Do Institutional Investors Show the Disposition Effect?:

Evidence from South Korea's Bond Market

JUNG SEOK WOO

Hanyang University Business School

222 Wangsimni-ro, Seongdong-gu

Seoul, Korea, 133-791

tel: +82.10.6207-6773

jung_seok_woo@hotmail.com

JU HYUN KIM *

SKKU Business School, Sungkyunkwan University

25-2, Sungkyunkwan-ro, Jongno-gu

Seoul, Korea, 110-745

tel: +82.10.9987-6896

kimjh79@skku.edu

HYOUNG-GOO KANG

Hanyang University Business School

222 Wangsimni-ro, Seongdong-gu

Seoul, Korea, 133-791

tel: +82.2.2220-2883, fax: +82.2.2220-0249

hyongkang@hanyang.ac.kr

*Corresponding author: Ju Hyun Kim

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ABSTRACT

We study the disposition effect in institutional traders by analyzing a unique bond trading dataset of a prominent financial firm in South Korea. The data contains the trade records of RP and Proprietary trading books for the years 2012 and 2013. Overall, Proportion of Gains Realized (PGR) is not meaningfully larger than the Proportion of Losses Realized (PLR) – that is, there is little evidence of the disposition effect, where the reference is the purchase price, or to alternative specifications. We explain these findings with trader discipline, which mitigates reference dependence and aversion to loss realization. We posit that the results have important implications for market efficiency, since institutional traders play a very important role in the price discovery process of financial markets.

Keywords:

Institutional investors, disposition effect, bond market, loss aversion, framing, trading, reference dependence

I. INTRODUCTION

In financial literature, the term “disposition effect” refers to the widespread phenomenon where investors sell more of their winning investments and hold on to the losing ones. One of the most salient topics in behavioral finance, the disposition effect has been extensively studied in individual investors, perhaps most notably by Odean (1998). The irrational investment behavior, often detrimental to the overall profits of the investor, is influenced by the investor’s past investment decisions or specific points of reference, which are usually related to the purchase prices of individual securities.

Consensus in the academic field is that the disposition effect is a prominent feature in individual investors. However, the literature is sparse when it comes to professional and institutional investors, and there is conflicting evidence regarding the investor subgroups. This is a serious challenge, as these investors are responsible for most of the meaningful action in financial markets.

As former institutional traders, we realized that this disposition effect was exactly what trading personnel were trained to eliminate in our discipline. The wisdom handed down from trader to trader are phrases like “the first loss is the best loss” and “don’t think about where you bought it”. To quote a couple of legendary traders, “We’re not going to play a winning hand every day.” (John Paulson), and "I'm more concerned about controlling the downside. Learn to take the losses. The most important thing about making money is not to let your losses get out of hand." (Marty Schwartz). The framing methodology of risk and performance differs significantly between institutional and individual investors, and with years of learning and experience, the disposition effect in the conventional sense should be significantly less in institutional traders compared to individual investors. We test this hypothesis in a bond institutional investor environment, with a unique dataset which contains the trading records of a prominent financial firm of South Korea.

The bond market seems better suited for the purposes of this study, as fixed income trading is still relatively less computerized. Unlike equity trading which utilize highly complex algorithms, bond trading is much less centralized, and in the case of Korea relies heavily on OTC (over-the-counter) trades. This setting allows us to assume that any differences in institutional investor behavior comes from the human factor, which may be more difficult to glean from the effect of computers and systems in more automated markets.

The literature on the disposition effect in individual investors is substantial and mostly agrees on its existence. In contrast, the amount of work done on institutional investors is sparse and divided in their results. We posit that because of trader training and evaluation system, institutional investors will not show the disposition effect in regard to the purchase price, which our analysis supports. One exception is that when our sample period is classified into 5 categories by the size of daily market move – Positive-Large, Positive-Small, No Move, Negative-Small, and Negative-Large, we observe signs of the disposition effect in Positive-High days. This contrasts with Negative-Large days, which show the reverse disposition effect. Taken together, the evidence seems to point to well-disciplined profit taking and loss cutting, rather than as proof of the disposition effect in institutional traders. We conduct additional tests to discover whether this phenomenon arises from the existence of an alternate reference point – the previous closing price. The results show that the bond institutional traders in our sample do not show the disposition effect in regard to either set of reference points.

Related to recent literature on delegation and the disposition effect, we posit that any influence of delegation will be more evident in the RP book than the Proprietary book. This is because the RP book trader has client investment decisions to delegate blame on, whereas the Proprietary trader is completely accountable for all decisions made for his book. Chang et al. (2015) find that the disposition effect can be weakened with delegation of blame, and our results support their hypothesis in that the RP book tends to show a reverse disposition effect that survives the tests of various analysis and regressions.

Our paper proceeds as follows. In Section II of this paper, we review the major empirical studies on the disposition effect by investor class – individuals and institutions. Section III describes the data. Section IV introduces the methodology we use in empirical analysis to discover whether the disposition effect exists in the institutional bond investors of a financial firm in South Korea, and presents the results. We discuss the contribution and implications of our findings in Section V. Section VI summarizes the findings and contributions of this paper.

II. LITERATURE REVIEW

A. The Disposition Effect in Individual Investors

The term 'Disposition Effect' made its formal appearance in 1985 when Shefrin and Statman gave the name to the phenomenon of individual investors showing the tendency to "sell winners too early and ride losers too long". The four pillars of their theoretical framework are prospect theory (Kahneman and Tversky, 1979), mental accounting (Thaler 1980, 1985, Tversky and Kahneman, 1981), regret aversion, and self-control.

Prospect theory assumes that the reference point for an individual's investment is the purchase price. From this reference point, the utility function of investors takes on an "S"-shaped value function, or put more simply, they are risk-averse in the domain of gains and risk-seeking in the domain of losses. Mental accounting states that people create a different mental account for each investment, and track the value each security using the respective purchase price as the reference point. Regret aversion says even if people know they have made the wrong decision regarding a certain investment, admitting to this mistake and closing out the investment position with their own hands will remind them of their initial decision. Thus, people may seek to avoid this resurfacing of regret. Toward the end of the year, there may be additional self-control inducing factors such as tax benefits on realized capital losses which weaken the observed disposition effect.

The disposition effect was thus named but left unexplored for many years, until Terrance Odean. In his seminal paper on individual investor disposition effect, Odean (1998) analyzes the trading records of over 10,000 individual investor accounts at a large discount brokerage house (therefore ruling out the influence of retail brokers). By studying the stock trading records of these individual accounts, he finds ample evidence of the disposition effect. Odean proposes a new and intuitive method of quantifying the tendency to sell winners versus losers – rather than just comparing the simple counts of the two types of events, he calculates the ratios of actual sales for a gain (or a loss) to the total number of winners (or losers) in each portfolio. The resulting ratios are labeled Proportion of Gains Realized (PGR) and Proportion of Losses Realized (PLR), and for the time horizon of 1987 to 1993, there is statistically meaningful evidence of a tendency to sell a larger proportion of winning investments than the losing ones. This is true for every month of the year except for December, when the proportion of actual sales done for losses is significantly larger than those done for gains. Of the several possibilities behind this phenomenon, Odean points to tax benefit related selling as the most powerful explanation. While investors may convince themselves to hold on to their losing investments with the belief in price mean reversion, Odean shows this is an unfounded belief by tracking the ex post returns of winning stocks sold (realized gains) and losing stocks that are not sold (paper losses). Compared to the value-weighted CRSP index, the average excess returns on winning stocks sold are positive for all the timeframes analyzed (84, 252, and 504 trading days), and on losing stocks kept are negative for all the mentioned time horizons.

The existence of the disposition effect in the individual investor is also shown in a laboratory experiment by Weber and Camerer (1998). The authors design a setting where 6 hypothetical risky assets are created. There are 14 sessions of price moves generated by a random process, and participants are asked to compose their portfolios before the start of each session. Each of the risky assets are designated a certain chance of price rise – 65%, 55%, 50%, 45%, and 35% (2 assets are designated the chance of 50%, and other assets are paired with one of the remaining chances). The experimental subjects are informed of these chances, but not of which share is paired with which probability. Under this setting, the rational investor will infer the probability distributions from the price movements and concentrate her investments in the assets that are expected to show the best performance. However, the results show that the subjects hold a much more diversified portfolio than is optimal, and sell more winners (nearly 60%) than losers (less than 40%). Interesting to note, when asked to match probabilities with respective securities, the participants show high levels of accuracy. Thus the portfolio misallocation is not a result of bad guesses at trend estimation. The disposition effect is much reduced when the authors impose an automatic selling restraint at the end of each session. Although investors are reluctant to realize their losing investments, they are not eager to maintain them by repurchasing those investments after they have been sold.

Other studies which attest to the existence of the disposition effect in individual investors include a study of Israeli accounts by Shapira and Venezia (2001), of Australian investors by Brown et al (2006), and of Chinese investors by Chen et al (2004).

Another strand of the literature develops models with prospect theory preferences to predict the disposition effect. The partial equilibrium model by Barberis and Xiong (2009) suggest that annual gains and losses are not relevant for the disposition effect, but only realized gains and losses are. Kaustia (2010b) also examines the link between prospect theory utility and the disposition effect, and finds that there are many aspects in which the disposition effect does not match the predictions of prospect theory preferences. In a later paper, Li and Yang (2013) develop a general equilibrium model to investigate the relationship between prospect theory, the disposition effect, and asset markets. They find that that "there is a nontrivial range of preference parameters for prospect theory to simultaneously explain the disposition effect, the momentum effect, and the equity premium puzzle." The existing opinions are thus mixed, but the aim of this paper does not lie in providing conclusive evidence in this area. Our main objective is to widen the horizon in the disposition effect literature by contributing to the less explored institutional investor segment.

