EFI, EKONOMISKA FORSKNINGSINSTITUTET
VID HANDELSHÖGSKOLAN I STOCKHOLM

The Informational Advantage of Foreign Investors: An Empirical Study of the Swedish Bond Market

Patrik Säfvenblad

Working Paper No. 240

May 1998

Working Paper Series
in Economics and Finance

The Informational Advantage of Foreign Investors: An Empirical Study of the Swedish Bond Market*

Patrik Säfvenblad
Stockholm School of Economics
Department of Finance†

May 31, 1998

Working Paper Series in Economics and Finance No. 240

Abstract

This paper uses daily capital flows to the Swedish bond market to analyse the relative information endowment of domestic and foreign investors. Using the standard framework of a noisy rational expectations equilibrium it is shown that foreign investors are, on average, better informed than domestic investors.

The better information of foreign investors is related to pan-European factors, including ITL bond yields, future order flow, as well as pure Swedish factors.

Keywords: Bond prices, capital flows, foreign investors, informed investors, interest rate determination.
JEL classification: E43, G12, G14, G15.

*I thank Sveriges Riksbank for providing the data and Magnus Dahlquist, Antti Koivisto, Kjell Nordin and Ulf Söderström for comments. Part of the work on this paper was made while the author was visiting the Haas School of Business. I thank the Finance Group for its hospitality during this stay. The views expressed in this paper are those of the author and do not necessarily reflect those of Sveriges Riksbank. I gratefully acknowledge research funding from Bankforskningsinstitutet.

†Address: Box 6501, S-113 83 Stockholm, telephone: +46-8-736 9161, fax: +46-8-31 23 27, e-mail: finpsa@hhs.se, internet: http://www.hhs.se/personal/safvenblad.

1 Introduction

This paper investigates whether domestic investors have an information advantage over foreign investors in the Swedish bond market. From a theoretical perspective it is not clear what to expect. Domestic investors may be better informed about local fundamentals, however, in an international market prices, also depend on international fundamentals that may be better known by foreign investors.

In addition, home bias implies that liquidity shocks will be mainly off-set by trading in the domestic market. This will reduce the informational content of the trades of domestic investors. Although international investors may, in general, have less information about a particular market or security, they do have freedom to choose their market. It is conceivable that they allocate capital and analytic resources to markets where they, at least temporarily, hold an informational advantage over domestic investors.[1]

This paper provides new empirical evidence on the informational endowments of domestic versus foreign investors using data from the Swedish bond market. It also provides a backdrop for the more general question of the effects of internationalisation of financial markets, and the influence of foreign investors on capital markets.

The arguments made in this paper are based on standard results derived in the literature on noisy rational expectations equilibria (REE).[2] The basic premise of the REE literature is that prices reflect all publicly know information. This implies that returns will be serially uncorrelated and that trading strategies based on public information such as past prices cannot be profitable. Regardless of the chosen REE framework, there are three clearly identifiable trader types, the noise trader, the informed trader and the market maker. For details see Kyle (1989).

A noise trader is any investors that trade for reasons unrelated to the future value of a security, for example due to a liquidity shock or for hedging purposes. Since noise traders cannot credibly signal the nature of their trades, a net purchase made by a noise trader will tend to push up the price temporarily. After a while rices will return to their prior level.

The informed investor, on the other hand, implements a profit maximising trading strategy that is based on information not yet reflected in securities prices. The resulting profits correspond to losses for the noise traders. A net purchase made by an informed trader push up a price permanently. The price increase will be followed by continued price increases and net purchases until the information is fully reflected in securities prices.

If the number of informed investors is limited there may also be room for a third type of trader, the market maker. A market maker has no information that is not already reflected in securities prices, but can make trading profits by accommodating the trading of noise traders. Relative to a market without market maker, this will improve the price efficiency, reduce losses of noise traders and cut profits of the informed investors. A market maker will act as a "contrarian" buying when prices drop and selling when prices increase.

[1] This notion is supported by the finding of Tesar and Werner (1995), that investors have a higher rate of turnover of foreign stock holdings.

[2] Useful references include Hellwig (1980) and Kyle (1985, 1989).

