Who Are the "Informed" in Bond Markets: Foreign or Domestic Traders?

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Abstract

We empirically examine the relative information content embedded in the trades by foreign and domestic investors on a government bond market in a relatively small open economy. Bonds allow us to focus on the information pertaining to interest rates. We find that foreign investors have a greater impact on prices and incur smaller trading losses. Both foreign and domestic investors hold loss positions longer than gain positions but the effect is weaker for foreign investors. Foreign investors also exhibit a stronger tendency to trade in the active portion of the market. Collectively, these results suggest that foreign investors are more informed than their domestic counterparts in bond markets.

JEL Classification: G15, G21, F21

Key Words: Bond Markets, Trading, Information, Foreign vs. Domestic

1. Introduction

An ongoing debate in finance is whether domestic traders (investors) have an information advantage over foreign traders (investors). Several empirical studies involving a variety of equity markets suggest that domestic investors are more informed than their foreign counterparts (e.g., Dahlquist and Robertsson, 2004; Lee et al., 2004; Choe, Kho and Stulz, 2005; Dvorák, 2006) while others report the opposite (e.g., Grinblatt and Keloharju, 2000; Bacmann and Bolliger, 2003; Bailey, Mao and Sirodom, 2004; Huang and Shiu, 2005).[1] Equity prices, however, reflect both future cash flows and interest rates, which, in turn, reflect business and financial risks as well as the market interest rate. Existing studies do not provide any insights into whether the information advantage, if any, is cash flow or interest rate related. Disentangling the sources of information advantage (cash flow versus interest rate) for different groups of investors, however, is important because domestic (foreign) investors may have more information on cash flows (interest rate) but not interest rates (cash flows).

In this paper we investigate the information advantage of different investor groups (foreign and domestic) by focusing on interest rates as the source of information asymmetry. Specifically, we analyze the price impact, profitability, and trading behavior of foreign and domestic investors in a government bond market in a relatively small open economy. Using a bond market for our analysis has four advantages. First, because government debt is often backed by government taxing power, its cash flow risk is small

[1] Domestic traders, for instance, may be able to gather more timely and accurate information about the prospects of the investment opportunity through formal and informal networks, be more familiar with domestic laws and information disclosure policies, and be able to avoid information distortions caused by linguistic and cultural differences. Foreign investors, however, may be able to exploit their prior investment experience and expertise as well as their knowledge of international business conditions. These investors may also employ locals who are familiar with the domestic market.

thereby allowing us to examine which investor group is more informed concerning the interest rate. Second, bond markets usually provide little pre-trading transparency. As Biais and Green (2005) point out, this creates valuable opportunities for informed traders to take advantage of their superior information and enhances our ability to detect differences between informed and uninformed traders. Third, bond market participants are typically banks or brokerage firms, either acting on their own behalf or at the behest of others, as opposed to the mixture of financial and non-financial institutions as well as households that is often found in equity markets. This improves the chances that the characteristic that distinguishes our two groups of investors is indeed the national origin of the investor. Finally, as mentioned by Balduzzi, Elton and Green (2001), Pasquariello and Vega (2006) and others, unlike equity prices, government bond prices are clearly linked to domestic macroeconomic fundamentals. Global interest rate parity also plays an important role in interest rate formation. Thus, the information that needs to be "known" in bond markets is more public and homogeneous than found in equity markets.

We address the relative informedness of foreign versus domestic investors from three different perspectives. First, we examine the delayed price impact associated with foreign trades and domestic trades. By measuring the delayed price impact of trading, we test if a particular group of traders can consistently buy (sell) before other traders before the market price increases (decreases). Consistent better performance by a particular group implies that they have superior information. Second, we assess the profitability of day trading of different trader groups. Presumably, a group of traders with superior information is likely to earn high profits or incur lower losses on average than other trader groups. We also investigate the duration of bond positions and relate the duration

to trader characteristics, gain and loss status, and market interest rate volatility. Third, we analyze the trading patterns of different groups of traders for more actively traded bonds and less actively traded bonds. Because Chowdhry and Nanda (1991) suggest that informed investors tend to trade in liquid assets, we test if one particular trader group trades more active bonds than other trader groups.

Our empirical investigation uses a relatively new data set for the Turkish government's Bonds and Bills Market, which contains not only price and volume transaction data but also the identities of the transacting counterparties. Although Turkey is considered an emerging market economy, its government bond market is well-developed. Participants in the Turkish government bond market include not only small and large domestic financial institutions but also large international banks.

We find that foreign investors consistently have a larger impact on prices than domestic investors (both large and small), regardless of who initiates a trade, when their counterparties are domestic traders. Similarly large domestic investors have a greater impact than small domestic traders. Moreover, the foreign investor impact is approximately 11 times the large domestic impact. Specifically, our estimation indicates that for every one million Turkish Lira that foreign investors trade the bond price changes by 60 U.S. cents more than if the one million Turkish Lira were traded by domestic small investors in a 10 minute interval after the trade. In contrast, for every one million Turkish Lira traded by domestic large trader, the bond price changes by 5.5 U.S. cents more than if the one million Turkish Lira were traded by domestic small investors in a 10 minute interval after the trade. Our results are robust to different bond types (short versus long

term), trading intervals (10 to 30 minutes), and control for major scheduled and unscheduled domestic economic news.

By introducing the notion of trading cycles, we find that on average all investors incur losses over a cycle but the losses are significantly smaller for foreign investors than for domestic investors. Day trading profitability exhibits some persistence for all three types of investors. High interest rate volatility reduces day trading profitability but increases investor participation. We further examine the duration of the trading cycles for positions with losses and gains. We find that the duration of trading cycles is longer for loss positions than for gain positions, indicating that these professional bond investors exhibit the disposition effect that is widely documented in equity trading. We find that domestic small investors exhibit the strongest disposition effect while foreign investors show the weakest disposition effect. That foreign investors are consistently more profitable supports the notion that foreign investors are more informed.

Finally, we analyze the trading behavior of foreign and domestic investors with respect to their propensity to trade active bonds, presumably to camouflage their informedness. We find that foreign investors tend to trade more heavily in the liquid (active) portion of the market than domestic investors. Because this strategy is often employed by informed investors, this behavior strengthens our conclusion that foreign investors are more informed than their domestic counterparts.

In sum our empirical analysis strongly indicates that foreign investors are more informed in the Turkish government's Bonds and Bills Market. This is consistent with Turkey being a small open economy with its market interest rate being influenced by not

only domestic economic situation but also the global economy. It is precisely the latter that foreign investors may have superior information and knowledge.

We organize the remainder of our paper as follows. Section 2 describes the Turkish government bond market and data. In Section 3, we develop our measures, describe our methods of analysis and present our empirical results concerning the price impact of trades, the profitability of day trading and its related disposition effect, and trading strategies involving active bonds. We make concluding remarks in Section 4.