B. The Disposition Effect in Institutional Investors

Grinblatt and Keloharju (2001) analyze a comprehensive dataset of the Finnish stock market from December 1994 to January 1997. The data contains daily data of all investor classes, and their

Logit regressions include numerous independent variables to discover the determinants of investment decisions. Through their comprehensive analysis, they find that the disposition effect and tax-related concerns are the major factors in determining the selling behavior of investors. The disposition effect was found for all investor classes, with extreme capital losses (losses greater than 30 percent) more likely to decrease the propensity to sell than moderate losses (losses smaller than or equal to 30 percent). A closer look at the December tax-related selling reveals that the phenomenon is much more relevant in the second half of the month, when the end of the calendar year looms near and the needs for tax savings become more imminent. However, our evidence on institutional trader disposition effect points the other way, as the bond traders in the Korean market show little evidence of the disposition effect.

In the Korean stock index futures market, Choe and Eom (2009) examine the total trading records of the Kospi 200 futures for the period of January 2003 to March 2005. Investors are classified into three groups – individual, institutional, and foreigner. Analyzing nearly 70,000 accounts and over 22 million transactions, they find that the disposition effect is found in all three types of investors. Since they are dealing with only one investment vehicle, the PGR and PLR methodology of Odean (1998) is modified to count the number of days, not the number of securities. Through the trading records they claim that institutional investors are the biggest losers – a conclusion that we would like to view in a different light. In practice, it is hardly the case that institutional investors comprise their portfolios of only the Kospi 200 futures and nothing else. Rather, the Kospi 200 futures is just one of the securities that are available as a hedging or an investment tool for the portfolio manager. Measuring the profit and loss from just one security in a portfolio and using it as a proxy for the overall performance of the investor is questionable. In the same line of reasoning, we question the validity of counting the number of days of losses and gains for a single security and judging the overall tendency of investment decisions.

Whereas most research on the disposition effect finds its existence not only in individuals but even in professional and institutional investors, O’Connell and Teo (2009) argue for the contrary. They graph the relationship between trading profit and loss on the risk-taking tendency of institutional investors of currency trades from a proprietary database. The results show that institutions tend to increase risk in the periods following gains and reduce risk following losses. The amplitudes with which the risks respond is much larger for losses than for gains – that is, the institutional investors in the sample cut losing positions much more quickly and actively than they add to their winning positions. The authors cite this phenomenon as evidence that the disposition effect does not exist in the subjects of their study. However, we are reserved in accepting these results outright, as we question the validity of treating different currencies as substitutable investments. Other works on the disposition effect essentially analyze the trade records of securities that belong to the same market, such as U.S. stocks (Odean, 1998) or Finnish stocks (Grinblatt and Keloharju, 2001). It is highly likely that major currencies such as JPY and GBP will be under the influence of many different fundamental variables – which inevitably influence investment decisions. Among the numerous factors, one cannot gauge how much weight the disposition effect has on the selling decisions made for a portfolio of different currencies. Another concern is that the methodology in testing for the disposition effect differs from most of the existing literature, in that the trades in a currency portfolio cannot be segregated into different "securities" and it is impossible to calculate the proportion of realized gains and losses compared to the opportunities to do so.

Prominent works on the behavior of investment professionals include the study of Locke and Mann (2005) and Haigh and List (2005), both supporting the existence of the disposition effect in professional traders. However, risk taking and profit generation is top priority for the institutional trader, which may not be the case for a larger part of the professionals. The performance evaluation of traders is highly quantitative, with a profit target set explicitly for each fiscal year for each trader. This target, often called the budget, is the single most important factor in trader evaluation and compensation. While other job functions also have quantitative targets, often the budget is not personalized, and evaluation is complemented by many qualitative factors. This type of job environment sets the trading profession apart from others in regard to risk taking.

In sum, the number of empirical studies done on the subject of institutional investors and the disposition effect is much smaller than that done for individual investors, and the results are also mixed. In many of the studies, the data characteristics and methodology differ from the classical method of Odean's (1998). Our contribution lies in testing for the disposition effect with daily data for a set of bond institutional investors in the orthodox methodology, and also in testing for the disposition effect in regard to alternate reference points other than the purchase price.

III. DATA

South Korea boasts a sound financial base with many types of investors and numerous financial corporations. There are 13 domestic banks, 39 foreign bank branches, 6 special banks, 62 securities companies, and 25 life insurance companies among many others.[1] Our sample dataset is from a major securities house which ranks among the top ten most profitable securities companies in 2014.[2] In the Appendix, we describe the Korean bond market in detail.

To test for the disposition effect in bond institutional traders, we analyze the complete set of bond records from the proprietary trading book for the period of October 2012 to December 2013, and from the RP book for the year 2012. RP, or repurchase agreements, are contracts where the seller agrees to repurchase a certain security from the buyer at a fixed date in the future at a pre-agreed price. The RP account of a securities house faces various individual investors to cater for their diverse needs in maturities. From the viewpoint of the individual, the difference in RP accounts and bank deposits are not material, as the cash flow structures of the products are identical. Rather the RP account is more often preferred, as it usually promises a higher yield than a bank deposit. The RP book aggregates the cash committed from these individual investors, and the traders in charge of the book are responsible

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[1] Source: Financial Supervisory Service, data as of February 2015.

[2] Source: Korea Exchange (KRX).

for managing the cash and making investments as they see fit. The aim is of course to make more money than that which has to be paid out to the original investors.

While the RP book is primarily client-driven, the proprietary trading book is another matter. The proprietary trading book has no client flows, and the decisions to invest or to divest are totally up to the discretion of the trader(s) in charge. Since the proprietary trader has no minimal amount of inventory to keep from the inflow of cash from individual investors, the book size will be much smaller than that of the RP book. The type of bonds in the proprietary book will be concentrated on those with ample liquidity, as positions that are difficult to get out of may result in additional losses.

We test both types of accounts to verify whether the disposition effect varies according to investment type even within the institutional bond investor class. As detailed in our analysis, the disposition effect is generally not found in either of the two book types. An exception is the month of March, which we test for the year-end effect. In this month, our trade records show the disposition effect, which is contrary to the reverse disposition effect of individual investors shown at year-end.

Our dataset records trades on book level only, and not on individual trader level. This is natural from the institution's point of view, as the trading unit as a whole is responsible for generating profits. The business unit is ongoing, whereas keeping track of trader level profits may prove problematic, as individual employees are free to come and go, or there may be adjustment in headcount, and various other issues.

The best way to grasp the characteristics of the dataset will be to picture it as a series of snapshots taken at the end of each day's trading session. Each day's picture is a very comprehensive one where daily balances of all the bonds outstanding in the portfolio are reported, together with ISIN (International Securities Identification Number), amounts pledged as collateral, amounts available for sale, profit and loss since inception of the trades, market values, closing yields and prices, bond maturities, bond durations and modified durations, convexities, credit ratings, accrued interests and receivables, bond issue dates, and coupon rates. The advantage of our data is that we have a complete set of all the investments held on each date and know the exact purchasing point of each bond – something that is more difficult to construct from the usual trade record type data. Of course, if the trade record type data spans an adequately long time horizon, the construction of investment portfolios will be very close or identical to the actual positions. With our dataset, we rest assured in the knowledge that we know the exact portfolio composition for each day in our sample period.

IV. ANALYSIS

A. Methodology

To test for the existence of the disposition effect in the behavior of institutional investors of Korea's bond market, we follow the methodology of Odean (1998). Odean analyzes the trading records of more than 10,000 accounts at a large discount brokerage house from 1987 to 1993, testing for the evidence of the disposition effect in individual equity investors. The test focuses on not only comparing the number of gains and losses realized, but also on the ratios at which the winning and losing investments are sold relative to the total number of opportunities to do so. This approach prevents misinterpretation of the data when market moves are extreme. For example, in a booming market when most of the securities appreciate in value, the proportion of winning securities in a portfolio will naturally be much larger than that of the losing ones. This proportion will be reflected in the numbers of winners and losers that are actually sold, and a simple count of the number of securities sold for a gain or loss is highly likely to overstate the tendency of investors to sell their winning investments versus their losing ones. The relative proportion based approach resolves this problem.

We investigate the trading records of the proprietary trading book for the time period of October 2012 to December 2013, and of the RP book for the whole of 2012. The trading books belong to a major securities house of South Korea. For each date, we have a complete inventory of all the bonds held in each book. The raw data contains the ISIN, the long name of each bond, bond classification, fund code, fund name, amount outstanding, amount pledged as collateral, amount available for sale, profit and loss from purchase price, market value, mark-to-market yield, market price, maturity date, modified duration, convexity, duration, credit rating, accrued interest, accrued interest receivable, issue date, and coupon rate. Of these items, we extract the ISIN, amount outstanding, profit and loss from purchase price, mark-to-market yield, and modified duration.[3]

We construct a comprehensive list of all the bonds in the database. For each bond, we obtain the amount outstanding at the end of each day, and calculate the change in inventory. A negative signal for this variable indicates an actual sale taking place. In the original data files, whenever the total position in a security is sold it simply "disappears", as the end of day balance for that bond is now zero and the bond ceases to exist in the inventory. Thus the profit and loss item disappears on the day of the sale, and we have to manually adjust for the price movement on the sale date to find out if the sale is done at a gain or a loss. We obtain the bond closing yields from the Bank of Korea database, and assume the sale was done at this price. The difference between the closing yield on the date of sale the previous trading day's is calculated, and the modified duration used to find the price movement on the sale date. Table A1 shows the summary statistics for bond market moves in our sample period. The daily fluctuation in bond yields (and prices) are very small compared to equities – in years 2012 and 2013, the average moves of daily closing yields for benchmark KTBs were 1.5 bps for 1y, 2.2 bps for 3y, 2.6 bps for 10y, and 2.5bps for 20y. The maximum daily move of a benchmark KTB yield during this period was 22 basis points, or 0.22%. Even this move was caused by an unexpected rate cut by the Bank of Korea, when the central bank decided to enter an easing cycle from the tightening cycle.[4] Because the daily rate moves are relatively small, the profit and loss calculation from yield moves and modified duration is well justified. The calculated price movement on the sale date is then added to

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[3] For descriptive statistics, see Table A2 in the appendix.

[4] The Bank of Korea raised the target rate gradually from 2.00% in February 2009 to 3.25% in June 2011. The policy rate was then unchanged for 13 consecutive months, and was cut unexpectedly by 25 bps in July 2012. The decision was the start of an easing cycle in interest rates, and the target rate now stands at 1.75%, the most recent rate cut done as of March 2015.

the previous day's profit and loss, and we end up with the final profit and loss from purchase price. We also account for the effect of brokerage fees.