Of course, any individual investor may change trader type depending on circumstances. The statement that foreign investors tend to be act as informed investors does thus not preclude these investors from occasionally trading as market makers or noise traders. It only implies that the average trading pattern of foreign investors corresponds to that of an informed investor.

In order to identify the "type" of a particular class of traders we can use the outlined correlation between price impact and net trades. Sellin (1994) used this approach to conclude that foreign investors tend to be noise trader in the Swedish market. Returns were positively correlated with the concurrent investment flows, but returns were subsequently reversed, leading to a net price effect of zero after three months. This is consistent with the noise trader pattern outlined above where returns are positively correlated with transaction flows but negatively correlated with lagged transaction flows.

Brennan and Cao (1997) do a similar study for 16 emerging market economies. However, they only study the (predominantly positive) correlation between returns and concurrent capital flows. This indicates that domestic investors act as market makers, accommodating the demand of foreign investors. However the study cannot determine whether foreign investors are noise traders or informed traders since both hypotheses predict the same concurrent correlation (positive) between order flow and returns.

In the macroeconomic literature, Cebula and Koch (1989, 1994) and Correia-Nunes and Stemitsiotis (1995) also find that monthly capital flows positively correlated with USD bond returns. However, as they interpret their results in the context of the flow-of-funds literature their results are not strictly comparable to those obtained in the REE literature.

This paper study the same questions using data from the Swedish bond market. This paper is unique in three respects. Firstly, it uses a dataset of capital flows that has no equivalent in the existing literature. The daily observations make it unique both in comprehensiveness and detail. Furthermore it is from a country without capital restrictions and a flexible exchange rate eliminating many of the empirical problems encountered when studying, e.g., emerging markets. The high frequency of the data makes it possible to identify both concurrent and lagged price effects of transaction flows.

Secondly, it uses information that has never been observed by market participants. The econometrician thus has an informational advantage over market participants. This is necessary in order to make inference on the lagged price adjustment. If capital flow were available to market participants, say, after the end of the trading day. Informed traders would need to trade more aggressively on their information, reducing the lagged price effects.

Thirdly, contrary to conventional wisdom and the results of both Sellin (1994) and Brennan and Cao (1997), the paper concludes that foreign investors are better informed about future Swedish bond yields than Swedish investors.

2 The Swedish bond market

Swedish bonds are traded in a market setting similar to that of foreign exchange trading. Dealers display quotes in an electronic information system. Quotes are usually honoured, but must be confirmed over telephone before a transaction is made.

Table 1: Daily trading volume in the Swedish bond market

	Trading volume†	Share
Spot bond trading		
Dealer - Foreign investor	9.2	19.1%
Dealer - Domestic investor	8.6	21.6%
Dealer - Dealer	8.1	20.2%
Total spot	26.0	60.8%
Forward bond trading		
Dealer - Foreign investor	5.4	12.6%
Dealer - Domestic investor	4.7	11.1%
Dealer - Dealer	6.1	14.3%
Total forward	16.2	38.0%
Total	42.2	100.0%

Sample period: January 1993 – May 1996.† Values in billion SEK per day. Sample period: January 1993 – May 1996.

The market makers in the Swedish bond markets are called "primary dealers." The name is related to the fact that primary dealers have exclusive right to bid for newly issued government securities (in the "primary market"). During the 1993 – 96 sample period there were 10-15 primary dealers in the Swedish bond market, the number mainly due to bank mergers and entry/exit of smaller dealers.

In exchange for the right to trade in the primary market, primary dealers are required to provide daily reports of their trading to Sveriges Riksbank. As virtually all trading in Swedish bonds and related instruments is made via a primary dealer this gives a very comprehensive record of trading in the Swedish bond market.

The primary dealers act as intermediaries for 100–200 actively trading domestic and foreign investors. The Swedish investors are dominated by a few pension funds that hold high substantial SEK denominated bond portfolios while a large number of foreign investors primarily have small SEK denominated bond holdings as part of internationally diversified bond portfolios.[3]

The average bond trading volume amounted to 42 billion SEK per day during the sample period (see table 1). Approximately 60% of transactions were traded spot (delivery in 5 days) with the remainder traded forward (later delivery). Trading volume for domestic and foreign investors is approximately equal. Interdealer trading accounts for roughly a third of total trading.