2. Description of Turkish Bond Market and the Data

2.1 The Market

Almost every month, the Turkish Treasury auctions bonds with maturities ranging from one month to 10 years. After the primary market allocation, these bonds are traded on an automated secondary market, named the Bonds and Bills Market. This market also facilitates repurchase agreements but these transactions are executed separately. The institutions that are authorized to trade on the Bonds and Bills Market are the Central Bank of Turkey, member banks, and Istanbul Stock Exchange (ISE) member brokerage houses. Member banks and brokerage houses are classified by the ISE as either domestic or foreign based on their affiliation with foreign financial institutions. These institutions typically trade on their own accounts but they also sometimes fill retail orders from their inventory.[2] Domestic institutions are taxed on interest and capital gains while foreign institutions are taxed only on capital gains.

[2] Anecdotal evidence suggests that when customers of member institutions place an order, the institutions fill these orders from their existing portfolios. Occasionally, however, institutions go to market if they do not have capacity to fill the order immediately. This possibility raises the question of whether a small

As displayed in Table I, Turkey's public bond market is an important trading venue. For example, if we use a bond market's total capitalization standardized by the GDP to measure importance, Turkey ranks 9th out of 30 major financial markets. In contrast, a similar measure for equity markets places Turkey 24th. Moreover, in relative terms, Turkey's public bond market is 2.3 times as large as its stock market. By way of comparison, this ratio is 0.38 for the United States but is 2.01 for Japan..

2.2 The Trading System

The Bonds and Bills Market uses an electronic platform to match, administer and report orders to buy and sell. Traders enter buy and sell orders into the computer system. The orders are processed and executed according to price and time priority. Market participants are then informed of the details of the transaction. A montage provides the details of the order book (up to 20 best bid or ask prices). Past transactions can be viewed by all members. The bond with the maximum trading volume is designated as the active (or benchmark) bond. The market operates in two sessions: the first session is from 9:30 a.m. to 12:00 noon, and the second session is from 1:00 p.m. to 5:00 p.m. Until 2:00 p.m., the settlement time for the day, bonds with same-day and next-day settlement trade, whereas after 2:00 p.m. until closing, only bonds with next-day settlement trade. Thus, the number of transactions declines noticeably after 2:00 p.m.

Our sample consists of 1,716,917 tick-by-tick time-stamped transactions data beginning May 1, 2001 and ending June 15, 2005 (1039 trading days). Our starting point is two months after the well-documented Turkish financial crisis that began in November

institution's order flow may materially reflect individual orders. Our tests show that both large domestic and foreign investors drive our results, which suggests that this is not a material issue.

2000 and ended in February 2001, which is attributed to liquidity shortages in the banking system. To resolve this crisis, the Turkish government took several actions such as borrowing funds from the International Monetary Fund (IMF), switching to floating exchange regime from pre-announced crawling peg system, speeding up financial reforms, and taking over 15 excessive risk taking banks under the auspices of the Saving Deposit Insurance Fund.[3] Data availability dictates the sample's ending date.

For each transaction, we know the time of order placed, transaction price, and trade size for all Turkish lira (TL) denominated treasury bills and notes. We also know the identities of the investors on both sides of the trade from their unique identification code, the identity of the trader who initiated the trade, and the length of time it took to fill the order. Although on any particular day the number of potential investors varies somewhat because of the restructuring of banks and brokerage houses and the granting of new licenses, there are 170 unique trader identification codes and 177 unique bills and bonds with varying maturities in our data set.

Traders include large foreign banks such as HSBC, Deutsche Bank, Citibank, JP Morgan Chase, Amro Bank as well as large domestic banks such as Yapı Kredi Bankası A.Ş., Vakıflar Bankası A.Ş., Garanti Bankası A.Ş., İş Bankası A.Ş. and Akbank A.Ş. Using the trader identification code and a separate data set provided by the ISE, we classify each transaction as being made by a foreign, domestic large, or domestic small investor. The size classification is based on total asset size of institution reported to ISE

[3] Danielsson and Saltoglu (2005) provide a discussion of the details of crisis period and its impact on order flows in the repurchase market. Ozatay and Sak (2002), among others, argue that the crisis was not different from crises experienced by other countries in terms of causes such as inadequate bank capital controls, weak assessment of credit risks, lack of autonomous regulators and supervisors, and most importantly, excessive duration or currency mismatches.

(large/small), and the foreign classification is determined by the affiliation with foreign banks (foreign/domestic). In our sample we have 114 domestic small traders, 35 domestic large traders, and 21 foreign traders. We also classify traders according to their trading volume using their past month's transactions and find that the exogenously determined size variable and the volume indicator are highly correlated. This is not surprising since anecdotal evidence suggests that large banks participate in treasury auctions more frequently and have the ability to obtain more bonds.

Table II reports some summary statistics for our data. Panel A provides the average daily trading volume in U.S. dollars (USD) in the Bonds and Bills Market by the domestic small, domestic large and foreign traders sorted by seller- and buyer-initiated trades and their counterparties.[4] Of the USD 640 million total daily volume, trading between domestic large investors accounts for the largest proportion. Their seller and buyer initiated trades amount to USD 167 million and USD 181 million daily, respectively. Trading between foreign and domestic large investors ranks the second highest. The daily average trading volume between domestic large and foreign investors reached USD 91 million (42.4 million + 48.4 million) for seller initiated trades and USD 101 million (59.1 million + 42.1 million) for buyer initiated trades.

In Panel B of Table II, we report descriptive statistics for tick-by-tick transactions for foreign, domestic large, and domestic small traders without reference to the initiator. The average per transaction USD volume between foreign traders is the highest at USD 1.1 million. Transaction size for trades between domestic large and foreign traders is the

[4] The volume in U.S. dollars is obtained by using the daily closing exchange rate between the Turkish Lira and the U.S. dollar for that day. Turkey dropped six zeros from its currency at the end of 2004. We incorporate this change in our calculations. During the sample period, the average exchange rate was 1.46 TL = 1 USD with a standard deviation of 0.11 TL.

second highest and ranges from USD 0.93 to 0.97 USD million. The average per transaction USD volume between domestic large traders is slightly smaller at USD 0.9 million. The average per transaction USD volume is also higher between foreign and domestic small than between domestic large and small investors. In terms of number of transactions, trade between domestic large traders is the highest at 808,410 and accounts for 47% of all trades. The trades between foreign and domestic large investors rank the second highest at 419,427 (226,458 + 192,969) and account for 24% of all transactions.

3. Empirical Analysis

We divide our analysis into three distinct areas: price impact, trading profitability and disposition, and strategic trading. The evidence provided in each section supports the contention that foreign investors are more informed than their domestic counterparts.

