Discussion

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The rationale for deriving a more accurate measure of market expectations about short-term interest rates is relatively straightforward. If market expectations about the behaviour of these rates differ from central bank expectations, there is risk that a change in monetary policy may cause financial markets to react in an undesirable way—a way that, at least in the short run, may run contrary to the bank's initial strategy.

One example of divergent expectations delaying a desired easing in monetary conditions occurred during the winter of 1994–95 (Clinton and Zelmer 1997). In this instance, a modest, unanticipated decline in overnight interest rates caused a sharp fall in the value of the Canadian dollar. To defend the currency, the Bank of Canada accommodated a rise in overnight interest rates of nearly 200 basis points over the following few months.

If there is a discrepancy between market expectations and the central bank's expectations of future interest rates, the bank may choose to re-evaluate its forecast of the underlying trends in growth and inflation. If, after re-evaluation, the bank remains convinced that its own view of the economic fundamentals and short-term interest rates is justified, it may decide to communicate its views more forcibly or to delay any move in interest rates in an effort to ameliorate the impact of the policy shift on the real economy. An accurate measure of interest rate expectations in this case serves both as an economic indicator and as a guide for implementing policy.

Forward rates are an obvious starting point for gauging interest rate expectations. One of the simplest models used to infer the future behaviour of interest rates is the expectations hypothesis of the term structure (EHTS).

This model assumes an arbitrage relationship between zero-coupon securities of various maturities, such that longer-term interest rates represent an average of current and expected short-term interest rates, *plus a constant-term premium*. The constant-term premium is required by investors, because they bear the risk of holding longer-dated instruments. The EHTS can be estimated by

$$(r(n)_{t+m} - r(n)_t) = b(f(m,n)_t - r(n)_t) + a + v_{t+m}, \quad (1)$$

where $f(m,n)_t$ is the forward rate at time t of an n-period instrument beginning in m periods, $r(n)_{t+m}$ is the spot rate at time $t+m$ of an n-period instrument, a is the constant-term premium associated with these rates, and v_{t+m} represents unexpected interest rate movements. Notice that when the slope parameter equals 1, thereby satisfying rational expectations, equation (1) collapses to an estimate of ex post forecast errors of the forward rate. A non-zero constant implies that forward rates are a biased predictor of future short-term interest rates and that the estimate of a is simply the mean forecast error of forward rates. One can interpret this bias as a market risk premium.

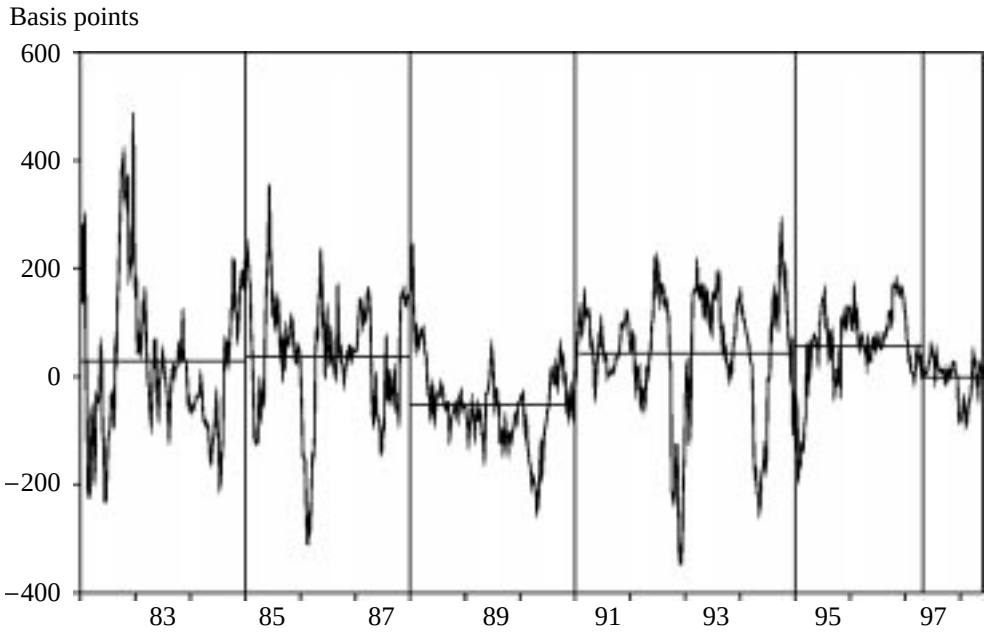
The paper by Gravelle, Muller, and Stréliski first evaluates empirical evidence of the traditional EHTS. They review studies using both U.S. rates and non-U.S. rates, and conclude there is weak evidence favouring EHTS with non-U.S. interest rates. However, there is at least a suggestion that the risk premium may vary over time. Looking at Canadian data, Paquette and Stréliski (1998) note substantial variation in the estimates of the constant term across various subperiods. Gravelle et al. also question the validity of the tests for EHTS, citing the possibility of biased parameters in the presence of a cointegrating relationship between spot and forward rates.