3 The dataset

The data on investment flows used this paper result from the daily primary dealer reports during the period January 1993 to May 1996. Reports specify

[3]There has been no academic work on the difference in investor types. Results from a survey of investor holding are give in Affärsvärlden (1997) (in Swedish).

Table 2: First five autocorrelations of the data series

	Partial autocorrelation at lag 1-5						
	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\beta}_3$	$\hat{\beta}_4$	$\hat{\beta}_5$	$\chi^2(5)$	T
Transaction series							
Spot Government	0.09^{**}	-0.01	0.02	0.01	0.05	10.7°	884
Spot Mortgage	0.18^{**}	-0.02	0.01	0.04	0.11^{**}	36.8^{**}	884
Forward Government	0.07	-0.07°	0.03	0.04	-0.03	7.3	884
Forward Mortgage	-0.06°	0.05	0.04	0.08	-0.02	7.3	884
Total	0.15^{**}	-0.03	0.00	0.04	0.07^{*}	22.8^{**}	884
Bond yield changes							
Δ SEK 10y	0.03	-0.03	0.02	0.08°	-0.11°	8.3	739
Δ DEM 10y	-0.04	0.01	0.02	-0.06	0.05	6.4	746
Δ ITL 10y	-0.04	0.03	0.05	0.03	-0.02	4.1	758

The table reports the estimates from fitting an AR(5) process + constant to each of the series. The constant is omitted from the table. The $\chi^2(5)$ statistic tests the restriction $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$. Sample period: January 1993 – May 1996. $^{**}/^{*}/^{\circ}$ Significantly different from zero at the 0.01/0.05/0.10 level.

net transactions made with three separate investor classes, domestic, foreign and other dealers. As all dealers close the trading day with an empty book, inter-dealer trades sum to zero. Therefore the reported trades with domestic and foreign investors are equal with opposite sign. Net trades can thus be interpreted seen as an investment flow from foreign investors to the Swedish market.

Although all series report transactions with debt instruments with a remaining maturity of more than one year, there is no specification of the exact maturity of the traded bonds. However, as dealers report the market value of transactions this does not introduce errors into the actual flows. The reports made by dealers are never made public. This paper is based on the daily summary of individual dealer reports. There is thus no possibility of tracking transactions to individual dealers or market participants.

This paper uses five separate series to measure of capital flow from foreign investors: *Spot Government* and *Forward Government* is spot and forward purchases of government bonds, while *Spot Mortgage* and *Forward Government* is spot and forward purchases of mortgage bonds. The series *Total* is the sum of the other four series. The bond yields used are yields on 10 year government bonds at market close.

Table 2 presents the first five autocorrelations of the capital flow and interest rates series used in this paper. Autocorrelation is low for the yields changes and forward bond transactions. However, for *Spot Government* and *Spot Mortgage* there is significantly positive one-day autocorrelation as well as a day-of-the-week effect manifested in the five day autocorrelation. This indicates that foreign investors split their order flow over subsequent days as well as over weeks.

Table 3 reports the contemporaneous correlation between the five capital flow series. There is strong negative correlation between spot and forward purchases of securities, indicating that traders use forward trading as a substitute for spot

Table 3: Correlation matrix of capital flows

	Spot Government	*Spot Mortgage*	*Forward Government*	*Forward Mortgage*	*Total*
Daily flows					
Spot Government	$\cdots$	0.07^{*}	-0.14^{**}	0.01	0.82^{**}
Spot Mortgage	0.07^{*}	$\cdots$	0.01	-0.20^{**}	0.25^{**}
Forward Government	-0.14^{**}	0.01	$\cdots$	-0.05°	0.40^{**}
Forward Mortgage	0.01	-0.20^{**}	-0.05°	$\cdots$	0.11^{**}
Total	0.82^{**}	0.25^{**}	0.40^{**}	0.11^{**}	$\cdots$
Aggregated over 5 days					
Spot Government	$\cdots$	0.25^{**}	-0.19^{*}	0.16^{**}	0.84^{**}
Spot Mortgage	0.25^{**}	$\cdots$	-0.05	-0.05	0.40^{**}
Forward Government	-0.19^{*}	-0.05	$\cdots$	-0.00	0.32^{**}
Forward Mortgage	0.16^{**}	-0.05	-0.00	$\cdots$	0.28^{**}
Total	0.84^{**}	0.40^{**}	0.32^{**}	0.28^{**}	$\cdots$