3.1 Price Impact

In a transparent market, each investor can infer the degree of the informativeness of the other investors she is trading with by examining the direction of prices in the period following the transaction that she executed with her counterpart. The Turkish Bonds and Bills Market's pre-trading period, similar to most other world bond markets, is not transparent. This creates opportunities for informed traders to exploit their information advantage. Nevertheless, it also hampers the ability to infer the information content of an incoming trade so that the permanent price impact can only be used to identify an informed trade after the trade has been disclosed.

We define an investor as "informed" if she consistently buys before prices rise and sells before prices decline. Following the existing literature on the relation between

order flow and returns (e.g., Hasbrouck, 1991;, Hasbrouck and Seppi, 2001; Massa and Siminov, 2003; among others), to determine the degree of informativeness of different investors, we examine the changes in prices of the same bond in the *D*-minute interval that follows each transaction. For a given bond *k*, we estimate the following regression to identify the permanent price impact of an informed trade:

$$\Delta P_{k,t+D} = \theta_{ij} T_{ijk,t} + \varepsilon_{ijk,t+D}\,, \tag{1}$$

where $\Delta P_{k,t+D} = P_{k,t+D} - P_{k,t}$ is the change in the actual price of the *k*th bond in the *D* minutes following the transaction, $T_{ijk;t}$ is the (signed) investor *i* initiated trade with investor *j* of the *k*th bond at time t (positive for purchases and negative for sales), and θ_{ij} is the regression coefficient that measures the effect on permanent price change of investor *i* initiated trade with investor *j* of the *k*th bond (*k* is suppressed for clarity). For $P_{k,t+D}$ to be defined, there must be a transaction for bond *k* in the interval (*t*, *t*+*D*). If there is more than one transaction, we use the last transaction within the interval, and if no transaction takes place, we set $P_{k,t}$ equal to $P_{k,t+D}$.

To minimize the temporary price impact resulting from liquidity trading, we use a 10-minute time interval (*D* = 10) in our regression to identify the permanent price impact of informed trades. We thus implicitly assume that the price impact of liquidity induced trades lasts less than 10 minutes and informed trades impact the price for 10 minutes or more. Given the total number of trades and trading days in our sample, on average there are about 30 trades per 10-minute interval, i.e., 1,716,917/(1039 x 8 x (60/10)). As

robustness check, we also perform our analysis using 20- and 30-minute time intervals, which increases the average number of trades per interval to 60 and 90, respectively.[5]

We estimate equation (1) for each investor at the beginning of each day. Each time the data comprise all the transactions the investor is involved in the previous 50 days and all the following changes in prices. To be included in the estimation we require four or more observations between traders i and j for bond k within last 50 days.[6] θ_{ij} represents the degree of informativeness of the ith investor, who initiated the trade. Specifically, a positive θ_{ij} means that the trade initiator, investor i, consistently bought (sold) from (to) other investors before an increase (decrease) in prices. A significant value of θ_{ij} implies that the ith investor is informed. The larger the coefficient value, the greater the informational content of the order. Similarly, a negative θ_{ji} indicates that investor i, who fills orders initiated by other investors, has consistently bought (sold) from (to) other investors before an increase (decrease) in prices. Consequently, a higher difference, θ_{ij} - θ_{ji}, shows that the trader i has information advantage over trader j.

Using our daily informativeness measure for each trader, we investigate whether the information content of trades differs across foreign and domestic investors and different investor sizes. For each investor i, we define INF_D_{it} as the sum of the difference (θ_{ijt} - θ_{jit}) across all other investors at time t for all bonds, i.e., $INF\_D_{it} = \sum_{\forall j, j \neq i} (\theta_{ijt} - \theta_{jit})$, estimated using D- minute price changes. Since a positive θ_{ij} (a

[5] Excluding the top and bottom decile trades from each day to control for the potential impact of extreme trading does not qualitatively change our results.

[6] We also estimate the same specification by using trades of bond k between ith dealer and all other investors, rather than pair-wise matching. We also use different estimation windows (25, 75, and 100 days). In no case do our results materially change.

negative θ_{ji}) measures the extent of the price impact after a trade by investor *i*, we use INF_D_{it} as a proxy for the informativeness of investor *i* relative to other investors. We find quantitatively similar results using θ_{ij} or $-\theta_{ji}$.

Using data provided by the ISE, we classify investors as foreign, domestic large and domestic small. There are no foreign small investors. We then estimate the following equation that relates informativeness to trader characteristics:

$$INF\_D_{it} = \beta_0 + \beta_1 FDUM_i + \beta_2 DLDUM_i + \varepsilon_{it}, \quad (2)$$

where *FDUM* is a dummy variable that takes a value of one for foreign traders and zero otherwise, and *DLDUM* is a dummy variable that takes a value of one for domestic large trader and zero otherwise. The domestic small trader is our benchmark trader group. We estimate the equation (2) using the Fama and Macbeth (1973) method and report the time series averages of the cross-sectional estimates in Table III. The statistical significance of all variables remains similar when we use robust clustered (by day) standard errors instead.

The results indicate that foreign traders, on average, are more informed than domestic large and small traders. For the baseline 10-minute time interval, the estimated coefficient for *FDUM* (p = 0.000) suggests that for every one million TL that foreign investors trade the bond price changes by 0.86 TL more than if the one million TL were traded by domestic small investors. Using the average exchange rate during the sample period, 1.46 TL/USD, this effect corresponds to 60 U.S. cents (0.86/1.46). The coefficient estimate for *DLDUM* (p = 0.002) also suggests that domestic large traders have more information than domestic small traders. The informativeness associated with

domestic large traders is, however, much less than that of foreign traders. Specifically, for every one million TL traded by domestic large traders, the price changes by 0.08 TL more in a 10-minute interval than if the one million TL were traded by domestic small investors. When the price impact is measured at 20- and 30-minute intervals, the coefficient estimates for *FDUM* (both p = 0.000) imply a larger price impact, i.e., 0.94 TL (64 U.S. cents) and 1.08 TL (74 U.S. cents), respectively. The coefficients for *DLDUM,* however, are now negative and no longer statistically significant (p = 0.116 and 0.087, respectively). These results are consistent with the notion that foreign investors are more informed than domestic investors.

3.2 Day Trading Profits

3.2.1 Overview

A natural question is if the relative information advantage of different investors affects their day trading profits. We answer this question by constructing daily trading cycles for each bond *j* for investor *i* on day *t*. To illustrate the mechanics, consider the transactions of a domestic small trader on May 3, 2003 given in Table IV. Assume that the initial inventory of the trader's holding in the asset is zero. Then, as shown in Figure 1, purchases cause the inventory to increase while sales cause it to decrease. On this particular date, this investor's cumulative trades hit zero at times 11:56:58, 13:08:48, 13:16:18, and 13:42:21.