Insert Figure 1 about here

For example, assume a hypothetical bond A which is marked with a profit of 2,000,000 won at *t-1*. On day *t* the entire position in the bond is sold: the closing yield of bond A has moved down 2 basis points compared to *t-1*, the modified duration of bond A is 2 years, and the amount outstanding was 10 billion KRW. The profit on the day of the sale is 4,000,000 KRW (10 billion KRW x 0.0002 x 2), and adding this last day's figure to the previous day's profit of 2,000,000 won we are left with a profit of 6,000,000 won before brokerage. From this number we subtract the standard market brokerage fee of 1,000,000 won, arriving at a final figure of 5,000,000 won. The bond has been sold at a realized gain compared to its purchase price. In brokerage calculations we follow the market standard fee scheme, which charges 1,000,000 won for each 10 billion bond ticket with maturity greater than 1 year, and 500,000 won for those with maturity equal to or less than 1 year.

On each date that an actual sale takes place, each sale is labeled as a realized gain (RG) or a realized loss (RL). The remaining bonds in the inventory are aggregated by ISIN and each labeled as a paper gain (PG) or a paper loss (PL), according to the sign of its profit and loss item. The number of realized gains, realized losses, paper gains, and paper losses are summed up to calculate the proportion of gains realized (PGR) and proportion of losses realized (PRL).

$$\frac{\text{Realized Gains}}{\text{Realized Gains} + \text{Paper Gains}} = \text{Proportion of Gains Realized (PGR)} \qquad (1)$$

$$\frac{\text{Realized Losses}}{\text{Realized Losses} + \text{Paper Losses}} = \text{Proportion of Losses Realized (PLR)} \qquad (2)$$

We follow the methodology of Odean (1998) in calculating these ratios. The number of realized gains is divided by the sum of realized gains and paper gains to calculate PGR, and the same done for losses to find PLR. The resulting figures are intuitive and logical measures of the tendency to sell winners or losers, as they measure the actual number of sales done for a profit or loss compared to the total number of opportunities to do so.

In the disposition effect literature, the true point of reference can be ambiguous, as there are many candidates for it. Some possibilities are the initial purchase price, the most recent purchase price, the average purchase price, the highest purchase price, or the lowest purchase price. In this study, one possible point of reference is quite clear from the data – the system painstakingly keeps records of "profit and loss" for each ISIN, which is the money made or lost compared to the purchase price. In the case when there is only one purchase of the same ISIN, there is no difference between the initial purchase price and the average purchase price. When there are multiple purchases for a certain bond, the "profit and loss" is the combined figure from the multiple purchase points – that is, the reference will be the weighted average purchase price. So in this study, we first test for the disposition effect with the reference point as the weighted average purchase price.

We test the disposition effect in two dimensions in relation to extant literature – first, whether institutional bond investors show the disposition effect in their trading behavior and second, whether there is the year-end reverse disposition effect that is shown by individual investors. As a result of reporting and evaluation systems and their trading discipline (including stop-loss limits), we posit that institutional traders will not be prone to the disposition effect with regard to the purchase price as the reference point. Whereas Odean (1998) tests the December effect and finds that individual investors are more willing to realize losses at year-end due to tax issues, we test the March effect, which is the fiscal year-end for the institution in our sample. Again we posit that bond institutional investors will show different behavior from individuals, as they are not liable for any taxes paid by the financial firm they work for. One additional hypothesis to test, with regard to trader discipline, is that traders will cut losses when the market turns against them, and take advantage of profit-taking opportunities.

In addition to the main analysis following Odean (1998), we perform a set of OLS and logit regressions with numerous specifications. In the regressions, the dependent variable $Sale_{it}$ is defined as a dummy variable that takes a value of *1* if a sale takes place for security *i* at time *t*, and zero otherwise. The independent variables are also binary variables, which we also use to form various data subsets. The regressions are run on the total dataset and on various subsets, classified by book type (Prop vs RP), bond issuer class (KTB, MSB, Other), bond maturity (Short, Medium, and Long-term), MPC dates, and daily market moves (Negative Large, Negative, No Move, Positive, Positive Large).

Our primary model specifications are presented below, which are modified to suit each data subset.

(1) $Sale_{it} = b_0+b_1Gain_{it}+\epsilon_{it}$

(2) $Sale_{it} = b_0+b_1Gain_{it}+b_2RP_{it}+\epsilon_{it}$

(3) $Sale_{it} = b_0+b_1Gain_{it}+b_2RP_{it}+b_{3,1}KTB_i+b_{3,2}MSB_i+\epsilon_{it}$

(4) $Sale_{it} = b_0+b_1Gain_{it}+b_2RP_{it}+b_{3,1}KTB_i+b_{3,2}MSB_i+b_{4,1}Medium_{it}+b_{4,2}Long_{it}+\epsilon_{it}$

(5) $Sale_{it} = b_0+b_1Gain_{it}+b_2RP_{it}+b_{3,1}KTB_i+b_{3,2}MSB_i+b_{4,1}Medium_{it}+b_{4,2}Long_{it}+b_5MPC_{it}+\epsilon_{it}$

(6) $Sale_{it} = b_0+b_1Gain_{it}+b_2RP_{it}+b_{3,1}KTB_i+b_{3,2}MSB_i+b_{4,1}Medium_{it}+b_{4,2}Long_{it}+b_5MPC_{it}$

$+b_{6,1}NegL_{it}+b_{6,2}Neg_{it}+b_{6,3}Pos_{it}+b_{6,4}PosL_{it}+\epsilon_{it},$

All independent variables are binary. The variable $Gain_{it}$ takes a value of 1 if security *i* is at a gain from its weighted average purchase price at time *t* and 0 otherwise. RP_{it} takes a value of 1 if security *i* belongs to the RP book at time *t* and 0 if it belongs to the Prop book. KTB_i takes a value of 1 if the security is a Korea Treasury Bond and 0 otherwise, and MSB_i is similarly defined for Monetary Stabilization bonds. We drop the subscript *t* for these two variables, as bond type does not change with time. Bonds which are neither KTB nor MSB belong to the Other category, which is the omitted variable in the regressions. Bonds are classified as short, medium, or long according to their maturity – consistent with prior specifications in this paper, short-term bonds are those with maturities less than 2 years, medium-term bonds have maturities between 2~5 years, and long-term bonds have maturities longer than 5 years. The dummy variables $Medium_{it}$ and $Long_{it}$ take a value of 1 if security *i* belongs to the respective category at time *t* and 0 otherwise, short-term maturity being the omitted category.

MPC_{it} takes a value of 1 if the observation falls within a week before the MPC date, and 0 otherwise. $NegL_{it}$, Neg_{it}, Pos_{it}, and $PosL_{it}$ are variables related to daily yield moves of each security – $NegL_{it}$ takes a value of 1 if the yield move for security *i* is +2bps or larger at time *t*, Neg_{it} takes a value of 1 if the yield move is between 0~+2bps, Pos_{it} takes a value of 1 if the yield move is between 0~-2bps, and $PosL_{it}$ takes a value of 1 if the yield move is more negative than -2bps. Observations on days when the yield move is 0 is classified into the No Move category, which is the omitted class in the regressions.

B. Hypotheses

We test the following set of hypotheses in this study.

HYPOTHESIS 1: Institutional bond traders do not show the disposition effect.

HYPOTHESIS 2: Institutional bond traders do not show the end-of-year effect.

HYPOTHESIS 3: Institutional bond traders will cut more losses on losing days and sell more winning investments on winning days.

To elaborate, Hypothesis 1 tests that the proportion of gains realized is not greater than the proportion of losses realized (for the entire year). This is a direct test of the disposition effect as popularly documented in individual investor behavior, to see if it exists in the institutional investor counterpart. We posit that institutional investors will not show the disposition effect with the purchase price as the reference point.

Hypothesis 2 tests that PLR-PGR in March is not greater than PLR-PGR in April - February. Odean (1998) documents that individual investors show the disposition effect except for in the month of December, which he points to tax issues as a possible explanation. At the end of the year, to realize capital losses and receive tax related benefits, individuals tend to sell more of their losing investments, which is a phenomenon that is opposite of what they show in other months of the year. With regard to institutional investors, we posit that this "reverse-disposition effect" will not be visible in our sample of bond traders, as they are not responsible for any taxes paid by the firm and hence are indifferent to these issues. In our sample, the fiscal year-end is the month of March, and accordingly we test this month instead of December.

Hypothesis 3 tests if PGR is higher than PLR on winning days (when interest rates move down and bond prices rise) and if PLR is higher than PGR on losing days (when interest rates move up and bond prices fall). In the trading profession, controlling losses is of utmost importance. There are explicit loss limits to be observed, and traders are disciplined to unwind their positions if they reach a certain amount of losses, or if they see further losses ahead. As the celebrated fund manager Peter Lynch puts it, "In this business if you're good, you're right six times out of ten. You're never going to be right nine times out of ten." Therefore, we posit that when market falls, traders will sell their losing positions. On the other side of the coin, we posit that bond traders will "cash in" on their winning positions on days when bond prices rise.

C. Results

C.1. Results for Entire Sample

PGR and PLR ratios for the entire year, for March, and for April through February are reported in Table I. Contrary to the results of Odean's (1998) analysis of individual investors, we do not find any evidence of the disposition effect in our sample of institutional bond traders with respect to the purchase price. Rather, for the entire dataset, the test statistic is in strong favor of the opposite phenomenon – the traders in our sample have a pronounced tendency to sell a larger proportion of their losing investments and hold on to the winners, as can be seen from the large negative t-statistic of -11.1.

The null of the second hypothesis is also rejected – the traders in our sample do not sell a larger proportion of their losing investments at the end of the year, which is March for the financial institution. Again, the results for institutional investors are the opposite of individual investors who show a tendency to realize more of their losing investments at the end of the year, possibly due to tax issues. The tax theory explains the difference in individuals and institutions, as the traders in our sample are not responsible for any taxes paid by the institution and have no incentive to reduce corporate taxes.

