1998 conference

Information in Financial Asset Prices

Proceedings of a conference held by the Bank of Canada, May 1998

Introduction

Kevin Clinton and Mark Zelmer

Much of this conference was devoted to techniques for measuring expectations in financial markets, following recommendations made at the Bank's 1995 conference. Three papers looked at expected movements in short-term interest rates and the degree of uncertainty, or dispersion, surrounding expected movements in exchange rates and interest rates.

An additional session was devoted to the broader issue of how central banks should operate in a world of instantaneous information and constantly changing financial asset prices.

Extracting Information for Monetary Policy Strategy

Asset Pricing in Consumption Models: A Survey of the Literature

Benoît Carmichael (Université Laval)

A common characteristic of modern asset-pricing models is that prices and yields are linked, in a general-equilibrium context, to investors' decisions about consumption and savings. The term structure of yields predicted by these models is intimately tied to the nature of investors' preferences, particularly their risk aversion and time preference. Carmichael finds that models using a single parameter to represent both these properties cannot simultaneously explain the level of real interest rates and the size of the equity premium.

Uncertainty about the purchasing power of money modifies the systematic risk of financial assets and gives rise to an inflation-risk premium. In the case of bonds, this premium reflects the positive relationship between the marginal rate of intertemporal substitution of consumption with the rate of inflation—i.e., real income tends to be low when inflation is high. In the case of equities, the inflation-risk premium also reflects the distortionary effect of taxes levied on nominal capital gains.

Extraction of Expected Inflation from Canadian Forward Rates

Joseph Atta-Mensah and Mingwei Yuan (Bank of Canada)

Forward interest rates contain the same information as the yield curve. However, the forward-rate curve presents it in a manner more easily interpreted for monetary policy purposes. Distinguishing between the key factors—expected future movements of short-term interest rates and the future path of inflation and risk premiums—can be difficult. Many researchers adopt the assumption that real interest rates are constant and that premiums related to inflation uncertainty and forward-term premiums are constant.

In this paper, Atta-Mensah and Yuan examine Canadian forward interest rates in an attempt to estimate the degree to which movements in nominal interest rates reflect changes in inflation expectations. In the first part of the paper, a standard consumption-based capital-asset-pricing model is used to examine the properties of the risk premiums embedded in Canadian forward interest rates. The rest of the paper is focused on the relationship between expected inflation and forward interest rates.

The authors draw the following conclusions: (i) inflation-risk and term premiums are very small; (ii) on average, a 1 per cent increase in forward interest rates corresponds to an increase of 0.4 to 0.5 per cent in the expected annual rate of future inflation; (iii) real interest rates in Canada fluctuate widely and are generally more volatile than inflation expectations, particularly at the shorter end of the maturity spectrum; and (iv) while real interest rates and expected inflation tend to move in the same direction at the shorter end of the maturity spectrum (consistent with the view that authorities are reacting to the increase in expected inflation), at the longer end these two variables move in opposite directions (reflecting the view

that higher real short-term interest rates should depress economic activity and cause inflation to eventually decline).

Yield and Inflation Differentials between Canada and the United States

Ben Fung (Bank of Canada) and Eli Remolona (Federal Reserve Bank of New York)

Fung and Remolona also seek to extract information on expected future inflation from the term structure of interest rates. However, they exploit co-movements among interest rates in Canada and the United States, as well as movements of the yield curve. Specifically, they extend a two-factor term-structure model of interest rates to a two-country setting. Yields in each country are determined by two unobserved factors: an inflation factor specific to each country; and a real factor common to both countries derived from close economic links, especially capital market integration.

The empirical results suggest that the additional information contained in the U.S. yield curve is significant. Also, differences in inflation expectations and inflation-risk premiums are both important components of the changes in yield spreads between the two countries.

Central Bank Policy, Inflation, and Stock Prices

Ronald Giammarino (University of British Columbia)

There has been much public discussion of the strong performance of stock markets around the world in recent years (most notably markets in the United States) and whether this should be a concern for monetary policy-makers. This begs the questions of whether movements in equity prices are linked to inflation and, hence, whether they should be taken into account by monetary policy, or whether stock prices predominantly reflect such things as financial market bubbles. The latter question might not provide useful information with respect to current monetary policy, but it might be of concern from the viewpoint of financial system stability. Giammarino surveys what is known about the links among inflation, stock prices, and central bank policy in order to shed light on these issues. He identifies areas where knowledge is lacking and poses some questions for future research.

Movements in equity prices are not a perfect hedge against inflation because most companies are not able to pass along general price increases to their customers. Giammarino postulates that this might reflect a negative correlation between economic activity and inflation, perhaps because countercyclical monetary policy implies that an expected decline in real economic activity will lead to an easier monetary policy stance and, ultimately, to higher inflation. He suggests that some progress has been made in setting out the conditions under which a central bank might actively target the level of stock prices relative to some "fundamental" level in order to promote systemic financial stability. However, the feasibility of such policy prescriptions has not been empirically established. The author is skeptical that central banks are well placed to be able to identify asset-price bubbles in a timely way.

Extracting Information for Monetary Policy Implementation

Towards a New Measure of Interest Rate Expectations in Canada: Estimating a Time-Varying Term Premium

Toni Gravelle, Philippe Muller and David Stréliski (Bank of Canada)

Information about financial market participants' views regarding future movements in short-term interest rates can help monetary policy-makers identify any discrepancies between their desired path for interest rate changes over the medium term and that of the market. The authorities can then take action to limit the kind of financial disturbances that can arise when monetary policy takes an unexpected turn.