For each bond *k*, we divide the daily trading pattern into cycles (segments) by using where the inventory on hand is zero or becomes negative as delimeters. In our example, the inventory on hand crosses or hits zero four times, which delineates five

cycles. We then define two measures for each cycle. Our first measure, TDR_{itkc}, is the duration (length) of trading cycle c on day t for investor i.[7] The second measure is the percentage profit ($Profit_{itkc}$) earned in trading cycle c on day t for investor i using the amount of funds, $Inv_{itkc,}$ committed to the position .

For our example in Figure 1, according to the *TDR* measure it takes two hours seven minutes and three seconds (2.11 hours) to complete the trading cycle. Within this cycle, the trader invested TL 374,870 (*Inv*), (62.495 x 1000 + 62.475 x 5000), to build up the position. Upon closing the position, the trader lost TL 452.99, (62.495 x 1000 + 62.475 x 5000) - (62.475 x 5000 + 62.948 x 1000). As a result, the percentage profit (*Profit*) of this trader for this trading cycle is -0.12, (100x 452.99/ 374,870). Using information on the percentage profit and funds invested in trading cycles (c) for all bonds (k) for a given trader i at day t, we construct the day trading profitability measure for each investor i at day t:

$$PRF_{it} = \frac{\sum_{k=1}^{K} \sum_{c=1}^{C} Profit_{itck} \times Inv_{itck}}{\sum_{k=1}^{K} \sum_{c=1}^{C} Inv_{itck}}. \qquad (3)$$

PRF thus defined represents the weighted average percentage profit per trading cycle for investor i on day t. We ignore direct transaction costs in our calculation because they are

[7] Our procedure assumes that the initial inventory is zero, that the zeros of the cumulative inventory and related measures depend on the initial inventory, and that TDR of gains and losses are not systematically time varying. Because we do not know how much each investor obtains from the auction, we cannot trace the initial position from the beginning of each day. However, any bias caused by this assumption impacts all traders in the same direction and likely does not affect our conclusions regarding the relationship between *TDR* and *PRF* across investors. Nevertheless, as a robustness check, we create a hypothetical inventory position for each trader at the beginning of the day using the past trades of each investor for the each asset and find quantitatively similar results.

only approximately 0.001%. Moreover, since we are not privy to tick-by-tick USD/TL data, we calculate profits per cycle using TL prices. Although TL and USD profits may differ, there is no compelling reason for this difference to create a systematic bias in the short term.

In Table V, we report the summary statistics for per cycle *TDR*, and per day *PRF* of domestic large, and domestic small investors. All investor groups experience on average a negative profit on their day trading activities. Trades attributed to foreign investors, however, have a smaller average loss than the trades of large domestic investors ($p = 0.000$), and these latter investors experience smaller averages losses (*PRF*) than domestic small investors ($p = 0.000$).[8] Nevertheless, this does not necessarily mean that Bonds and Bills Market traders do not make an overall profit. Profits may be obtained using other strategies such as buy and hold. These strategies are used by the traders (48% of the total number of traders) who do not day trade, and they may also be used by the day traders as well since day trading may only be part of their overall trading strategy. Lending support to this contention is that day trades make up 35% of the USD trading volume.

The average duration for positions held (*TDR*), however, is noticeably longer for foreign investors than for domestic traders. Specifically, the average duration for the positions (long or short) of foreign investors is about 75 minutes while the average duration is 54 minutes for domestic large investors and 51 minutes for domestic small

[8] Using data from the Taiwanese stock market, Barber et al. (2006) find that individual day traders routinely incur losses, while institutional day traders, on average, profit from this type of trading. The composition of trades in this market, however, is dramatically different that the Bond and Bills Market. For instance, in the Bonds and Bills Market all of the traders are institutions, while institutions only account for 10.5% of the Taiwanese trade value.

investors. The differences in the average durations between foreign and domestic large, foreign and domestic small, and domestic large and domestic small investors are all highly significant (p = 0.000).

3.2.2 Factors Influencing Profitability

In this section we explore the interactions between trader characteristics and other factors, such as prior trading success and market volatility that may explain day trading profits. Barber et al. (2004) suggest that frequent day traders perform the best. Further, if investors are overconfident in their trading skills, then we expect prior profitability to impact their participation. It is also plausible that traders learn from prior trading and adjust their trading strategies accordingly. Because there is large proportion of investors who do not participate, we incorporate the possibility that an investor's decision to trade may depend on her prior day trading successes and the market environment. We incorporate the participation decision by using Heckman's (1979) self-selection model.

Specifically, we use the following model to estimate investors' day trading profitability:

$$PRF_{i,t} = \beta_0 + \beta_1 DLDUM_i + \beta_2 FDUM_i + \beta_3 LPRF_{it} + \beta_4 LPRF_{it} * DLDUM_i + \beta_5 LPRF_{it} * FDUM_i + \beta_6 VOLINT_{i,t-1} + \varepsilon_{it}$$

$$PART_{it} = \gamma_1 LPRF_{it} + \gamma_2 VOLINT_{i,t-1} + u_{it} > 0 \quad , \qquad (4)$$

where PRF_{it} is the daily percentage profit of trader i at day t and $LPRF_{it}$ is the percentage profit of previous day. The PRF_{it} measure uses the PRFs of all day trading cycles c for all bonds k traded by investor i in day t. The interaction terms involving domestic size and foreign dummy variables with lagged profitability are used to capture the impact of prior

profitability on different trader groups. We define the participation variable ($PART_{it}$) to equal one if an investor participates at time *t* and zero otherwise. $VOLINT_{i,t-1}$ is the standard deviation of interest rate in the previous day using 30-minute observations. We use *VOLINT* to control for the possible presence of endogeneity between trading activities and market conditions.

Table VI reports the estimation results on the profitability analysis of day trading of different trader groups. Column (1) shows the Heckman model results for all bonds traded during the sample period. As shown in this column, *FDUM*'s coefficient indicates that the percentage profit per trading day is 0.026 percentage points higher (p = 0.000) for foreign investors than for domestic small investors (the omitted investor group). The coefficient for the domestic large investors, *DLDUM,* is insignificant (p = 0.558), indicating that domestic large and small investors engage in equally profitable trades. As suggested by the positive constant term, these domestic investors earn on average a daily positive profit, 0.095% (p = 0.000), after controlling for interest rate volatility and previous day trading profitability. The coefficient estimate for lagged day trading profitability is positive and significant (p = 0.000), suggesting some persistence in day trading profitability. Further, the coefficients of *LPRF*DLDUM* and *LPRF*FDUM* are significantly negative (both are p = 0.000). Nevertheless, the sum of *LPRF* related coefficients for domestic large and foreign investors (i.e., $\beta_3 + \beta_4$, and $\beta_3 + \beta_4 + \beta_5$ for domestic large and foreign, respectively) are both insignificant. Thus, the persistence in day trading profitability is weaker but insignificant for domestic large and foreign investors than indicated by the corresponding *LPRF* coefficient.