Sample period: January 1993 – May 1996. $^{**}/^{*}/^{\circ}$ Significantly different from zero at the 0.01/0.05/0.10 level.

trading.

4 Empirical results

4.1 Methodology

This paper consistently uses linear least squares estimation. When series are aggregated over several trading days, regressions use overlapping observations. Standard error estimates calculated using the GMM estimator of (Hansen, 1982). Reported significance levels are thus robust to both autocorrelation and heteroskedasticity. The reported aggregation interval of 5 days is chosen arbitrarily. Similar results obtain for aggregation intervals between 2 and 20 days.

4.2 Correlation between bond returns and concurrent capital flow

Table 4 the shows that capital flows are negatively correlated with concurrent changes in Swedish bond yields. The estimate, $\hat{\beta}_1$, is significantly negative for *Spot Government* and *Forward Mortgage*. This implies that bond yields fall (and bond prices rise) when foreign investors buy Swedish bond market instruments. However, the measured effect is relatively small, the $\hat{\beta}_1$ estimate

Table 4: Regression of changes in SEK bond yields on concurrent capital flow

	$\hat{\beta}_1$	$\hat{\beta}_2$	R^2	T
Daily data				
Spot Government	-7.478^{**}	0.893^{**}	0.229	867
Spot Mortgage	-2.158	0.922^{**}	0.215	867
Forward Government	0.277	0.924^{**}	0.214	867
Forward Mortgage	4.807	0.924^{**}	0.215	867
Total	-5.664^{**}	0.895^{**}	0.226	867
Aggregated over 5 days				
Spot Government	-8.840^{**}	1.054^{**}	0.296	864
Spot Mortgage	-13.123	1.093^{**}	0.277	864
Forward Government	-0.232	1.108^{**}	0.274	864
Forward Mortgage	-39.044^{**}	1.101^{**}	0.288	864
Total	-8.190^{**}	1.039^{**}	0.299	864

Regression model: ΔSEK $10\mathrm{y}_t = \beta_0 + \beta_1 (\textit{Net bond transaction})_t + \varepsilon_t$. Sample period: January 1993 – May 1996. $^{**}/^{*}/^{\circ}$ Significantly different from zero at the 0.01/0.05/0.10 level.

for *Spot Government* of *–7.478* implies that a net purchase of 100 billion SEK government bonds result in a reduction of bond yields of 7.5 basis points.[4]

4.3 Correlation between bond returns and lagged capital flow

The results in table 5 show that foreign investors behave as either noise traders or informed traders. In order to resolve which we no study the correlation between bond returns and lagged capital flows. Table 5 repeats the estimation of table 4 using lagged capital flows. With the exception of daily *Forward Government*, all parameter estimates are negative, with the 1 day coefficient of *Forward Mortgage* and the 5 day coefficients for *Spot Mortgage*, *Forward Mortgage* and *Total* being significantly negative. This clearly corresponds to the price impact pattern of an informed trader in an REE environment. Capital flow from foreign investors is positively correlated with both concurrent and future bond returns.

4.4 The type of information

Although the results of table 5 clearly show that foreign investors are better informed than domestic investors, it is not yet clear what this informational advantage relies on. Heuristically, there are three major hypotheses regarding the nature of this information endowment. Firstly foreign investors may have better knowledge on non-Swedish fundamentals, secondly they may have better information on (their own) future capital flows, and thirdly they may have better information on Swedish fundamentals.

[4] At current exchange rates 100 billion SEK corresponds to 12-13 billion USD.

