The Forward Premium Bias under Different Monetary Policy Environments

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Abstract

The ex post failure of uncovered interest parity (i.e. the forward premium bias) in the post-Bretton Woods era is well documented. Recently, explanations have been offered for this failure which have centred upon the unusual monetary experience over this period. We test these explanations using data from earlier periods as well as subsequent to the adoption of an inflation target. Canada operated a flexible exchange rate regime during the Bretton Woods era, providing a unique opportunity to examine ex post deviations from uncovered interest parity. Canada is also unusual in that it has pursued an explicit inflation rate target since February 1991. We find no forward premium bias over the flexible rate period during Bretton Woods, as well as prior to Canada's adoption of inflation rate targeting (when learning would be expected to have taken place), while a forward premium bias does exist during the inflationary/disinflationary period and subsequent to the new monetary regime.

1. Introduction

Overwhelming empirical research documents the existence of a forward premium bias in OECD nations under floating exchange rates[1]. During this time agents would have earned excess returns from investing in high-interest yielding bonds relative to the returns available on low-interest bonds[2].

Ex post deviations from uncovered interest parity have been attributed both to the existence of a foreign exchange risk premium and to systematic forecasting errors. Domestic investors who decide to hold foreign bonds will demand compensation for bearing foreign exchange risk. Thus, if agents form expectations rationally, foreign bonds should yield predictable excess returns over domestic bonds, equal to the foreign exchange risk premium. Hence, Fama (1984) argues that it is the risk averse behaviour of economic transactors that explains the existence of a forward premium bias. "[A]ny forward rate can be interpreted as the sum of a premium and an expected future spot rate" (p. 337).

However, more recent empirical research suggests that the existence of a foreign exchange premium is unable to satisfactorily explain ex post deviations from uncovered interest parity.

[1] For example Canada, France, Netherlands, Japan, Switzerland, West Germany and United Kingdom (Cumby and Obstfeld, 1981; Fama, 1984); Begium and Italy (Fama, 1984). These studies used US cross-rates. See also Hodrick (1987), Froot and Thaler (1990) and Lewis (1995) for surveys.

[2] Froot and Thaler (1990).

Froot and Frankel (1989) found, using survey data, that excess returns were in fact primarily the result of systematic forecast errors rather than foreign exchange risk premia.

Systematic forecast errors may arise because of the existence of irrational traders - see Froot and Thaler (1990), and MacDonald and Torrance (1990). Alternatively, rational agents may make expectational errors as a result of infrequent shocks to the economy. Lewis (1995) demonstrates that if agents incorporate uncertainty in respect of economic shocks into their expectations, forecast errors may arise which appear systematically wrong, ex post. Thus, ex post deviations from uncovered interest parity not related to risk premia - ostensible failures of rational expectations - may actually reflect a small sample problem.

Lewis (1989a) demonstrates that changes in the money market that are not fully understood will affect exchange rate forecast errors. Agents will gradually update their beliefs that a new regime is in place, generating systematic forecast errors during the transition. This argument provides one possible explanation for the observed deviations from uncovered interest parity across OECD nations. The sample period over which studies have found a forward premium bias (1970's to 1990's) was characterised by a series of inflation and disinflation episodes for many of the OECD countries. If there were more permanent monetary shocks during this time than agents expected then investors may have consistently expected monetary policy reversals which never eventuated. In disinflating economies this would have resulted in exaggerated inflation forecasts and consequently excess returns on domestic bonds. In inflating economies the reverse would have occurred. Inflation would be under-forecasted and domestic bonds would have yielded negative excess returns.

Lewis (1989a, 1989b) observes that learning should take place over time if agents are rational. Agents will gradually update their beliefs as they realise that a monetary shift was permanent. In the mean time forecast errors will be observed. Because the learning occurs gradually these forecast errors will appear to be systematic in small samples. This explanation of the failure of uncovered interest parity, while plausible, lacks empirical testing.

We test this argument by comparing ex post deviations from uncovered interest parity prior to the inflationary/disinflationary period with deviations during this period. Unfortunately, most OECD nations operated fixed exchange rate regimes during the Bretton Woods period, with the exception of Canada. Canada operated a floating exchange rate between March 1957 and May 1962, as well as after March 1970. Hence, Canada's exchange rate experience provides a unique opportunity to test this argument. If ex post deviations from uncovered interest parity were due to inflation expectation errors then these deviations should be less pronounced before the inflationary/disinflationary period (as well as in more recent data, due to learning).

Canada is also unusual in that its central bank, the Bank of Canada (in conjunction with the government), formally pursues an inflation target of 1-3 percent inflation per annum[3]. If monetary shocks generate systematic forecast errors, so that we observe ex post deviations from uncovered interest parity following changes in monetary regime, then the adoption of an inflation target could be expected to have precipitated deviations from uncovered interest parity after February 1991.

[3] McCallum (1996) documents the forming of an agreement between the Canadian government and the Bank of Canada which lead to explicit inflation rate targeting from Feb 1991.