The interest rate volatility has a significant negative effect ($p = 0.000$) on day trading profitability. This suggests that it is more difficult to profit from day trading when the bond market is volatile. However, higher volatility has a significant positive effect ($p = 0.000$) on the decision to participate in day trading. One possible explanation is that informed investors are more likely to day trade and higher volatility reflects more informed investors in the market. Consistent with the participation of informed investors in day trading, the lagged percentage profit in day trading negatively affects the participation decision. A plausible reason for this relationship is that an informed investor who has just traded may not immediately trade again unless she receives new information immediately after the previous trading cycle.

We examine the robustness of our overall results first by splitting our sample into long-and short-term bonds and second by considering only those days in which there is no domestic macroeconomic news. These data separations reflect Balduzzi, Elton and Green's (2001) finding that intermediate- and long-term bonds are more responsive to macroeconomic news than short-term bonds and Morris and Shin's (2002) contention that bond yields react most to news that is emphasized by the news media.

Columns (2) and (3) in Table VI report the estimation results for long-term bonds (remaining maturity is more than one year) and short-term bonds (remaining maturity is one year or less), respectively. Column (4) gives the results when we use the 860 non-domestic news only days. These days are those that remain after we eliminate the days that have Turkish scheduled macroeconomic news reported by Bloomberg. These news items include inflation, gross national product, industrial production, current account, trade balance, unemployment, and capacity utilization announcements.

An examination of columns (2) through (4) reveals that these three different partitions provide results that are qualitatively very similar to those we report in column (1). For the long-term bond regressions the coefficient for *LPRF*FDUM* remains negative but is now insignificant (p = 0.082). This means that in this instance the persistence in day trading profitability for foreign traders is somewhat stronger than reported in column (1).

3.2.3 Trading Cycles and the Disposition Effect

Recall that in Table V we reported that our mean trading duration measure (*TDR*) is larger for foreign traders than for domestic large and small traders. We now examine how the duration of day trading cycles relates to a trader's loss or gain status and the interest rate volatility in addition to the trading group. We use the following specification

$$\begin{aligned} TDR_{itkc} = {} & \beta_0 + \beta_1 LDUM_{itkc} + \beta_2 FDUM_i + \beta_3 DLDUM_i + \beta_4 VOLINT_{it-1} + \beta_5 FDUM_i * LDUM_{itkc} \\ & + \beta_6 DLDUM_i * LDUM_{itkc} + \beta_7 VOLINT_{it-1} * LDUM_{itkc} + \beta_8 VOLINT_{it-1} * FDUM_i \\ & + \beta_9 VOLINT_{it-1} * DLDUM_i + \beta_{10} VOLINT_{it-1} * DLDUM_i * LDUM_{itkc} \\ & + \beta_{11} VOLINT_{it-1} * FDUM_i * LDUM_{itkc} + \varepsilon_{itc} \end{aligned} \quad , \quad (5)$$

where $LDUM_{itkc}$ is a dummy variable that takes a value of one when the position is losing money during cycle *c* at date *t* for investor *i* ($Profit_{itkc}$ <0) and zero otherwise. We continue to use lagged volatility, $VOLINT_{t-1}$, to account for potential endogeneity between trading activities and market conditions. We report our estimation results in Table VII. In Panel A the results excluding *VOLINT* are given in column (1) and those including *VOLINT* in column (2). Because the coefficient of *VOLINT* is significant (p = 0.000) as are those for

four of the five interaction variables involving *VOLINT*, we focus on the column (2) results.[9]

As shown in column (2), the coefficient for *LDUM*, the day trading loss dummy, is positive and significant (p = 0.000), indicating that losing positions are kept longer. This is consistent with the widely documented "disposition effect" in equity markets in which individual investors tend to keep stocks with embedded losses and sell stocks with embedded gains (e.g., Feng and Seasholes, 2005; Coval and Shumway, 2005; Locke and Mann, 2005; Dhar and Zhu, 2006). The coefficient's value suggests that on average loss positions are held longer than gain positions by about 15 minutes (0.264 x 60) on average.

The durations of trading cycles on loss positions for foreign traders (p = 0.000) and domestic large traders (p = 0.000) are longer than that of domestic small traders. The coefficient for *VOLINT* (p = 0.000) shows that interest rate volatility increases the duration of trading cycles. However, because the coefficient of *VOLINT*LDUM* is negative (p = 0.000), if the investor has a loss on her position, the duration is shorter, indicating that she is less reluctant to realize losses if the market interest rate is more volatile.

The duration of trading cycle is also longer for foreign traders than for domestic small traders when the interest rate is more volatile as indicated by a positive coefficient for *VOLINT*FDUM* (p = 0.000). There is no significant difference between domestic

[9] It is also plausible to expect that a loss position in a cycle is endogenously related to the factors affecting *TDR*. Thus, we use a 2SLS model in which we use latest cycle's profitability and previous day's volatility as instruments for *LDUM*. Although the magnitudes of the coefficients change, their direction and statistical significance do not.

large and small traders when the market interest rate is more volatile. However, when domestic investors have embedded losses, they hold their loss positions longer than domestic small investors when the market interest rate is more volatile. In contrast, when foreign investors have embedded losses, they shorten the duration of their loss positions compared to domestic small investors. These are reflected by a positive coefficient estimate for *VOLINT*DLDUM*LDUM* (p = 0.001) and a negative coefficient estimate for *VOLINT*FDUM*LDUM* (p = 0.000).

To provide additional insights on the duration of trading cycles and how the durations for loss positions and gain positions vary with trader groups and market interest rate volatility, we use the coefficient estimates reported in Panel A of Table VII and calculate the average *TDR* for different trading groups by substituting in different combinations of values for *LDUM*, *FDUM*, and *DLDUM*. We report the results in Panel B of Table VII. The numbers reported under columns *Constant* and *VOLINT* are the point estimates for the *Constant* and the coefficient for the previous day market interest rate volatility calculated for that particular combination of trader group and loss/gain status.[10] Fixing the interest rate volatility at its mean value, the average duration for the loss position is longer than for gain positions for all three trading groups. The duration for foreign traders averages about 1.38 hours for loss positions and 1.16 hours for gain positions, whereas the duration averages about 0.99 hours for loss positions and 0.78 hours for gain positions for domestic large traders and about 0.95 hours for loss positions and 0.72 hours for gain positions for domestic small traders.

[10] For instance, for foreign traders with embedded losses, the constant is 1.38 which is the summation of 0.685, 0.264, 0.357, and 0.079.