Table 5: Regression of changes in SEK bond yields on lagged capital flow

	$\hat{\beta}_1$	$\hat{\beta}_2$	R^2	T
Daily data				
Spot Government	−2.016	0.926**	0.216	868
Spot Mortgage	−6.614	0.923**	0.215	868
Forward Government	4.507	0.922**	0.216	868
Forward Mortgage	−34.200**	0.931**	0.226	868
Total	−1.545	0.926**	0.215	868
Aggregated over 5 days				
Spot Government	−6.796	1.106**	0.276	868
Spot Mortgage	−53.943**	1.100**	0.282	868
Forward Government	−6.151	1.105**	0.274	868
Forward Mortgage	−49.026*	1.114**	0.278	868
Total	−10.811*	1.107**	0.281	868

Regression model: $\Sigma_{s=t}^{t+lag}(\Delta\text{SEK 10y})_s = \beta_0 + \beta_1(\textit{Net bond transaction})_{t-1} + \varepsilon_t$, with $lag = 0$ for daily data and $lag = 4$ for data aggregated over 5 days. Sample period: January 1993 – May 1996. **/*/° Significantly different from zero at the 0.01/0.05/0.10 level.

It is straightforward to test whether capital flows are related to better information on non-Swedish factors. Simply use the capital flows as predictors for non-Swedish return series. Table 6 reports such a test using ITL bond yields. Results are very similar to those obtained for SEK bonds in table 5. This implies that at least part of the informational advantage of foreign investors result from better information on a factor in interest rate formation that affects both Sweden and Italy.

There is, however, no evidence of capital flows predicting future DEM bond yields or the SEK/DEM exchange rate. This result supports the conventional market wisdom that SEK bonds shares a "soft currency" factor with ITL bonds.

As some of the capital flows series are positively autocorrelated, it is possible that some of the predictability result from foreign investors having better knowledge of their future capital flow. That capital flows predict future capital flows is easily seen from the reported autocorrelations in table 2.

This capital flow could be the result of noise trading needs as well as anticipated informed trading. In order to alleviate this problem we need to control bond returns for concurrent capital flows. Table 7 show that capital flows contribute to explaining future bond returns even when returns are controlled for concurrent yield changes for DEM and ITL, as well as the SEK/DEM exchange rate. Although the statistical significance of this result is low it implies that foreign investors are informed about pure Swedish fundamentals, in additional to pan-European fundamentals and future capital flows.

5 Conclusions

This paper investigates whether foreign investors are more or less informed about future SEK bond returns than Swedish investors. Contrary to earlier empirical studies, the paper concludes that foreign investors better informed of future

Table 6: Regression of changes in ITL bond yields on lagged capital flows to the Swedish bond market

	$\hat{\beta}_1$	$\hat{\beta}_2$	R^2	T
Daily data				
Spot Government	-2.462	0.855^{**}	0.145	861
Spot Mortgage	-0.472	0.852^{**}	0.143	861
Forward Government	2.808	0.851^{**}	0.144	861
Forward Mortgage	-20.749^{*}	0.856^{**}	0.147	861
Total	-1.720	0.855^{**}	0.144	861
Aggregated over 5 days				
Spot Government	-10.116^{*}	1.173^{**}	0.263	858
Spot Mortgage	-23.371	1.171^{**}	0.260	858
Forward Government	-3.065	1.173^{**}	0.259	858
Forward Mortgage	-51.615^{*}	1.182^{**}	0.263	858
Total	-11.295^{**}	1.174^{**}	0.265	858

Regression model: $\Sigma_{s=t}^{t+lag}(\Delta\text{ITL 10y})_s = \beta_0 + \beta_1(\textit{Net bond transaction})_{t-1} + \varepsilon_t$, with $lag = 0$ for daily data and $lag = 4$ for data aggregated over 5 days. Sample period: January 1993 – May 1996. $^{**}/^{*}/^{\circ}$ Significantly different from zero at the 0.01/0.05/0.10 level.