An additional factor may be liquidity issues – on dates such as month-end, quarter-end and year-end, market liquidity in cash can dry up very quickly. The status of institutions on these dates must be made public through various financial reports, and it is the norm for financial firms to plan ahead for these dates and try to adhere to the plans as tightly as possible. The size and number of trades are kept to a minimum near these dates, and trades requiring the use of year-end cash are at the top of the list of trades to be avoided. Scarcity of cash can cause market borrowing rates to soar, and bond traders are very sensitive to moves in cash rates as bond notionals are large and even a small move in funding rates can substantially affect the profitability of the portfolio. Thus, when traders are selling near year-end to secure cash, they may resort to selling more of their winning investments as these will usually be sold at a higher price than their losing investments.

Insert Table I about here

Excluding the fiscal year-end month of March from the dataset, we have a larger test statistic rejecting the first null hypothesis for the months of April through February. The data shows no support for the existence of the disposition effect in institutional bond traders with the weighted average purchase price as the reference point.

In addition to the main analysis, we test alternative specifications, namely with OLS and logit models. The results of OLS regressions are presented in Table II, and results for logit regressions can be found in the Appendix (Table A8). Table II shows that OLS regressions yield qualitatively similar results to the main PGR/PLR analysis – the coefficient for the independent variable *Gain* is negative, and survives the addition of a cohort of control variables and maintains its significance. The figures double-confirm that institutional investors are not inclined to sell more of their winning investments.

On the contrary, the tendency to sell a certain security decreases with being “in-the-money”, showing that the bond traders in our sample differ from individual investors who are prone to the disposition effect.

Insert Table II about here

C.2. Results by Book Type

We segregate the results by book type to see if the above phenomenon holds for both the Proprietary trading account and the RP account. Table III shows the results by book type, and again we find no support for the existence of the disposition effect in either of the trading books. Although we fail to reject the null hypothesis for the proprietary trading book, the t-statistic does not point in the opposite direction. That is, we cannot say that there is evidence of the disposition effect, but neither can we argue in favor of the contrary. For the RP book, the picture is clearer – the results support the existence of a reverse disposition effect, consistent with the statistics for entire dataset. The March effect (which is the opposite of the December effect in individuals) is prominent in the Proprietary trading account, whereas it is more muted in the RP account.

Insert Table III about here

We supplement the results with OLS and logit regressions. Tables IV and V show the results of OLS regressions for the Proprietary and RP trading books, respectively. Again we see evidence in line with our primary analysis. For the Proprietary trading book, the coefficients for the variable *Gain* are statistically insignificant, but are mostly negative. For the RP book, we see evidence of a reverse disposition effect – the coefficients for *Gain* are negative and significant for all model specifications. Logit regressions also yield similar results, which are shown in the Appendix (Table A9 and Table A10). We run a simple model with the independent variable Gain for the Prop and RP books, and graph the predicted probability of *Sale* of the logit regression in Table VI. The graph shows that the probability of sale for increases with gains for the Prop book, but decreases with gains for the RP book, which are in line with previous results.

Insert Table IV about here

Insert Table V about here

Insert Table VI about here

From the analysis of book types, we can relate to the literature on delegation of blame and the disposition effect. The reverse-disposition effect shows up more clearly in the RP book, but is not so evident in the Proprietary trading book. From the perspective of delegation of blame and cognitive dissonance (Chang et al., 2015), we can infer that it is easier for the RP book trader to delegate blame to the customers who are responsible for making investment decisions in the RP account. On the other hand, the proprietary trader is solely accountable for the Proprietary book. It is less easy to blame another party for the bad investment decision (losses), and cut the losing investments. This shows up in the less powerful results for the propensity to realize losses in the Proprietary trading book compared to the RP book.

Looking at the year-end effect in more detail, our data shows that the ratio of PGR to PLR for each month *increases* as we approach the fiscal year-end of March. This is exactly the reverse pattern shown by individual investors in the study of Odean (1998) for the year-end month of December. This points to a clear difference between individual investors and institutional investors.

Insert Figure 2 about here

C.3. Other Tests with Purchase Price as the Reference Point

Is it possible that our results are influenced by a certain bond class? We test for this possibility by repeating the above analysis for different bond classes – KTBs, MSBs, and Others. The results are presented in Table VII. The evidence again supports our hypothesis that bond institutional investors do not show the disposition effect in regard to the purchase price, and that there is no year-end effect. Panel A shows statistics by simple breakdown into the three different bond classes. The KTB and Other classes show higher PLR than PGR ratios. Even in the MSB class where the PGR ratio is higher, the difference in proportions is statistically insignificant and does not support the disposition effect. Panel B shows results by bond class and book type, again showing no signs of the disposition effect in the investors of our sample. Panel C shows the tests for Hypothesis 2 by bond class. We find no evidence of year-end tax related selling in any of the bond classes.

Insert Table VII about here

We undertake alternative analyses on each bond category, and find that the results tie with the primary methodology. For the KTB and Other classes, the coefficients for *Gain* are negative and significant. For the MPC class, even though the coefficients lack statistical significance, they are all negative, lending support to the absence of the disposition effect. The results of OLS regressions for each bond class are shown in Table VIII, Table IX, and Table X. The results for logit regressions are qualitatively similar, and the tables are presented in the Appendix (Table A11, Table A12, and Table A13).

Insert Table VIII about here

Insert Table IX about here

Insert Table X about here

We perform another robustness test to check that our results hold for bonds of different maturities. The maturities of all bonds are calculated for all dates in the sample, and segregated into 3 classes according to their remaining time to maturity. We take the conventional market classifications of short-term (2 years and under), medium-term (2 to 5 years), and long-term (over 5 years). The results are shown in Table XI. Our expectations for Hypothesis 1 and 2 both hold for all specifications, except for the short-term bonds for March. PLR is much higher than PGR for this subset of bonds, however rather than viewing this as evidence for year-end tax related selling, we interpret it as a strong proof against the disposition effect, as we already mentioned that corporate taxes are no concern for the bond trader.

Insert Table XI about here

OLS regressions results for bond subsets of various maturities are presented in Table XII, Table XIII and Table XIV. The implications are mostly in line with the PGR/PLR methodology, with the exception of loss of significance of the *Gain* variable in the subset of long-term bonds. However, all figures point to a negative relation between the sale of a security and its gain, again lending support to the hypothesis that institutional bond traders do not show the disposition effect. The logit regression counterparts are in the Appendix (Table A14, Table A15 and Table A16).

Insert Table XII about here

Insert Table XIII about here

Insert Table XIV about here

The policy rate of South Korea is determined by the Bank of Korea in its monthly Monetary Policy Committee meetings. We test for the differences in PGR and PLR in the week preceding these MPC meetings (the MPC meeting date itself is excluded, as rate decisions are usually announced before 10 a.m.), since this period is when portfolio adjustment will be most active. As an alternative specification, we test for the two-week period as well. The results are presented in the Table XV. For both specifications we find no evidence of the disposition effect in regard to the purchase price. The opposite phenomenon that institutional investors have a tendency to sell more of their losing investments are strongly supported by the results for the RP book. This picture is supported with the predicted probability of *Sale* of the logit regression in the Appendix (Table A25). For both non-MPC and MPC dates, the probability of the sale of a security decreases with gains.

Insert Table XV about here

OLS regressions with Sale as the binary dependent variable provide additional evidence of the lack of a disposition effect in the institutional investors of our sample. Although the results are not conclusive in proposing a reverse disposition effect, the regression coefficients indicate a negative relationship between the sale and gains of a certain security. We present the results in Table XVI and Table XVII, and the logit counterparts in the Appendix (Table A17 and Table A18).

Insert Table XVI about here

Insert Table XVII about here

C.4. Results by Market Move

We test for the disposition effect with respect to the purchase price according to daily market moves. We test this specification because daily mark-to-market is mandatory for the institutional trader and reporting of daily profit and loss is a core routine. We test whether this routine affects the propensities to sell winning or losing investments in any meaningful degree. This is particularly relevant to testing hypothesis 3, which is strongly related with trader discipline. We use the 3-year benchmark KTB yield as a proxy for market moves, as it is the representative rate of the South Korean rates market. Days when the KTB yield moves down (up), prices go up (down), so these are classified as positive (negative) days. We use the yield instead of price because this eliminates the need to adjust for coupon payments.

Insert Table XVIII about here

The results of the preliminary analysis are shown in Panel A of Table XVIII. Most of the statistics seem to support our hypotheses 1 and 2, except for the prominent difference in the Proprietary book on positive days. To further investigate the cause of this phenomenon, we divide the positive days into high and low move days by the median yield move and repeat the analysis for the Proprietary book. As can be seen in Panel B of table XVIII, on days when the positive moves are low (2 basis points or less), the PGR and PLR ratios are not significantly different. However, on days when the positive moves are high (more than 2 basis points), the PGR ratio is significantly larger than the PLR ratio. This aspect is in line with Kaustia (2010b), who finds that the tendency to sell winning stocks can be increasing in the domain of gains. This suggests that institutional traders, at least for those who are at complete discretion about their trading decisions, are highly affected by daily moves in prices, and supports hypothesis 3.

We extend the analysis to negative days and to the RP book, and find that only the Proprietary trading book shows the disposition effect on positive days and the reverse disposition effect on negative days, and this tendency is pronounced when the absolute movement in the market benchmark rate is higher than the median. We find no such pattern in the RP books. The figures are presented in Panel C of Table XVIII. Overall, the breakdown by market move only partly supports our set of hypotheses.

For the total dataset, Negative high days account for 13% of observations, Negative low days 26%, No Move days 19%, Positive low days 26%, and Positive high days 16%. More than 70% of our observations lie within the middle three categories, with the two extremes accounting for less than 30%.

We break down the dataset into five categories according to daily market move and run OLS and logit regressions to check the disposition effect in further detail. Both sets of regression results show all but negative days exhibit a reverse disposition effect. Although there is a loss of significance in the coefficient for the independent variable *Gain* on the dependent variable *Sale*, the relationship is still negative and lends support for our set of hypotheses. OLS regression results are presented in Tables A3~A7, and logit regression results are shown in Tables A19~A23.