To assess which trader group exhibits the strongest relative disposition effect, we calculate the ratio of duration for loss positions to the duration for gain positions (Loss/Gain *TDR* ratio). Foreign traders have the lowest Loss/Gain *TDR* ratio (1.19), indicating that foreign trades exhibit the least disposition effect in relative terms. Domestic small traders, on the other hand, have the highest Loss/Gain *TDR* ratio (1.32), thus exhibiting the strongest disposition effect, with the disposition effect for the domestic large traders lying in between (1.26).[11]

In Panel C of Table VII, we test whether the disposition effect measured by the Loss/Gain *TDR* ratios are different across trader groups. To do this, we first generate daily time series of *TDR* ratios for trader groups using the parameter estimates in Panel B and distribution of *VOLINT*. Then we compare the sample means of foreign, domestic large and domestic small trader *TDR* ratios under the assumption of unequal variances. Our results indicate that the *TDR* ratios are statistically significantly different from each other ($p = 0.000$), which indicates disposition effect is smallest for foreigners and largest for domestic small investors. We also note that increase in volatility has different impacts on the durations of positions with losses and gains for different trader groups. In volatile times, foreign traders tend to close their loss positions sooner but keep gain positions longer. In other words, an increase in volatility decreases the Loss/Gain *TDR* ratio of foreign traders. However, the impact of volatility on the duration of positions with loses and gains for domestic traders is positive indicating that volatile times

[11] Alternatively, we construct a measure for the strength of *absolute* disposition effect by calculating the difference between the loss duration and gain duration for each group of investors and examine if the difference varies across different investor groups. We find no significant differences in the strength of *absolute* disposition effects.

encourage domestic traders to keep both their loss and gain positions longer. The increase on the loss position is stronger than that on the gain position as the market interest rate volatility increases.

3.3 Strategic Trading

Chowdry and Nanda (1991) show that informed investors tend to trade in the more liquid markets. Underlying this tendency is the need for these traders to strategically hide trades that might convey information. In studying the U.S. treasury market, Brandt and Kavajecz (2002), Goldreich, Hanke and Nath (2005), and Pasquariello and Vega (2006) suggest that the most liquid bonds are the ones that are most recently issued. These bonds are similar to the Turkish "benchmark" bonds. Accordingly, we compare the trading activities of foreign and domestic traders of these active bonds to the other Turkish bonds, which we refer to as passive bonds.

In Table VIII we report the average daily number and USD volume of trades by domestic (large and small) investors that involve active (benchmark) bonds and the proportion of these metrics to the total number and volume of trades. We examine the cases where foreign investors are on both sides of the transaction, a foreign investor is on one side and a domestic investor on the other, and a domestic investor on both sides. The economic results for the average number of transactions and USD volume are similar, although the ones involving volume are more dramatic. In particular, the ratio of active to passive bonds is the greatest when foreign investors are on both sides of the transaction and smallest when domestic investors are the trade counterparts. For example, the ratio involving the number of trades with foreign investors as counterparts is 3.24 while for solely domestic counterparts is 1.14. Moreover, the ratios that involve a foreign investor

being at least on one side of the transaction are significantly ($p = 0.000$) different from the ratio involving two domestic investors. This finding offers additional empirical support for the assertion that foreign investors are more informed than domestic investors.

4. Concluding Remarks

We investigate the informativeness of trades of foreign, domestic large, and domestic small traders on interest rates using transaction level data from the Turkish Bonds and Bills Market. We find that foreign investors consistently exert a larger price impact on bonds than domestic large and small investors, regardless of who initiates the trade. This result implies that foreign investors not only bought before (sold after) the bond prices went up (down) but also at more favorable prices than domestic large or small investors.

Day trading profitability for domestic traders is significantly less than the day trading profit of foreign traders. An increase in interest rate volatility reduces the day trading profit for all trader groups. Moreover, the duration of loss positions is longer than the duration of gain positions for all types of investors and is consistent with the disposition effect documented for equity trading. The relative disposition effect is strongest for domestic small investors (the least informed group) and the weakest for foreign investors (the most informed group). This is consistent with Coval and Shumway (2005) who find that the tendency to hold losers longer creates costly trading behaviors by showing that foreign investors exhibit a smaller disposition effect than domestic traders but also do not lose as much. We also show that foreign investors have a greater

propensity to trade it the more liquid part of the market than their domestic counterparts, most likely because of their desire to disguise their strategic trades.

Our evidence leads us to believe that foreign traders are more informed than domestic traders. However, a puzzle remains. Why do day traders, who are the agents of institutions, on the Bonds and Bill Market on average incur losses? After all, Barber et al. (2006) report that institutions that day trade on the Taiwanese stock market profit from this activity at the expense of individuals who lose. Why are the traders of Turkish bills and bonds different? Our extant empirical findings contribute to the long-term research agenda pursued by many researchers concerning whether the magnitude of day trading profits and losses are affected by different security types, types of traders, market microstructure set-ups, regulations and cultures. As exemplified by the differences between the Turkish government bond market and the Taiwanese stock market, our results also call for more future research to better understand the differences between trading in bond markets and equity markets.

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Table I
World Public Bond Markets

In this table we provide some descriptive statistics of stock and bond market capitalization relative to GDP for various countries (source: World Bank database on Financial Development and Structure: http://www.worldbank.org/research/projects/finstructure/database.htm)

Country name	Public bond market capitalization to GDP	Stock market capitalization to GDP	Public bond market/Stock market capitalization
Japan	1.21	0.60	2.01
Belgium	0.97	0.50	1.94
Lebanon	0.91	0.08	11.84
Greece	0.85	0.51	1.66
Italy	0.85	0.37	2.26
Canada	0.56	0.89	0.63
France	0.52	0.67	0.77
Czech Rep.	0.52	0.18	2.82
Turkey	**0.49**	**0.21**	**2.30**
Denmark	0.48	0.48	0.99
Portugal	0.46	0.34	1.36
Netherlands	0.45	0.88	0.51
Spain	0.45	0.71	0.62
U.S.	0.44	1.17	0.38
Brazil	0.43	0.36	1.18
Sweden	0.41	0.78	0.53
Hungary	0.41	0.17	2.35
Singapore	0.39	1.36	0.29
Germany	0.38	0.37	1.02
Austria	0.37	0.17	2.16
Malaysia	0.36	1.41	0.26
Finland	0.36	0.96	0.37
South Africa	0.32	1.36	0.23
India	0.29	0.34	0.85
Poland	0.29	0.15	1.90
Switzerland	0.29	2.08	0.14
Philippines	0.28	0.40	0.71
New Zealand	0.28	0.36	0.77
U.K.	0.28	1.20	0.23
Chile	0.27	0.86	0.32

Table II
Transaction Descriptive Statistics

In Panel A, we report the daily mean dollar trading volume of buyer- and seller-initiated trades with their counterparts. Panel B summarizes the descriptive statistics of mean dollar volume and number of transactions between trader groups. The sample period is May 2001 to June 2005 (1039 trading days).