2. Data and Method

Regression analysis was based upon IFS end of quarter 90-day forward *(156..B..ZF...)* and spot *(156..AE.ZF...)* Canada/US exchange rates. Quarterly data was used as 30-day forward exchange rate data was available only from January 1970. Four periods are examined using this data: the Bretton Woods period over which Canada operated a floating exchange rate (ie. 1957:2 to 1962:1; 1970:2 to 1972:4); the post-Bretton Woods era (ie. 1973:1 to 1996:2); and the four years either side of the adoption of explicit inflation rate targeting in Canada (ie. 1987:2 to 1991:1 and 1991:2 to 1995:1)[4]. For the periods where the 30-day forward exchange rate data was available we also repeat the analysis with end of month 30-day forward and spot Canada/US exchange rates from the Bank of Canada. We employ the standard regression equation where all variables are in logs:

$$s_{t+1} - s_t = \alpha + \beta(f_{t,t+1} - s_t) + u_{t+1}$$

We expect that: the forward premium bias should be small in the first period (i.e. the period prior to the inflation/disinflation); the bias should be smaller for the third period than for the second period (due to learning); and the bias will be greater after Canada's adoption of an inflation rate target.

3 Results

The results of regression analysis are summarised in Table 1. In the first period (prior to the inflationary/disinflationary period) there is no apparent forward premium bias (β=0.9841). We are thus unable to reject the null hypothesis that there is no forward premium bias (β=1) with a p-value of 0.990.

In the second period, as anticipated by previous research, a significant forward premium bias is observed (β = -0.6508). The null hypothesis that uncovered interest parity holds ex post (β=1) is easily rejected at the five percent level of significance (p-value = 0.003)[5]. By contrast during the third period, following the period characterised by monetary shocks and prior to Canada's adoption of an explicit inflation target[6], deviations from uncovered interest parity are much smaller (β = 1.0911). Indeed we cannot reject β=1; the p-value from this test is 0.949.

If monetary shocks generate systematic forecast errors so that we observe a forward premium bias following changes in monetary regime, then the adoption of an inflation target might have precipitated deviations from uncovered interest parity after February 1991.

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[4] The selection of four years either side of Canada's adoption of inflation rate targeting represents a compromise between an a prori expectation that significant learning will occur after the first few years from the change in monetary regime and the problem of a small number of observations. This specification is supported by the results of alternative specifications presented below.

[5] Using monthly data with 30-day forward rates over the same period gave an even stronger rejection of uncovered interest parity. In this case β= -1.2143 and the p-value is 0.00001.

[6] During this period Canadian inflation had stabilised at around four percent per annum.

Indeed, for the period from February 1991 to January 1995 a large forward premium bias is observed (β = -2.4245). The p-value of a test that β=1 is 0.067, a rejection at the 10% level although not at the 5% level. The Chow test provides statistical support for structural change between the pre and post inflation targeting periods ($F_{2,28}$ = 4.1685; p-value = 0.019).

Table 1: The Forward Premium Bias in Different Monetary Environments

Sample Period	No. of Observations	α	β	p-value (β=1)	DW
1957:2 to 1962:1, 1970:2 to 1972:4	31	-0.174E-03 (0.302E-02)	0.9841 (1.301)	0.990	1.96
1973:1 to 1996:2	94	0.520E-02 (0.270E-02)	-0.6508 (0.5500)	0.003	1.91
1987:2 to 1991:1	16	-0.0141 (0.967E-02)	1.0911 (1.4235)	0.949	1.91
1991:1 to 1995:1	16	0.2366 (0.1090)	-2.4245 (1.8711)	0.067	2.18

Note: Standard errors are in parentheses.

One concern with the results for the third and fouth periods is the small number of observations used. We also test the impact of inflation targeting under two alternative specifications with increased sample size. First, the analysis is performed using the 30-day forward rate and monthly data. No qualitative differences are observed with the increased number of observations. However, we are now able to reject uncovered interest parity, ex post, at the five percent level in the post-inflation targeting period (p-value = 0.018)[7]. Second, the analysis is performed with quarterly data for the five years either side of inflation targeting. While the observed deviation from uncovered interest parity in the post-inflation period is of reduced significance (p-value = 0.146)[8], the Chow test is again statistically significant ($F_{2,36}$ = 3.4360, p-value = 0.043).

4. Conclusion

[7] The Chow test for structural change yielded very similar results to those obtained with quarterly data ($F_{2,92}$ = 4.2858; p-value = 0.017).

[8] This result supports our specification of periods. Reduced significance over the longer period is consistent with learning.

The empirical results provide support for the argument that ex post deviations from uncovered interest parity are caused by systematic forecast errors arising from changes in monetary regime. No forward premium bias was apparent for Canada over the Bretton Woods period, as well as prior to the adoption in Canada of an inflation target (when learning would be expected to have taken place) while a forward premium bias was found during the inflationary/disinflationary period as well as subsequent to the new monetary regime.

If the forward premium bias is substantially caused by forecast errors arising from monetary changes then the bias should be less (more) pronounced for countries characterised by stable (unstable) monetary policy. Examination of this implication offers a fertile testing ground for explaining deviations from uncovered interest parity. This paper provides evidence from one country along these lines. While Canada was the only OECD country to float its exchange rate during Bretton Woods, other non-OECD countries could be examined where monetary stability existed together with floating exchange rates. Another interesting area for future research is examination of the impact of inflation targeting on the forward premium bias. Future research will benefit from a longer sample against which to assess the effects of such formal monetary regimes.

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