lead, for broad classes of policies, to indeterminacy of the rational expectations equilibrium. An implication is that even successful attempts to target the inflation forecast may be associated with arbitrary volatility in inflation itself, as well as in output and other goal variables. Thus, direct targeting of private-sector inflation forecasts is not a panacea for the problems raised by the long lag between monetary policy actions and the response of inflation."

This does not mean that market expectations of future developments that are incorporated in financial asset prices are not of interest to the authorities. They are of considerable interest for many reasons. First, medium- to long-term inflation expectations are a useful measure of the central bank's credibility. Thus, market expectations of inflation that are appreciably higher than the authorities' announced target rate would be a signal that the authorities have not yet achieved credibility. In turn, this would suggest that, in the event of a shock, they would not have the room to manoeuvre that a fully credible central bank would have (Freedman 1996). That is, whereas a fully credible central bank can adopt a wait-and-see attitude to an expansionary shock while awaiting further information on the extent and duration of that shock, a less-credible central bank might have to respond quickly and on the basis of incomplete information to prevent a price-level shock turning into a price-wage-price spiral. Moreover, a fully credible central bank can lower interest rates in response to a negative demand shock that is expected to put downward pressure on future inflation, while a less-credible central bank faces the risk that a decline in interest rates would be interpreted by the markets as a relaxation of its commitment to fighting inflation.

Second, even if the markets are fully confident that the authorities will achieve the inflation target over the long term, this does not rule out movements of inflation over the short to medium term in response to a shock. Thus, a related use of market measures of inflation expectations can be to assess the market's anticipation of the short-run and medium-run movement of inflation in response to a shock. In particular,

the central bank would be interested in knowing whether the market expects inflation to move outside the target range over the next few quarters in response to a shock, and when it expects it to return within the range. Unfortunately, no country except the United Kingdom has a range of indexed debt that would enable it to derive inflation expectations for more than a couple of rather long time horizons.

Third, and most important in my view, is the information that the authorities can obtain from asset prices regarding the market's expectations of interest rates and exchange rates. Consider, for example, a positive demand shock to the economy. If the authorities viewed monetary conditions before the shock as appropriate, the shock would imply the need for some tightening. While the direction of the needed movement would be clear in such circumstances, the size and timing of the tightening would depend on the nature of the shock. The central bank would find it helpful to be able to assess whether the market had a similar interpretation of the shock in terms of the size and timing of the expected tightening, as well as the extent to which the market expected the tightening to come from an interest rate increase as opposed to an exchange rate appreciation.

The developments in the Canadian economy during 1996 provide a good example of market information used in this manner. On several occasions in 1996, newly released data indicated to the Bank that the economy was weaker than had been anticipated, and that future inflation would therefore be lower than had been expected. This, in turn, suggested the need to reduce the operating band for the overnight rate. On most of these occasions the data release led to a decline in the 90-day rate that was consistent with a near-term decline in the overnight rate. Thus, the Bank was able to reduce its operating band for the overnight rate, knowing that its action would be consistent with what the markets saw as appropriate, would not surprise the markets, and would not have unintended consequences further out on the interest rate yield curve or in exchange markets.

While a single, explicit shock lends itself most easily to this sort of interpretation (much like an event study), more typically the central bank has to assess the effect of a series of newly released pieces of information on its outlook for output and inflation. Here, too, the central bank would find it helpful to compare its assessment of the outlook and the implications of the outlook for the desired path of monetary conditions with those of the markets.

There are two cases to be addressed. First, the central bank and the markets might have the same views on changes to the outlook and the desired path of monetary conditions. This is the easier case, since the markets' views confirm the central bank's assessment of the situation and the central bank then takes the action (or inaction) appropriate to these jointly held views. Nonetheless, there may still be uncertainty about the timing and extent of the central bank's actions—what could be called the tactical element of policy.

Alternatively, the central bank and the markets might see things differently. This should cause the central bank to reconsider its views. If, after reconsideration, it reaches the same conclusion as it had previously, the central bank should make clear to the public and the markets that its views differed from those of the markets, and should explain the analytic and empirical basis for its views on the outlook for the economy, inflation, and the path of monetary conditions. The Bank of Canada does this through speeches, the semi-annual commentary in the *Bank of Canada Review,* and the semi-annual *Monetary Policy Report.* The Bank's explanation of how it interprets the economic situation would, in turn, give the markets an opportunity to reconsider their views on the outlook and to reassess their expectations regarding future inflation, interest rates, and exchange rates.