Panel A. Daily trading USD volumes (in million USD)

Seller-Initiated Trades

		Domestic Small	Domestic Large	Foreign
Seller	Domestic Small	1.94	13.14	3.87
	Domestic Large	15.29	166.97	48.38
	Foreign	3.92	42.42	13.46

Buyer-Initiated Trades

		Domestic Small	Domestic Large	Foreign
Buyer	Domestic Small	2.00	14.08	3.45
	Domestic Large	12.73	180.83	42.14
	Foreign	4.52	59.09	16.26

Panel B. Sample Statistics of Transactions

Mean Amount of Transactions (in million USD)

		Buyer		
		Domestic Small	Domestic Large	Foreign
Seller	Domestic Small	0.16	0.37	0.48
	Domestic Large	0.36	0.90	0.97
	Foreign	0.46	0.93	1.10

Number of Transactions

		Buyer		
		Domestic Small	Domestic Large	Foreign
Seller	Domestic Small	52,093	151,280	31,184
	Domestic Large	162,451	808,410	192,969
	Foreign	37,702	226,458	54,370

Table III
Informativeness (INF) Measure across Investor Groups

This table presents regression results on the impact of investor type on informativeness. At each date t, we estimate θ_{ij} using Equation (1) for the transactions of bond k initiated by trader i and filled by trader j within last 50 trading days. For each transaction, we use D-minute price change ($\Delta P_{k,t+D} = P_{k,t+D} - P_{k,t}$) and signed trade amounts (T_{ijk}) (in million TL face value). At date t for investor i we calculate the INF_D_{it} as average of θ_{ij} -θ_{ji} for all k and j. The table reports the Fama andMacbeth (1973) regression results of the specification below for 10, 20 and 30 minute *INF* measures where $FDUM_i$ ($DLDUM_i$) is a dummy which takes a value of one if trader i is foreigner (domestic large) and zero otherwise. P-values associated with coefficient estimates are provided in brackets.

$$INF\_D_{it} = \beta_0 + \beta_1 FDUM_i + \beta_2 DLDUM_i + \varepsilon_{it} \quad (2)$$

	INF_10	INF_20	INF_30
Constant	-0.1939	-0.0669	0.0123
	[0.000]	[0.009]	[0.845]
FDUM	0.8611	0.9368	1.0758
	[0.000]	[0.000]	[0.000]
DLDUM	0.0788	-0.0438	-0.1123
	[0.002]	[0.116]	[0.087]
R^2	0.005	0.008	0.003
N	64,751	64,999	65,433
Days	989	989	989

Table IV
Illustrative Example

In this table we provide a sample trade sequence for a domestic small trader on May 3, 2003. The first column is the time stamp. The second column is the price. The third column, buy(+1) or sell(-1*),* is the directional indicator of the trade. The fourth and fifth columns report the quantity traded at time *t* and total quantity at hand after the transaction. Figure 1 illustrates the cumulative quantity at hand.

Time	Price	Buy(+1) or Sell(-1)	Quantity	Total Quantity
9:49:55	62.495	1	1000	1000
10:24:02	62.475	1	5000	6000
10:25:05	62.475	-1	5000	1000
11:56:58	62.948	-1	5000	-4000
13:08:46	62.809	1	1000	-3000
13:08:48	62.809	1	6000	3000
13:11:44	62.809	-1	2000	1000
13:16:18	62.809	-1	5000	-4000
13:36:54	62.632	1	7000	3000
13:40:52	62.628	-1	2000	1000
13:42:21	62.612	-1	3000	-2000
13:43:04	62.612	-1	1000	-3000
13:44:08	62.593	-1	1000	-4000

Table V
Foreign and Domestic Investors' Profits and Trade Duration

Panel A of this table contains descriptive statistics for percentage day trading profits (*PRF*) and trade duration (*TDR*) for domestic and foreign traders. Panel B reports the p-values of the hypothesis tests that the mean of the first column is equal to mean of the second column. Trade duration is recorded in hours and profits in percentages. *PRF* and *TDR* are calculated using the methodology described in section 3.2.

Panel A. Descriptive Statistics

	PRF				
	Obs	Mean	Std. Dev.	Median	75%
Foreign	6,372	-0.015	0.187	-0.003	0.045
Domestic Large	21,111	-0.032	0.157	-0.014	0.013
Domestic Small	17,227	-0.046	0.182	-0.019	0.008
All	44,710	-0.035	0.172	-0.014	0.015

	TDR				
	Obs	Mean	Std. Dev.	Median	75%
Foreign	18,655	1.254	1.661	0.489	1.775
Domestic Large	103,619	0.899	1.371	0.263	1.130
Domestic Small	57,236	0.849	1.309	0.233	1.068
All	179,510	0.920	1.390	0.270	1.177

Panel B. P-values

		PRF	*TDR*
Foreign	Domestic Large	0.000	0.000
Foreign	Domestic Small	0.000	0.000
Domestic Large	Domestic Small	0.000	0.000

Table VI
Day Trading Profits, Prior Profitability, Volatility and Trader Affiliation

In this table, we estimate our Heckman selection model for (1) the entire sample (2) long-term bonds, (3) short-term bonds, and (4) the 860 no-domestic macroeconomic news days. PRF_{it} is the day trading percentage profits for investor i at day t, $LPRF_{it}$ is lag profitability and $VOLINT_{it}$ is the standard deviation of half hour interest rates. $DLDUM_i$ ($FDUM_i$) is one if investor is domestic large trader (foreign) and zero otherwise. P-values associated with coefficient estimates are provided in brackets and are based on robust standard errors clustered by day.

$$PRF_{i,t} = \beta_0 + \beta_1 DLDUM_i + \beta_2 FDUM_i + \beta_3 PRF_{i,t-1} + \beta_4 PRF_{i,t-1} * DLDUM_i + \beta_5 PRF_{i,t-1} * FDUM_i + \beta_6 VOLINT_{i,t-1} + \varepsilon_{it}$$

$$PART_{it} = \gamma_1 PRF_{i,t-1} + \gamma_2 VOLINT_{i,t-1} + u_{it} > 0 \qquad (4)$$

	(1)	(2)	(3)	(4)
Constant	0.095	0.076	0.111	0.103
	[0.000]	[0.000]	[0.000]	[0.000]
DLDUM	0.001	-0.004	0.003	0.001
	[0.558]	[0.055]	[0.250]	[0.571]
FDUM	0.026	0.019	0.029	0.028
	[0.000]	[0.000]	[0.000]	[0.000]
LPRF	0.190	0.145	0.241	0.159
	[0.000]	[0.000]	[0.000]	[0.000]
*LPRF *DLDUM*	-0.084	-0.116	-0.127	-0.073
	[0.000]	[0.005]	[0.000]	[0.000]
*LPRF *FDUM*	-0.115	-0.073	-0.189	-0.123
	[0.000]	[0.082]	[0.000]	[0.000]
VOLINT	-4.247	-7.946	-3.350	-2.532
	[0.000]	[0.000]	[0.000]	[0.001]
Participation Equation				
LPRF	-0.393	-0.046	-0.306	-0.193
	[0.000]	[0.434]	[0.000]	[0.000]
VOLINT	54.223	125.790	36.776	27.605
	[0.000]	[0.000]	[0.000]	[0.000]
rho	-0.857	-0.811	-0.874	-0.860
N	44,710	22,510	32,877	36,933
Censored	11,073	6,396	10,997	14,244
Uncensored	33,637	16,114	21,880	22,689