C.5. Testing the Daily Profit and Loss as an Alternate Reference Point

Our results so far seem to be quite robust in ruling out the existence of the disposition effect in the institutional traders of our sample in regard to the purchase price. However, we observe a pattern in PGR/PLR ratios by sign and size of daily market benchmark move which seems to suggest that daily profits and losses affect selling decisions made by the traders in our sample. It is possible that trader training and discipline emphasizing daily profit and loss reporting routines has changed the framing methodology in institutional traders, merely substituting one reference point for another. To verify this argument, we now test for the disposition effect with the reference point as previous day's closing prices.

Insert Table XIX about here

We again calculate daily profits and losses using daily yield changes and modified duration, as this saves us from complicated adjustments for coupon payments. The PGR and PLR ratios using previous day's closing yields are presented in Table XIX. We extend the horizon to 10 days prior to the selling date, to see if any other recent closing prices affect trader selling decisions. Contrary to the projection that institutional trader training has merely substituted one type of disposition effect for another, the results show that our institutional traders do not show the disposition effect even when tested against previous day's (or other recent dates') closing prices. For a more graphic description, the PGR/PLR ratios for each time frame is plotted in Figure 3.

Insert Figure3 about here

C.6. Results Summary

We summarize the key results of our various analyses in Table XX. Panel A presents the results of our primary analysis methodology by PGR and PLR by various classifications, and Panel B shows the coefficients for OLS and Logit regressions. We show if each dataset shows any signs of the DE and its statistical significance.

Insert Table XX about here

V. DISCUSSION

Our results strongly support the view that institutional investors are materially different from individual investors in regard to the disposition effect. Why is the disposition effect found in individual investors but not in institutional investors? We propose that the root cause is in trader discipline and performance monitoring of financial institutions, which works to mitigate aversion to loss realization and reference dependence (and therefore mental accounting).

A. Reference Dependence

Each trader is required to report on a daily basis the risk she is running and the mark-to-market profit and loss. Neither the trader nor the manager is interested in trade level performance, and all reporting is done on portfolio level. Also, the sheer number of trades that institutional traders are involved in makes it quite impossible to remember the reference points for each security. Of course, the detailed data exists in the IT system, but as can be seen from our study the availability of such data does not seem to influence the institutional investor to any meaningful degree. Systematically, the individual investor necessarily performs both the trading function (front office) and the reconciliation function (back office), which are roles assigned to different personnel in a financial institution. The segregation of roles provides the institutional trader additional protection from the disposition effect in regard to the purchase price.

Even if the reference dependence on purchase price is thus eliminated, it may be argued that the trader discipline which stresses daily profits will merely act to "reset" the reference points on a daily basis. We explore this possibility but find that the previous closing price, probably the strongest in the list of possible alternate reference points, do not give rise to the disposition effect in institutional traders. We find this to be a strong case for systematic training weakening reference dependence, and therefore removing the disposition effect.

B. Loss Realization

While past performance does matter, present and future performance matters much more. Often mulling on past prices and thinking of what "could have been" will be detrimental in making the correct decisions. Any good trader will train his junior to view losses as something that cannot be avoided completely, but which has to be kept under control. In the disposition effect literature we see that the winning investments continue to outperform and the losing ones continue to underperform, and that the disposition effect hinders individuals from being successful in their investments. Assuming this phenomenon to hold for the bond market as well, traders who show the disposition effect will have a difficult time surviving. There may also be a learning curve effect from the pure amount of trades the institutional investors are involved in, and both direct and indirect learning since the risk profiles and performance of other traders in the institution are not kept secret. Removing the behavioral bias of aversion to loss realization seems to be a key to successful trading activity.

C. Implications for Market Efficiency

The process of verifying that institutional investors are not prey to irrational behavioral bias has import for the whole market. Although individual investors are by far the larger in number, institutional traders are responsible for most of the meaningful action in the market. Institutional investor rationality therefore may weigh much more on the efficiency of the financial markets than individual investor irrationality.

Also, our discovery that institutional investors are not prone to the disposition effect suggests that individual investors can avoid their losses from suboptimal trading behavior by entrusting their investment decisions to institutional traders. This is especially true for the bond market, where the standard ticket size in the market is too large for the individual to handle. The individual will benefit in many aspects such as diversity of investment portfolio, narrower bid/offers, and lower brokerage fees, by investing in a professionally managed portfolio compared to constructing his own.

Our results show that even institutional traders are not completely free from factors that affect individual investor behavior, and that delegation of blame has an effect on institutional traders as well. However, when handling investor accounts this works to strengthen the reverse disposition effect, and even in proprietary trading books we do not find any evidence of the disposition effect.

D. Implications for Individual Investors

The characteristics of institutional investors mentioned above are hardly likely to be found in individual investors. The perspective of the individual investor is completely different from that of the institutional counterpart – the number of securities that an individual investor trades is smaller, the measure of risk is likely to be the amount invested in each security (as opposed to the price sensitivity of the total investment portfolio), external feedback on past performance is likely to be minimal or nonexistent, and learning from past failures related to the disposition effect will be limited.

However individual investors do not need to despair – after all, institutional investors weren't born into the job. We believe training can eliminate the reference dependence and aversion to loss realization in individuals. A study by Feng and Seasholes (2005) finds that individual investors can reduce or even eliminate the disposition effect by a combination of sophistication and experience. To these two factors that constitute the learning effect, we would like to add framing as a powerful complement. Framing of the investment routine should be done as such that the investor does not perceive trading performance as a function of past decisions. Learning from the institutional trader framework, risk should be measured in units such as delta that do not associate with the past or discriminate different securities. The monitoring system should be setup so that the first thing that the investor sees is the portfolio level risk and profits (or losses), and numbers for individual securities positioned where they attract less attention. The power of framing is also supported by the research of Kumar and Lim (2008), where they find that wide framing (clustered trades) results in lower disposition effects than narrow framing (single security trades) in individual investors.

VI. CONCLUSION

We examine the daily trading records of the bond RP and proprietary trading books of a major financial firm of South Korea, and find little evidence of the disposition effect with regard to the purchase price or the previous closing price. There are a few exceptions by monthly breakdown (for the fiscal year-end month of March), by market move breakdown (for positive days in the Proprietary trading account), and by bond breakdown (MSBs). However, the general picture remains consistent in ruling out the existence of the disposition effect in our sample of institutional traders. We posit that this absence is from trader discipline and performance management, that mitigates much of the reference dependence and aversion to loss realization common in individual investor behavior.

In most markets, institutional investors are few in number, but account for a large part of the market volume. Our discovery has implications for market efficiency in that even if individuals are susceptible to behavioral biases, this should not harm market efficiency to a great degree if institutional traders are rational. We do not limit this phenomenon to South Korea's bond markets only – South Korea is a globalized market and trader behavior should be homogeneous in this globalized era.

Another contribution of this study is that it tests a reference point hitherto unexplored – the daily mark-to-market profits or the previous trading session's closing prices. However, we realize that this is one of many possible reference points, and alternate specifications could be tested in future research.

Figure 1
KTB Benchmark Yields, 2012~2013

The graph shows daily closing yields for 1 year, 3 year, 10 year, and 20 year benchmark Korea Treasury Bonds. The maximum daily move during this period is 22 basis points, or 0.22%.

Figure 2
PGR/PLR Ratios by Month

For our sample, the PGR/PLR ratio averages 0.4 (left), which is a stark contrast to the figure of 1.5 shown by individuals in Odean's study of 1998 (right). The ratio also *increases* as it approaches year-end, which is also the exact opposite of the phenomenon seen in the mentioned paper.

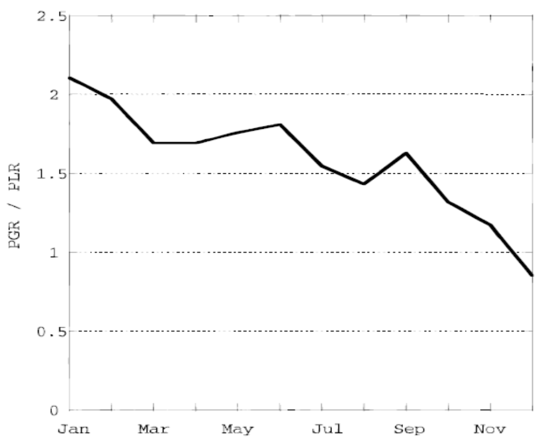

Figure 3
PGR/PLR Ratios with Previous Closing Prices

For both the Proprietary and RP books, the PGR/PLR ratios with the reference point as t-1 to t-10's closing prices are shown. Both books do not show any signs of the disposition effect with the new reference point.

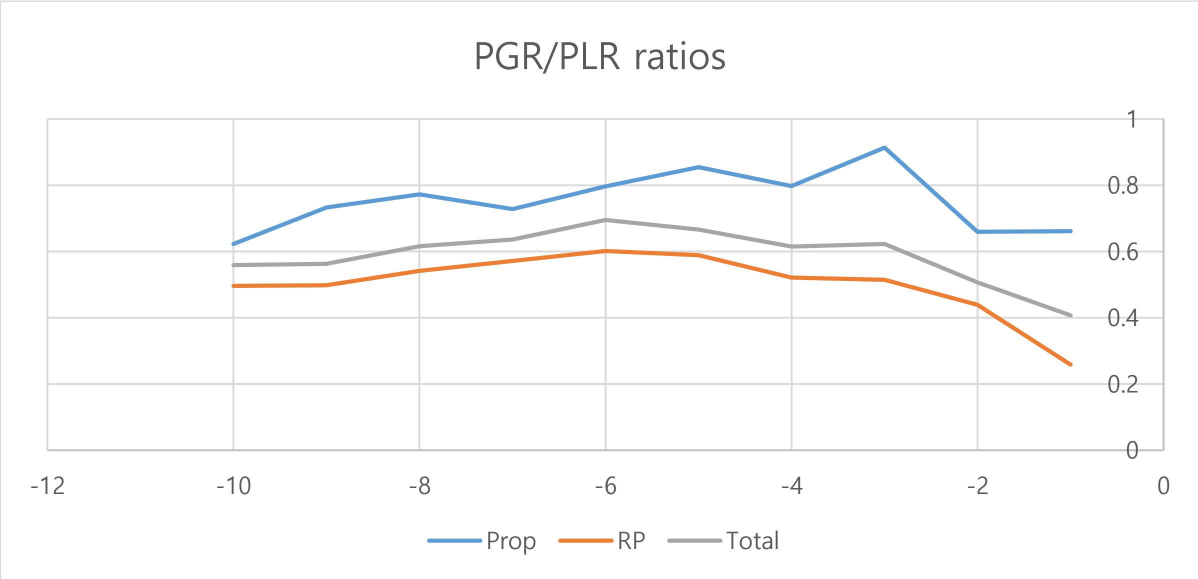

Table I

PGR and PLR for the Entire Data Set

This table shows the aggregate PGR (Proportion of Gains Realized) and PLR (Proportion of Losses Realized) for the entire data set. PGR is the number of realized gains divided by the sum of realized gains and paper (unrealized) gains, and PLR is the number of realized losses divided by the sum of realized losses and paper losses. The data is from the period of October 2012 to December 2013 for the prop book, and for the entire 2012 for the RP book. The t-statistic tests the null hypothesis that PGR is equal to PLR.[5] *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Entire Year		March		Apr-Feb	
PGR	0.031		0.066		0.029	
PLR	0.091		0.046		0.118	
Difference in Proportions	-0.060		0.019		-0.089	
t-statistic	-11.1	***	1.7	**	-11.8	***