Do these conclusions fit the Canadian data? Simple ex post forecast errors point to a systematic bias in forward rates as a predictor of future short rates; the average error is somewhat larger than the constant term the authors estimated using equation (1). For example, the average forecast error for the 9x12 forward-rate agreement over the period 1982 to 1997 is 77 basis points, compared with the 100-basis-point constant-term premium the authors estimated. A closer examination of the data supports the authors' assumption that the term premium may be variable. Moreover, the data hints that shifts in monetary policy may be a factor in explaining why the term premium could be variable. Figure 1 shows how the forward forecast bias has varied across various monetary policy episodes as defined by Armour, Engert, and Fung (1996).

In the presence of a time-varying risk component, the authors have attempted to estimate a term premium through a two-stage process. First, they calculate the constant-term premium in a simple EHTS framework.

Figure 1

Errors from Interest Rate Forwards
Lagged forward minus actual



Source: Bank of Canada, Goldman Sachs, 3-month forward 3-month interest rates

Second, they add a time-varying premium estimated from their vector error-correction model (VECM), which is positively related to the spread between forward and spot rates. This procedure is slightly troublesome. The authors suggest only weak empirical support in favour of the EHTS and test procedures reject the validity of EHTS within their VECM. There is no reason to believe a priori that the term premium should be equal to a simple combination of an EHTS-type constant term and a time-varying term related solely to spot and forward rates. Moreover, although the authors correct for a possible bias by estimating the time-varying premium in a cointegrated system of equations, the exclusion of other explanatory variables may introduce an alternate bias. Nevertheless, the authors' final results appear more reasonable than those suggested by a pure EHTS approach. During periods of high interest rate volatility and rising interest rates, the variable-term premium tends to rise in value and the future rate expectations calculated in this fashion appear to be more consistent with survey data. During less-volatile periods and falling interest rates, the calculated risk premium can move closer to, or even below, the constant-term premium under EHTS.

In estimating the risk premium imbedded in the forward curve at Goldman Sachs, we have tended to take a more direct approach. We calculate the ex post forecast errors of the forward rate and relate those errors explicitly to many of the "risk" variables outlined above in a simple single-equation model. For example, in our estimates for the risk premium imbedded in the U.S. Eurodollar forward curve, we find that the risk premium is a function of: (i) the slope of the forward curve; (ii) (implied) interest rate volatility; (iii) inflation; and (iv) inflation relative to expectations. It is possible to think of other risk variables that may be included in such an equation. For example, using U.S. T-bill data, Buser, Karolyi, and Sanders (1996) estimate a similar model incorporating bid–ask spreads, bond credit risk premiums, equity dividend yields and interest rate volatility.

The calculated risk premium in Canada's foreward-rate agreement curve is found to be positively related to the volatility of interest rates, the volatility of exchange rates, and the slope of the forward curve (see Figure 2). Other possible explanatory variables are: a terms of trade or commodity price measure (as market participants may be uncertain how the central bank might react to currency fluctuations with such a shock); inflation or inflation surprise measures (along the lines of those used in our Eurodollar risk premium estimates); or an output gap measure as suggested by the authors in their conclusion. Initial attempts to include inflation and the output gap in our equation show some promise.