This type of situation occurred in mid-1995, when a rise in the measured core rate of inflation (CPI excluding food, energy, and the effects of indirect taxes) raised concerns in markets about the possibility of a rise in the underlying rate of inflation and the need for tighter monetary conditions. When the Bank made clear its view that the increase in CPI inflation was temporary, resulting from a one-time increase in the price level due to a rise in raw materials prices and the past depreciation of the currency, the concerns evaporated, and the markets quieted down.

By interacting in this way with the markets, the Bank can ensure that there are no major surprises about its interpretation of the outlook, or about the strategic direction of its actions with respect to monetary conditions.

However, if, after reconsidering, the Bank and the markets still disagree about appropriate actions, the Bank must follow its own judgment. This may involve taking action when the market believes no action is needed, or not taking action when the market believes some action is needed.

The Bank must be careful in interpreting market signals of expected interest rate movements in circumstances in which the Bank and the market have different assessments of the outlook, because of the potential for circularity. Consider a situation in which the markets' expectations of aggregate demand were considerably stronger than those of the central bank. Suppose further that the markets believed, as a consequence, that a tightening of monetary conditions was necessary to ensure that the future rate of inflation remained within the target range. If the central bank had made clear its views that no such tightening was needed, the markets would expect no change in short-term interest rates in the near term, in spite of the fact that the markets believed that an increase in short-term rates was appropriate.

It would be important in such circumstances for the central bank to interpret these near-term market expectations *not* as a validation of its own views of the economic outlook, but simply as the markets' assessment of the most likely central bank action. To infer the market's views of appropriate policy in such circumstances, the central bank would have to examine closely not short-term expectations but medium-term expectations of interest rates, exchange rates, and the rate of inflation. If the market believed that the central bank was holding down interest rates inappropriately, it would expect future data releases to show a stronger economy and more inflation pressures than anticipated by the central bank. In turn, the markets would expect such an outcome to lead to future tightening of policy (although later than the markets deemed appropriate), and possibly a higher rate of inflation. It would be these expectations of movements in interest rates, exchange rates, and inflation over the medium term, reflected most notably in the movements of medium-term and long-term interest rates and perhaps in the differential between the rates on conventional and indexed bonds, that would show the central bank that the markets had different views of the outlook than it did.

It is especially in these kinds of situations that the full range of information extracted from asset prices and other sources such as surveys would be most useful. To interpret the markets' views, the central bank should look at the term structure of forward rates for both interest rates and exchange rates (adjusted as best as is possible for risk premiums), the volatility measures (as an indication of uncertainty in the market), the skewness measures (as an indication of asymmetry in market expectations), and the kurtosis measure (as an indication of the size of the tails in the distribution).[1] At the same time, the central bank should also be examining market measures of expected inflation.

Ultimately, the new types of information that can be derived from asset prices do not make monetary policy-making any more automatic. The central bank still has to make judgments about the economy and inflation, and it still has to take action (or not) based on those judgments. The market information does, nonetheless, help in a number of ways. First, it offers a cross-check on the central bank's judgments. Second, it lets the central bank know whether its intended actions would surprise the markets, thus helping the central bank to decide on tactical issues such as the timing of its actions and the need for increased communications of its views. Third, it gives the central bank an indication of the credibility of its policies in the markets.

However, as Pierre Siklos emphasized in his conference paper, the central bank has to be careful not to overreact to high-frequency information, which tends to be very volatile. And I can assure you that the Bank of Canada has no intention of reacting to every wiggle in market data, any more than we do now in the context of monetary conditions. In sum, the regular reporting of information based on asset prices is a valuable addition to the flow of data that the central bank uses in its decision-making, but it does not eliminate the need for the central bank to exercise judgment on the economic and inflation outlook and on the resulting desired course for monetary conditions.[2]

Endnotes

1. This tells us if the market is concerned about a 'peso problem,' i.e., a small probability of a large change. Whether and how the central bank should take account of such a possibility in making policy judgements is an interesting question.
2. These conclusions are in line with those reached by Bernanke and Woodford (1997, 656). 'Our analysis shows that, despite the problems with strict forecast targeting, a more subtle approach in which forecasts are simply used as one of several sources of information can be helpful. In particular, the central bank may well be able to infer useful information from private sector forecasts of macroeconomic variables *other than inflation*[author's italics], such as output or interest rates. However, again caution must be urged, as we show that the problem of indeterminacy of equilibrium can apply to monetary policy rules based on forecasts of output and interest rates, just as it can to policies based on forecasts of inflation. The most general conclusion of our paper is that central banks should be careful not to tie monetary policy too closely to any variable that is too sensitive to the expectations of the public.'

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