[5] The standard error for the difference in PGR and PLR is calculated from the below equation:

$$\sqrt{\frac{\mathrm{PGR}(1-\mathrm{PGR})}{n_{rg}+n_{pg}}+\frac{\mathrm{PLR}(1-\mathrm{PLR})}{n_{rl}+n_{pl}}}$$

where n_{rg}, n_{pg}, n_{rl}, and n_{pl} are number of realized gains, number of paper gains, number of realized losses, and number of paper losses respectively.

Table II
Disposition Effect OLS Regressions: Total Data

This table shows the results of various OLS regression models on the potential sale of securities for the total dataset. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + b_5MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + b_5MPC_{it} + b_{6,1}NegL_{it} + b_{6,2}Neg_{it} + b_{6,3}Pos_{it} + b_{6,4}PosL_{it} + \epsilon_{it,}$ for security *i* at time *t*. All independent variables are binary. *Gain* takes a value of 1 if the security is at a gain from its weighted average purchase price and 0 otherwise. *RP* takes a value of 1 if the security belongs to the RP book and 0 if it belongs to the Prop book. *KTB* takes a value of 1 if the security is a Korea Treasury Bond and 0 otherwise, and *MSB* is similarly defined for Monetary Stabilization bonds. Bonds are classified as short, medium, or long according to their maturity – consistent with prior specifications in this paper, short-term bonds are those with maturities less than 2 years, medium-term bonds have maturities between 2~5 years, and long-term bonds have maturities longer than 5 years. The dummy variables *Medium* and *Long* take a value of 1 if security *i* belongs to the respective category at time *t* and 0 otherwise, short-term maturity being the omitted category. *MPC* takes a value of 1 if the observation falls within a week before the MPC date, and 0 otherwise. NegL, Neg, Pos, and PosL are variables related to daily yield moves of each security – NegL takes a value of 1 if the yield move is +2bps or larger, Neg takes a value of 1 if the yield move is between 0~+2bps, Pos takes a value of 1 if the yield move is between 0~-2bps, and PosL takes a value of 1 if the yield move is more negative than -2bps. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Gain	-0.0322	***	-0.0201	***	-0.0170	***	-0.0159	***	-0.0165	***	-0.0168	***
	(0.0019)		(0.0020)		(0.0019)		(0.0019)		(0.0019)		(0.0019)	
RP			-0.0751	***	-0.0102	***	-0.0133	***	-0.0132	***	-0.0144	***
			(0.0028)		(0.0029)		(0.0030)		(0.0030)		(0.0030)	
KTB					0.2754	***	0.2780	***	0.2781	***	0.2771	***
					(0.0057)		(0.0057)		(0.0057)		(0.0057)	
MSB					0.1546	***	0.1470	***	0.1469	***	0.1464	***
					(0.0061)		(0.0062)		(0.0062)		(0.0062)	
Other					Omitted		Omitted		Omitted		Omitted	
Short							Omitted		Omitted		Omitted	
Medium							-0.0134	***	-0.0133	***	-0.0146	***
							(0.0014)		(0.0014)		(0.0014)	
Long							-0.0086		-0.00856		-0.0097	*
							(0.0054)		(0.0054)		(0.0054)	
MPC									0.00975	***	0.0100	***
									(0.0016)		(0.0016)	
Negative Large											0.0086	***
											(0.0026)	
Negative											0.0113	***
											(0.0023)	
No Move											Omitted	
Positive											0.0077	***
											(0.0022)	
Positive Large											0.0145	***
											(0.0023)	
Intercept	0.0478	***	0.1072	***	0.0376	***	0.0463	***	0.0443	***	0.0374	***
	(0.0018)		(0.0028)		(0.0030)		(0.0031)		(0.0032)		(0.0035)	
Adj. R^2	0.0069		0.0252		0.0887		0.0907		0.0915		0.0924	
N	39391		39391		39391		39391		39391		39391	

Table III
PGR and PLR by Book Type

This table shows the aggregate PGR (Proportion of Gains Realized) and PLR (Proportion of Losses Realized) for the Proprietary and RP trading books. PGR is the number of realized gains divided by the sum of realized gains and paper (unrealized) gains, and PLR is the number of realized losses divided by the sum of realized losses and paper losses. The data is from the period of October 2012 to December 2013 for the Prop book, and for the entire 2012 for the RP book. The t-statistic tests the null hypothesis that PGR is equal to PLR. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Entire Year		March		Apr-Feb	
Prop book PGR	0.170		0.181		0.168	
Prop book PLR	0.177		0.000		0.177	
Difference in Proportions	-0.007		0.181		-0.009	
t-statistic	-0.4		5.6	***	-0.5	
RP book PGR	0.021		0.037		0.020	
RP book PLR	0.068		0.046		0.088	
Difference in Proportions	-0.047		-0.009		-0.068	
t-statistic	-8.9	***	-0.9		-8.4	***

Table IV
Disposition Effect OLS Regressions: Prop Book

This table shows the results of various OLS regression models on the potential sale of securities. The analysis focuses on a subset of our data, which are the trades in the Proprietary trading book. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1Gain_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1Gain_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1Gain_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1Gain_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + b_5MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1Gain_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + b_5MPC_{it} + b_{6,1}NegL_{it} + b_{6,2}Neg_{it} + b_{6,3}Pos_{it} + b_{6,4}PosL_{it} + \epsilon_{it,}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2	Model 3		Model 4		Model 5		Model 6	
Gain	0.0100			-0.0100		-0.0103		-0.0096		-0.0110	
	(0.0108)			(0.0098)		(0.0098)		(0.0098)		(0.0101)	
KTB				0.2990	***	0.2958	***	0.2954	***	0.2942	***
				(0.0124)		(0.0132)		(0.0132)		(0.0134)	
MSB				0.2440	***	0.2391	***	0.2388	***	0.2388	***
				(0.0172)		(0.0192)		(0.0192)		(0.0192)	
Other				Omitted		Omitted		Omitted		Omitted	
Short						Omitted		Omitted		Omitted	
Medium						-0.0070		-0.0070		-0.0075	
						(0.0120)		(0.0120)		(0.0120)	
Long						0.0341		0.0345		0.0336	
						(0.0364)		(0.0364)		(0.0364)	
MPC								-0.00914		-0.0090	
								(0.0117)		(0.0118)	
Negative Large										0.0114	
										(0.0161)	
Negative										0.0351	**
										(0.0154)	
No Move										Omitted	
Positive										0.0306	**
										(0.0145)	
Positive Large										0.0355	**
										(0.0156)	
Intercept	0.0908	***		0.0211	***	0.0262	**	0.0279	**	0.0069	
	(0.0080)			(0.0077)		(0.0113)		(0.0115)		(0.0146)	
Adj. R2	-0.0001			0.1867		0.1867		0.1865		0.1878	
N	2992			2992		2992		2992		2992	

Table V
Disposition Effect OLS Regressions: RP Book

This table shows the results of various OLS regression models on the potential sale of securities. The analysis focuses on a subset of our data, which are the trades in the RP book. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it},$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2	Model 3		Model 4		Model 5		Model 6	
Gain	-0.0252	***		-0.0215	***	-0.0203	***	-0.0210	***	-0.0213	***
	(0.0018)			(0.0018)		(0.0018)		(0.0018)		(0.0018)	
KTB				0.2117	***	0.2158	***	0.2156	***	0.2151	***
				(0.0115)		(0.0115)		(0.0115)		(0.0115)	
MSB				0.0715	***	0.0659	***	0.06522	***	0.0652	***
				(0.0075)		(0.0075)		(0.0075)		(0.0075)	
Other				Omitted		Omitted		Omitted		Omitted	
Short						Omitted		Omitted		Omitted	
Medium						-0.0129	***	-0.0128	***	-0.0141	***
						(0.0013)		(0.0013)		(0.0013)	
Long						-0.0125	**	-0.0123	**	-0.0134	***
						(0.0049)		(0.0049)		(0.0049)	
MPC								0.01151	***	0.0118	***
								(0.0015)		(0.0015)	
Negative Large										0.0078	***
										(0.0024)	
Negative										0.0085	***
										(0.0021)	
No Move										Omitted	
Positive										0.0051	***
										(0.0020)	
Positive Large										0.0119	***
										(0.0021)	
Intercept	0.0364	***		0.0321	***	0.0373	***	0.0351	***	0.0290	***
	(0.0017)			(0.0077)		(0.0113)		(0.0018)		(0.0023)	
Adj. R2	0.0052			0.0166		0.0194		0.0210		0.0219	
N	36399			36399		36399		36399		36399	