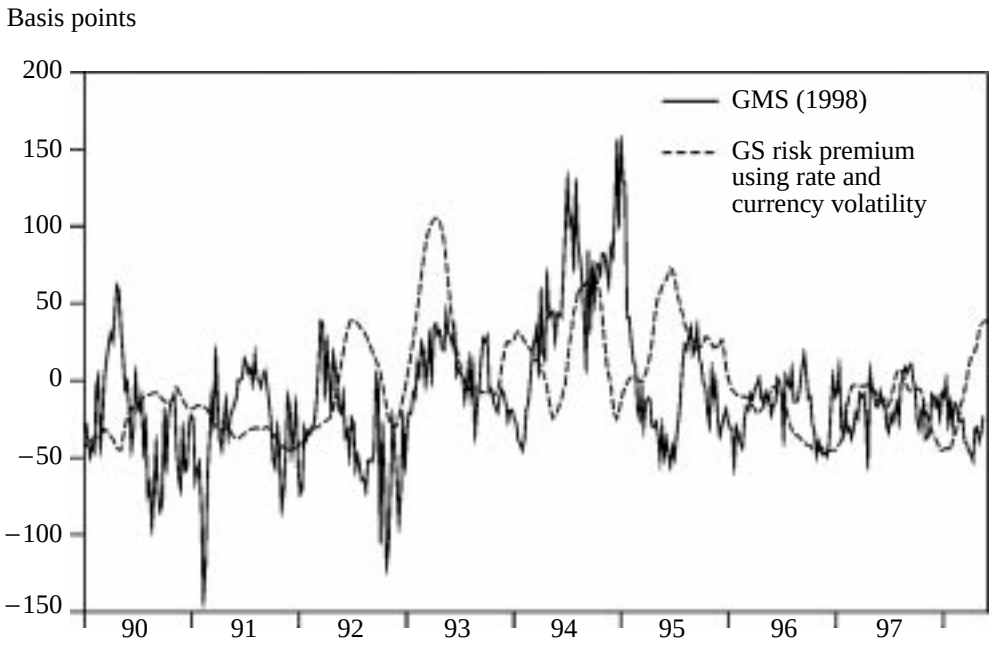
Summary and Conclusions

Estimates of the forward-risk premium (both constant and time-varying) that the authors calculated are a good starting point for extracting market expectations of future spot rates. Indeed, if monetary conditions are the Bank of Canada's short-run operational target, one should go through a similar procedure for exchange rates in order to estimate a market-based expectation for future monetary conditions. Our estimates of the forward-risk premium attempt to incorporate a broader set of information, notably the volatility of interest rates and exchange rates as determinants of the time-varying portion of the forward-risk premium. While we have not included any macroeconomic variables in our estimates of the risk premium presented above, initial efforts suggest that inflation and the output gap may prove significant (along the lines of what we have found using U.S. data).

The authors' estimated risk premiums and our own measures are similar for recent years, both suggesting that the implied three-month forward rate has been a pretty fair representation of expected future spot rates since 1996. However, during periods of sharp market disturbances, such as the exchange rate depreciation in late 1997, these estimates of time-

Figure 2

Variable Risk Premium: Goldman Sachs (GS) vs. Gravelle, Muller, and Stréliski (GMS)
3-month horizon



Source: Bank of Canada, Goldman Sachs, de-meaned over sample period

varying risk premiums can diverge substantially. Our measure tends to suggest a larger risk premium during these periods, arguably through the exchange rate channel. It may be worth comparing these estimates to market surveys over this period to test which model best captures interest rate expectations.

Finally, I will make a couple of points about future research in this area. First, I think these measures of market expectations could be useful not only in helping to guide market expectations, but also in examining the impact of interest rate shocks on the real economy. We estimate 10 such shocks of roughly 100 basis points during the 1990s. Second, I think there may be merit in incorporating macroeconomic variables as additional risk measures along the lines suggested by the authors. Finally, it might be useful to take a different approach altogether in calculating appropriate risk premiums by including forward rates as a separate asset class in a "market portfolio" that might include bonds, equities, currencies, commodities, etc. In this case, the forward-risk premium would be calculated through the variance of the forward rates with market returns and its covariance with other assets.

References

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