Table VII
Duration of Day Trading

In Panel A of this table, we estimate the below specification using OLS. TDR_{itkc} is the duration (in hours) of a day trading position is kept open; $LDUM_{itkc}$ is a dummy variable that takes a value of one when the position of trader *i,* at day *t*, for bond *k*, and cycle *c* is a loss ($Profit_{itkc}$<0), and zero otherwise. $VOLINT_{it}$ (x100) is the standard deviation of half hour interest rates. $DLDUM_i$ ($FDUM_i$) is one if investor is domestic large trader (foreigner), and zero otherwise. P-values associated with coefficient estimates are provided in brackets and are based on robust standard errors clustered by day. Panel B reports the loss/gain *TDR* difference based on estimations from Panel A. Panel C reports the p-values of the hypothesis tests that the mean of the first column is equal to mean of the second column.

$$\begin{aligned} TDR_{itc} = {} & \beta_0 + \beta_1 LDUM_{itc} + \beta_2 FDUM_i + \beta_3 DLDUM_i + \beta_4 VOLINT_{it-1} + \beta_5 FDUM_i * LDUM_{itc} \\ & + \beta_6 DLDUM_i * LDUM_{itc} + \beta_7 VOLINT_{it-1} * LDUM_{itc} + \beta_8 VOLINT_{it-1} * FDUM_i \\ & + \beta_9 VOLINT_{it-1} * DLDUM_i + \beta_{10} VOLINT_{it-1} * DLDUM_i * LDUM_{itc} \\ & + \beta_{11} VOLINT_{it-1} * FDUM_i * LDUM_{itc} + \varepsilon_{itc} \end{aligned} \quad (5)$$

Panel A. Estimation Results

	TDR	*TDR*
Constant	0.726	0.685
	[0.000]	[0.000]
LDUM	0.226	0.264
	[0.000]	[0.000]
FDUM	0.415	0.357
	[0.000]	[0.000]
DLDUM	0.056	0.071
	[0.000]	[0.000]
VOLINT		0.136
		[0.000]
*FDUM*LDUM*	0.012	0.079
	[0.676]	[0.026]
*DLDUM*LDUM*	-0.015	-0.047
	[0.331]	[0.008]
*VOLINT*LDUM*		-0.126
		[0.000]
*VOLINT*FDUM*		0.274
		[0.000]
*VOLINT*DLDUM*		-0.037
		[0.288]
*VOLINT*DLDUM*LDUM*		0.101
		[0.001]
*VOLINT*FDUM*LDUM*		-0.304
		[0.000]
N	179,510	179,510
R^2	0.013	0.014

Panel B. Loss/Gain *TDR* Ratios

		Constant	*VOLINT*	*TDR* at Mean Volatility	Loss/Gain *TDR* ratio
Foreign	Loss	1.385	-0.020	1.38	1.19
	Gain	1.042	0.410	1.16	
Domestic Large	Loss	0.973	0.074	0.99	1.26
	Gain	0.756	0.099	0.78	
Domestic Small	Loss	0.949	0.010	0.95	1.32
	Gain	0.685	0.136	0.72	

Panel C. Testing Loss/Gain *TDR* ratio across trader groups

		p-value
Foreign	Domestic Large	0.000
Foreign	Domestic Small	0.000
Domestic Large	Domestic Small	0.000

Table VIII
Relative Trading Activity in Activity and Passive Bonds

This table summarizes the daily number of active and passive bond transactions by number of trades (Panel B) and volume in U.S. dollars (Panel A). We present our metrics for transactions involving foreign investors on both sides of the trade, foreign investors on at least one side of the trade and domestic investors on both sides of the trade. The p-value obtains from testing the null hypothesis that the sample mean of one of the categories involving a foreign investor is greater than the mean of the category involving only domestic investors. The percentage of days measures the portion of days that the former two categories are greater that the category that involves only domestic investors.

Panel A. Number of Transactions

	Domestic/Domestic	Foreign/Domestic	Foreign/Foreign
Active	558.92	278.23	34.54
Passive	571.24	192.74	21.08
Ratio	1.14	1.93	3.24
Std. error of mean	0.02	0.05	0.16
p-value		(0.000)	(0.000)
Percentage of Days the Foreign Ratio is Greater than the Domestic Ratio		77.19	75.26

Panel B. Average Transactions in USD

	Domestic/Domestic	Foreign/Domestic	Foreign/Foreign
Active	190.01	118.34	16.44
Passive	216.92	89.72	14.35
Ratio	1.05	2.06	6.57
Std. error of mean	0.03	0.08	0.97
p-value		(0.000)	(0.000)
Percentage of Days the Foreign Ratio is Greater than the Domestic Ratio		78.92	72.67

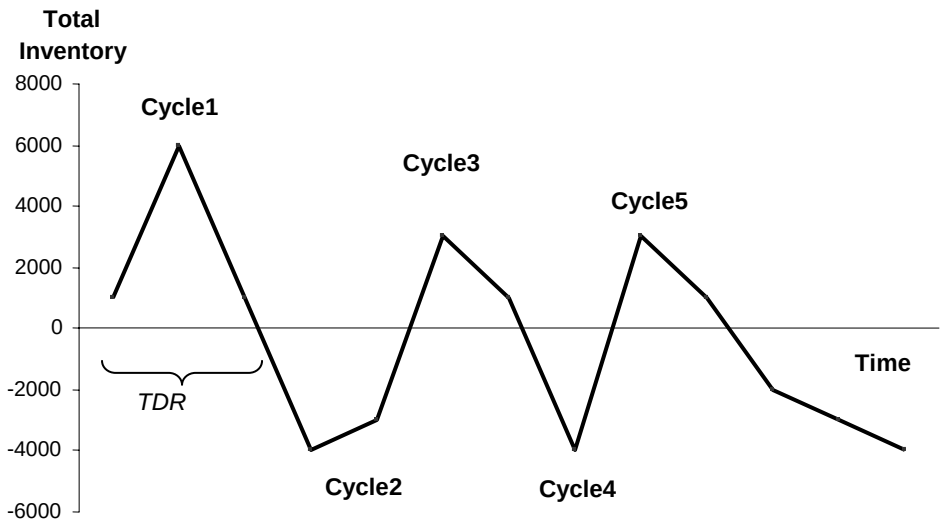

Figure 1
Day Trading Cycles Using Data in Table IV