Table VI
The Disposition Effect: Interaction Models – Gain*RP

This table shows the results of OLS and Logit regressions with *Sale* as the dependent variable and *Gain*, *RP*, and the interaction term *Gain*RP* as independent variables. Panel A shows OLS regression results, and Panel B shows logit regression results for the same model specifications. Panel C shows the predicted probabilities of the dependent variable *Sale* for the Prop and RP books, from the logit regression. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Panel A: OLS	Prop		RP		Total	
Gain	0.0100		-0.0252	***	0.0100	*
	(0.0108)		(0.0018)		(0.0052)	
RP					-0.0544	***
					(0.0043)	
Gain*RP					-0.03513	***
					(0.0056)	
Constant	0.0908	***	0.0364	***	0.0908	***
	(0.0080)		(0.0017)		(0.0038)	
Adj.R^2	0.0003		0.0053		0.0262	
Observations	2992		36399		39389	

Panel B: Logit	Prop		RP		Total	
Gain	0.115		-1.2021	***	0.1154	
	(0.1251)		(0.0918)		(0.1251)	
RP					-0.9727	***
					(0.1201)	
Gain*RP					-1.3174	***
					(0.1552)	
Constant	-2.3034	***	-3.2760	***	-2.3034	***
	(0.0942)		(0.0745)		(0.0942)	
R^2	0.0003		0.0040		0.0168	
Observations	2992		36399		39391	

Panel C: Predicted Probability of *Sale*

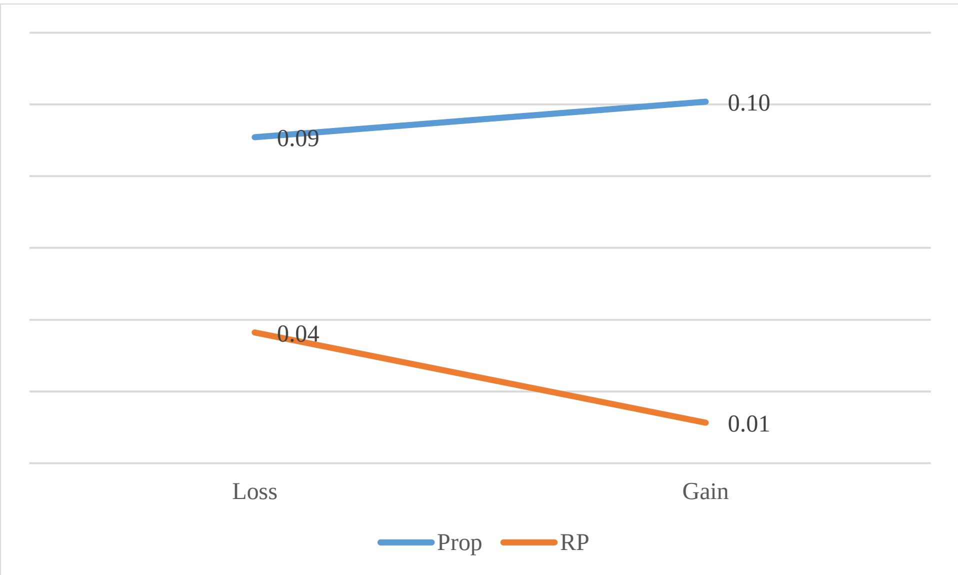

Table VII
PGR and PLR by Bond Class

This table shows the PGR (Proportion of Gains Realized) and PLR (Proportion of Losses Realized) for bonds classified into KTB, MSB, and Other. PGR is the number of realized gains divided by the sum of realized gains and paper (unrealized) gains, and PLR is the number of realized losses divided by the sum of realized losses and paper losses. The data is from the period of October 2012 to December 2013 for the Prop book, and for the entire 2012 for the RP book. The t-statistics test the null hypothesis that PGR and PLR ratios are equal. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Panel A: PGR and PLR ratios by Bond Class						
	KTB		MSB		Others	
PGR	0.393		0.418		0.025	
PLR	0.485		0.381		0.065	
Difference in Proportions	-0.092		0.037		-0.040	
t-statistic	-1.6	*	0.4		-7.3	***

Panel B: PGR and PLR ratios by Bond Class and Book Type						
	KTB		MSB		Others	
Prop book PGR	0.402		0.439		0.124	
Prop book PLR	0.480		0.424		0.115	
Difference in Proportions	-0.078		0.015		0.008	
t-statistic	-1.3	*	0.1		0.2	
RP book PGR	0.143		0.308		0.024	
RP book PLR	0.571		0.333		0.063	
Difference in Proportions	-0.429		-0.026		-0.040	
t-statistic	-1.9	*	-0.2		-7.3	***

Panel C: PGR and PLR ratios by Bond Class and Period						
	Entire Year		March		Apr-Feb	
KTB PGR	0.393		0.364		0.395	
KTB PLR	0.485		0.500		0.484	
Difference in Proportions	-0.092		-0.136		-0.090	
t-statistic	-1.6	*	-0.4		-1.6	*
MSB PGR	0.418		0.429		0.025	
MSB PLR	0.381		N/A		0.065	
Difference in Proportions	0.037		N/A		-0.040	
t-statistic	0.4		N/A		-7.3	***
Other PGR	0.025		0.050		0.024	
Other PLR	0.065		0.042		0.090	
Difference in Proportions	-0.040		0.008		-0.067	
t-statistic	-7.3	***	0.8		-7.5	***

Table VIII
Disposition Effect OLS Regressions: KTBs

This table shows the results of various OLS regression models on the potential sale of securities. The analysis focuses on a subset of our data, which are bonds belonging to the Korea Treasury Bonds (KTBs) category. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it,}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3	Model 4		Model 5		Model 6	
Gain	-0.0832	**	-0.0851	**		-0.0832	**	-0.0784	**	-0.0787	**
	(0.0356)		(0.0355)			(0.0359)		(0.0359)		(0.0382)	
RP			-0.0858	*		-0.0750		-0.0715		-0.0710	
			(0.0477)			(0.0484)		(0.0483)		(0.0483)	
Short						Omitted		Omitted		Omitted	
Medium						0.0892		0.0897		0.0943	*
						(0.0556)		(0.0555)		(0.0555)	
Long						0.1208	*	0.1220	*	0.1253	*
						(0.0725)		(0.0723)		(0.0724)	
MPC								-0.0820	*	-0.0795	*
								(0.0428)		(0.0429)	
Negative Large										0.0815	
										(0.0590)	
Negative										0.1277	**
										(0.0648)	
No Move										Omitted	
Positive										0.0802	
										(0.0622)	
Positive Large										0.0945	*
										(0.0573)	
Intercept	0.3516	***	0.3661	***		0.2807	***	0.2937	***	0.2087	***
	(0.0277)		(0.0288)			(0.0590)		(0.0593)		(0.0757)	
Adj. R2	0.0064		0.0096			0.0114		0.0152		0.0156	
N	694		694			694		694		694	

Table IX
Disposition Effect OLS Regressions: MSBs

This table shows the results of various OLS regression models on the potential sale of securities. The analysis focuses on a subset of our data, which are bonds belonging to the Monetary Stabilization Bonds (MSBs) category. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_5 MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_5 MPC_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it,}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table II. In addition to the bonds category, the maturity variables are not included in the regressions, as MSBs are short-term by definition (MSBs can only be issued up to 2 years). Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3	Model 4	Model 5		Model 6	
Gain	0.0345		-0.0050				-0.0037		-0.0076	
	(0.0334)		(0.0337)				(0.0340)		(0.0352)	
RP			-0.1643	***			-0.1632	***	-0.1640	***
			(0.0336)				(0.0339)		(0.0341)	
MPC							-0.0108		-0.0093	
							(0.0388)		(0.0389)	
Negative Large									0.0527	
									(0.0544)	
Negative									0.1015	**
									(0.0487)	
No Move									Omitted	
Positive									0.0490	
									(0.0487)	
Positive Large									0.1043	**
									(0.0521)	
Intercept	0.1631	***	0.2622	***			0.2636	***	0.2060	***
	(0.0229)		(0.0302)				(0.0307)		(0.0428)	
Adj. R2	0.0001		0.0416				0.0399		0.0436	
N	530		530				530		530	

Table X

Disposition Effect OLS Regressions: Other

This table shows the results of various OLS regression models on the potential sale of securities. The analysis focuses on a subset of our data, which are bonds excluding KTBs and MSBs. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it,}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3	Model 4		Model 5		Model 6	
Gain	-0.0175	***	-0.0180	***		-0.0168	***	-0.0175	***	-0.0178	***
	(0.0016)		(0.0017)			(0.0018)		(0.0017)		(0.0017)	
RP			0.0038			0.0004		0.0005		-0.0005	
			(0.0026)			(0.0026)		(0.0027)		(0.0027)	
Short						Omitted		Omitted		Omitted	
Medium						-0.0136	***	-0.0134	***	-0.0145	***
						(0.0012)		(0.0012)		(0.0012)	
Long						-0.0127	***	-0.0126	***	-0.0135	***
						(0.0048)		(0.0048)		(0.0048)	
MPC								0.0118	***	0.0119	***
								(0.0014)		(0.0014)	
Negative Large										0.0059	***
										(0.0023)	
Negative										0.0077	***
										(0.0020)	
No Move										Omitted	
Positive										0.0054	***
										(0.0018)	
Positive Large										0.0115	***
										(0.0020)	
Intercept	0.0284	***	0.0253	***		0.0342	***	0.0317	***	0.0270	***
	(0.0015)		(0.0027)			(0.0028)		(0.0028)		(0.0030)	
Adj. R2	0.0029		0.0030			0.0063		0.0081		0.0089	
N	38167		38167			38167		38167		38167	

Table XI
PGR and PLR by Bond Maturity

This table shows the PGR (Proportion of Gains Realized) and PLR (Proportion of Losses Realized) for bonds classified into short-term (2 years and under), medium-term (2 to 5 years), and long-term (longer than 5 years) maturities. PGR is the number of realized gains divided by the sum of realized gains and paper (unrealized) gains, and PLR is the number of realized losses divided by the sum of realized losses and paper losses. The data is from the period of October 2012 to December 2013 for the Prop book, and for the entire 2012 for the RP book. The t-statistics test the null hypothesis that PGR and PLR ratios are equal. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Panel A: PGR and PLR ratios by Bond Maturity