Table 7: Regression of changes in SEK bond yield on lagged capital flow controlling for DEM and ITL bond yields and SEK/DEM exchange rate

	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\beta}_3$	$\hat{\beta}_4$
Daily data				
Spot Government	-1.276	0.654^{**}	0.196^{**}	-6.371^{**}
Spot Mortgage	-9.197	0.651^{**}	0.197^{**}	-6.388^{**}
Forward Government	2.164	0.651^{**}	0.197^{**}	-6.353^{**}
Forward Mortgage	-20.748^{**}	0.660^{**}	0.195^{**}	-6.293^{**}
Total	-1.372	0.654^{**}	0.196^{**}	-6.380^{**}
Aggregated over 5 days				
Spot Government	-3.113	0.740^{**}	0.209^{**}	-9.435^{**}
Spot Mortgage	-33.634^{*}	0.737^{**}	0.209^{**}	-9.391^{**}
Forward Government	-6.301	0.738^{**}	0.211^{**}	-9.439^{**}
Forward Mortgage	-13.904	0.741^{**}	0.210^{**}	-9.416^{**}
Total	-6.139^{*}	0.744^{**}	0.206^{**}	-9.427^{**}

Regression model: $\Sigma_{s=t}^{t+lag}(\Delta\text{SEK 10y})_s = \beta_0 + \beta_1(\textit{Net bond transaction})_{t-1} + \beta_2\Sigma_{s=t}^{t+lag}(\Delta\text{DEM 10y})_s + \beta_3\Sigma_{s=t}^{t+lag}(\Delta\text{ITL 10y})_s + \beta_4\Sigma_{s=t}^{t+lag}(\textit{log change in SEK/DEM exchange rate})_s + \varepsilon_t$, with $lag = 0$ for daily data and $lag = 4$ for data aggregated over 5 days. Sample period: January 1993 – May 1996. $^{**}/^{*}/^{\circ}$ Significantly different from zero at the 0.01/0.05/0.10 level.

Swedish bond returns. This conclusion is reached by showing that the net trades of foreign investors are informative for future SEK bond returns.

The informational advantage of foreign investors is partly due to pan-European fundamentals, reflected in the fact that the transaction series have explanatory power for future ITL bond yield changes and partly due to knowledge of future order flow. However foreign investors are also better informed about pure Swedish fundamentals.

The results are particularly interesting as they contradict the conventional wisdom of domestic investors being better informed about local economic prospects than foreign portfolio investors. It is possible that the integration of international bond markets has reduced the advantage of domestic investors. This is an interesting topic for future studies on price formation.

References

Affärsvärlden, "Utlandsskuldens Ägare," *Affärsvärlden*, 1997, (12), 16–18.

Brennan, Michael J. and H. Henry Cao, "International Portfolio Investment Flows," *Journal of Finance*, December 1997, *52* (4).

Cebula, Richard J. and James V. Koch, "An Empirical Note on Deficits, Interest Rates, and International Capital Flows," *Quarterly Review of Economics and Business*, Autumn 1989, *29* (3), 121–127.

__ **and** __ , "Federal Budget Deficits, Interest Rates, and International Capital Flows: A Further Note," *Quarterly Review of Economics and Finance*, Spring 1994, *34* (1), 117–120.

Correia-Nunes, Jose and Loukas Stemitsiotis, "Budget Deficit and Interest Rates: Is There a Link? International Evidence," *Oxford Bulletin of Economics and Statistics*, November 1995, *57* (4), 425–429.

Hansen, Lars Peter, "Large Sample Properties of Generalized Method of Moments Estimators," *Econometrica*, July 1982, *50* (4), 1029–1054.

Hellwig, Martin F., "On the Aggregation of Information in Competitive Markets," *Journal of Economic Theory*, 1980, *22*, 477–498.

Kyle, Albert S., "Continuous Auctions and Insider Trading," *Econometrica*, 1985, *53* (6), 1315–1335.

__ , "Informed Speculation with Imperfect Competition," *Review of Economic Studies*, 1989, *56*, 317–356.

Sellin, Peter, "Do Foreign Investors Have a Market Impact on Swedish Stock Prices?," 1994. IIES Seminar Papers No. 581.

Tesar, Linda L. and Ingrid M. Werner, "Home Bias and High Turnover," *Journal of International Money and Finance*, 1995, *14* (4), 467–492.