In this paper, the authors seek a more accurate measure for expected movements of 3-month interest rates in Canada. They test the expectations hypothesis of the term structure, which postulates that longer-term interest rates represent an average of expected future short-term interest rates plus a constant-term premium. They find that this hypothesis does not hold because of time-varying term premiums, which appear to be much larger in Canada than in the United States and which increase in magnitude with time to maturity. Consequently, the authors estimate a vector error-correction model of the time-varying term premiums, which they use to generate better estimates of expected future short-term interest rates. The

results appear to be intuitively plausible and broadly in line with the results of the survey data on 3-month interest rate expectations. The authors also find that term premiums tend to be largest in periods of greater interest rate volatility, which suggests that they incorporate a risk premium to compensate investors for the increased uncertainty in such periods.

The Information Content of Canadian Dollar Futures Options

Alexander Levin (Bank of Montreal), Des Mc Manus and David Watt (Bank of Canada)

Levin et al. use price data on futures options from the Chicago Mercantile Exchange to derive risk-neutral probability density functions (PDFs) for the Canada–U.S. exchange rate. These PDFs provide the probabilities that risk-neutral agents attach to future exchange rate levels. "Bearish" sentiment on the Canadian dollar exists when the market assigns a relatively high risk-neutral probability to low future values, whereas a "bullish" market reflects the opposite.

The authors present case studies on the response of the risk-neutral PDF to the release of Bank of Canada *Monetary Policy Reports*and changes in the Bank's operating band for the overnight interest rate during the 1994–95 Mexican crisis and the recent Asian crisis. The results suggest that monetary policy statements, or actions indicating a change in policy intentions, tend to have a more significant impact on the risk-neutral PDF than do statements or actions that reiterate the policy stance or were anticipated by the market. This, of course, is in line with theoretical predictions.

Confidence Intervals and Constant-Maturity Series for Probability Measures Extracted from Options Prices

William Melick and Charles Thomas (Federal Reserve Board of Governors)

Like the previous paper, Melick and Thomas's paper discusses extracting PDFs from options prices. It also presents examples of the ways in which these concepts are used at the Federal Reserve Board.

The authors have developed a maturity technique to correct for term-to-maturity dependence, which arises from the fact that options listed on financial exchanges mature on fixed dates. As a result, their derived PDFs are more comparable over time than those available previously. Melick and Thomas conclude by outlining a technique for computing confidence intervals around estimated PDFs, which can give an idea of the uncertainty that surrounds these estimates.

Pitfalls and Opportunities for the Conduct of Monetary Policy in a World of High-Frequency Data

Pierre Siklos (Wilfrid Laurier University)

Innovations in technology and markets have greatly increased central banks' ability to monitor and analyze high-frequency data. However, since the lags in the effect of monetary policy on the economy are long and variable, concern about daily financial developments could hinder the accomplishment of monetary policy objectives. There is a risk that monetary authorities may become myopic or suffer from tunnel vision, and overreact to random events that have no real bearing on the basic objectives of monetary policy.

Siklos sees conflict between taking the long view on policy questions and needing to be seen to be responding quickly to shocks. Central banks' interest in high-frequency information could arise from the fear that a small event might trigger a financial crisis. Is this risk sufficiently high to warrant closely monitoring, and responding on a continuous basis to, high-frequency data? Evidence on this question is difficult to gather and interpret, but Siklos presents some suggestive results.

Wrap-Up Discussion

Charles Freedman (Bank of Canada) and Frank Milne (Queen's University)

Charles Freedman stresses two elements in the process of using information derived from asset prices in the conduct of monetary policy:

- *The technical aspects of extracting information:*Many assumptions have to be made when extracting information, such as risk-neutrality when deriving PDFs from options prices, or how term premiums behave in the case of forward or futures prices. The extraction process is less mechanical, and

requires more interpretation, than was previously thought. In Canada, the thin markets add to the difficulties of deriving reliable PDFs.

- *Using asset-price information in decision-making:* A basic input for monetary policy should be the central bank's own forecast of inflation, rather than market expectations. The former would be anchored by the objectives of monetary policy, whereas the latter might be affected by factors such as credibility problems.

Market expectations incorporated in asset prices are, nevertheless, of interest to the authorities. First, medium- to long-term inflation expectations are a gauge of policy credibility. Second, even if the markets are totally 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. Market measures could help indicate 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 inflation to return to the range. Third, and most important, is the information available on expected movements of interest rates and exchange rates—i.e., on the market's view of the future stance of monetary policy.

The market's expectations of financial variables provide a cross-check on the judgments that central banks have to make about the economy. They give the central bank a better idea of whether its intended actions might surprise markets. They might suggest a need for improved communication. However, the central bank must be careful not to overreact to high-frequency information, which tends to be very volatile.

Frank Milne challenged researchers to improve on the current generation of asset-pricing models. There is a need for models that allow disparate expectations, track the data well, cover international aspects, and treat the existence of financial intermediaries seriously. Two approaches that have been tried—full general-equilibrium and arbitrage-factor models— have weaknesses in these respects. Asset-pricing models without frictions sit uneasily with the more pragmatic models used in macroeconomics. This tension is noticeable at the moment, as central banks confront the cross-currents associated with the Asian crisis, high stock market values, and the introduction of the euro.