	~2y		2~5y		5y~	
PGR	0.046		0.019		0.049	
PLR	0.113		0.071		0.129	
Difference in Proportions	-0.068		-0.051		-0.080	
t-statistic	-7.5	***	-7.9	***	-1.8	*

Panel B: PGR and PLR ratios by Bond Maturity and Book Type

	~2y		2~5y		5y~	
Prop book PGR	0.247		0.133		0.288	
Prop book PLR	0.200		0.165		0.269	
Difference in Proportions	0.047		-0.031		0.019	
t-statistic	1.1		-1.4	*	0.2	
RP book PGR	0.037		0.008		0.013	
RP book PLR	0.103		0.033		0.028	
Difference in Proportions	-0.065		-0.024		-0.015	
t-statistic	-7.2	***	-4.6	***	-0.5	

Panel C: PGR and PLR ratios by Bond Maturity and Period

	Entire Year		March		Apr-Feb	
~2y PGR	0.046		0.101		0.043	
~2y PLR	0.113		0.166		0.103	
Difference in Proportions	-0.068		-0.065		-0.060	
t-statistic	-7.5	***	-2.2		-6.4	***
2~5y PGR	0.019		0.045		0.018	
2~5y PLR	0.071		0.015		0.140	
Difference in Proportions	-0.051		0.030		-0.123	
t-statistic	-7.9	***	2.7	**	-9.5	***
5y~ PGR	0.049		0.000		0.052	
5y~ PLR	0.129		0.071		0.146	
Difference in Proportions	-0.080		-0.071		-0.094	
t-statistic	-1.8	*	-1.0		-1.8	*

Table XII
Disposition Effect OLS Regressions: Short-term Bonds

This table shows the results of various OLS regression models on the potential sale of securities. The analysis focuses on a subset of our data, which are bonds belonging to the short-term (bonds with less than 2 years to maturity) category. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_5MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_5MPC_{it} + b_{6,1}NegL_{it} + b_{6,2}Neg_{it} + b_{6,3}Pos_{it} + b_{6,4}PosL_{it} + \epsilon_{it,}$

for security i at time t. All independent variables are binary, the definitions being identical to those in Table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Gain	-0.0318	***	-0.0245	***	-0.0195	***			-0.0201	***	-0.0207	***
	(0.0029)		(0.0029)		(0.0029)				(0.0029)		(0.0029)	
RP			-0.0765	***	-0.0326	***			-0.0329	***	-0.0337	***
			(0.0053)		(0.0057)				(0.0057)		(0.0057)	
KTB					0.1551	***			0.1553	***	0.1530	***
					(0.0178)				(0.0178)		(0.0178)	
MSB					0.1360	***			0.1358	***	0.1355	***
					(0.0074)				(0.0074)		(0.0074)	
Other					Omitted				Omitted		Omitted	
MPC									0.0145	***	0.0146	***
									(0.0026)		(0.0026)	
Negative Large											0.0074	
											(0.0046)	
Negative											0.0119	***
											(0.0034)	
No Move											Omitted	
Positive											0.0089	***
											(0.0031)	
Positive Large											0.0182	***
											(0.0037)	
Intercept	0.0517	***	0.1185	***	0.0684	***			0.0656	***	0.0576	***
	(0.0026)		(0.0053)		(0.0058)				(0.0058)		(0.0062)	
Adj. R2	0.0060		0.0163		0.0353				0.0368		0.0378	
N	19848		19848		19848				19848		19848	

Table XIII
Disposition Effect OLS Regressions: Medium-term Bonds

This table shows the results of various OLS regression models on the potential sale of securities. The analysis focuses on a subset of our data, which are bonds belonging to the medium-term (bonds with 2~5 years to maturity) category. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_5MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_5MPC_{it} + b_{6,1}NegL_{it} + b_{6,2}Neg_{it} + b_{6,3}Pos_{it} + b_{6,4}PosL_{it} + \epsilon_{it,}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Gain	-0.0304	***	-0.0128	***	-0.0112	***			-0.0116	***	-0.0111	***
	(0.0025)		(0.0026)		(0.0024)				(0.0024)		(0.0024)	
RP			-0.0716	***	-0.0025				-0.0024		-0.0035	
			(0.0030)		(0.0030)				(0.0030)		(0.0031)	
KTB					0.3009	***			0.3011	***	0.3003	***
					(0.0054)				(0.0054)		(0.0054)	
Other					Omitted				Omitted		Omitted	
MPC									0.0043	**	0.0045	**
									(0.0019)		(0.0019)	
Negative Large											0.0077	**
											(0.0030)	
Negative											0.0092	***
											(0.0029)	
No Move											Omitted	
Positive											0.0045	
											(0.0028)	
Positive Large											0.0090	***
											(0.0028)	
Intercept	0.0411	***	0.0902	***	0.0185	***			0.0177	***	0.0116	***
	(0.0023)		(0.0030)		(0.0031)				(0.0031)		(0.0037)	
Adj. R2	0.0078		0.0370		0.1725				0.1727		0.1731	
N	18870		18870		18870				18870		18870	

Table XIV
Disposition Effect OLS Regressions: Long-term Bonds

This table shows the results of various OLS regression models on the potential sale of securities. The analysis focuses on a subset of our data, which are bonds belonging to the long-term (bonds with more than 5 years to maturity) category. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_5 MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_5 MPC_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it},$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Gain	-0.0816	***	-0.0357		-0.0338				-0.0353		-0.0396	*
	(0.0248)		(0.0221)		(0.0218)				(0.0219)		(0.0218)	
RP			-0.3313	***	-0.1303	**			-0.1283	**	-0.1320	**
			(0.0237)		(0.0525)				(0.0525)		(0.0524)	
KTB					0.2060	***			0.2078	***	0.2030	***
					(0.0482)				(0.0482)		(0.0480)	
Other					Omitted				Omitted		Omitted	
MPC									0.0181		0.0202	
									(0.0161)		(0.0161)	
Negative Large											0.0477	*
											(0.0263)	
Negative											0.0517	**
											(0.0244)	
No Move											Omitted	
Positive											0.0464	*
											(0.0241)	
Positive Large											0.0901	***
											(0.0243)	
Intercept	0.1169	***	0.3750	***	0.1676	***			0.1626	***	0.1171	**
	(0.0233)		(0.0276)		(0.0557)				(0.0558)		(0.0588)	
Adj. R2	0.0144		0.2365		0.2557				0.2560		0.2675	
N	673		673		673				673		673	

Table XV

PGR and PLR in Periods Preceding Monetary Policy Committee Meetings

This table shows the PGR (Proportion of Gains Realized) and PLR (Proportion of Losses Realized) for 1 week and 2 weeks preceding Monetary Policy Committee Meetings, which set the target rate on a monthly basis. PGR is the number of realized gains divided by the sum of realized gains and paper (unrealized) gains, and PLR is the number of realized losses divided by the sum of realized losses and paper losses. The data is from the period of October 2012 to December 2013 for the Prop book, and for the entire 2012 for the RP book. The t-statistics test the null hypothesis that PGR and PLR ratios are equal. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	1 week		2 weeks	
Prop book PGR	0.155		0.183	
Prop book PLR	0.187		0.179	
Difference in Proportions	-0.032		0.005	
t-statistic	-0.8		0.2	
RP book PGR	0.030		0.032	
RP book PLR	0.065		0.101	
Difference in Proportions	-0.034		-0.068	
t-statistic	-2.6	***	-5.9	***

Table XVI

Disposition Effect OLS Regressions: MPC

This table shows the results of various OLS regression models on the potential sale of securities. The analysis focuses on a subset of our data, which are observations that fall within a week before a MPC date, in which the central bank makes decisions regarding the target rate. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it},$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5	Model 6	
Gain	-0.0164	***	-0.0081		-0.0049		-0.0023			-0.0055	
	(0.0049)		(0.0050)		(0.0050)		(0.0050)			(0.0050)	
RP			-0.0559	***	-0.0128	*	-0.0182			-0.0198	***
			(0.0066)		(0.0071)		(0.0072)			(0.0072)	
KTB					0.1961	***	0.1984	***		0.1954	***
					(0.0145)		(0.0145)			(0.0145)	
MSB					0.1301	***	0.1190	***		0.1167	***
					(0.0146)		(0.0147)			(0.0147)	
Other					Omitted		Omitted			Omitted	
Short							Omitted			Omitted	
Medium							-0.0208	***		-0.0240	***
							(0.0034)			(0.0035)	
Long							0.0008			-0.0015	
							(0.0128)			(0.0128)	
Negative Large										0.0215	***
										(0.0075)	
Negative										0.0227	***
										(0.0052)	
No Move										Omitted	
Positive										0.0173	***
										(0.0048)	
Positive Large										0.0319	***
										(0.0051)	
Intercept	0.0414	***	0.0861	***	0.0386	***	0.0512	***		0.0383	***
	(0.0046)		(0.0070)		(0.0076)		(0.0078)			(0.0083)	
Adj. R^2	0.0011		0.0084		0.0331		0.0368			0.0405	
N	9493		9493		9493		9493			9493	

Table XVII
Disposition Effect OLS Regressions: non-MPC

This table shows the results of various OLS regression models on the potential sale of securities. All observations in this subset do not fall within a week before a MPC date. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it,}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5	Model 6	
Gain	-0.0368	***	-0.0236	***	-0.0206	***	-0.0199	***		-0.0198	***
	(0.0021)		(0.0021)		(0.0020)		(0.0020)			(0.0020)	
RP			-0.0801	***	-0.0090	***	-0.0114	***		-0.0121	***
			(0.0030)		(0.0032)		(0.0032)			(0.0032)	
KTB					0.2969	***	0.2994	***		0.2989	***
					(0.0060)		(0.0061)			(0.0061)	
MSB					0.1623	***	0.1559	***		0.1557	***
					(0.0066)		(0.0067)			(0.0067)	
Other					Omitted		Omitted			Omitted	
Short							Omitted			Omitted	
Medium							-0.0111	***		-0.0117	***
							(0.0015)			(0.0016)	
Long							-0.0114	*		-0.0120	**
							(0.0058)			(0.0058)	
Negative Large										0.0044	
										(0.0027)	
Negative										0.0065	***
										(0.0025)	
No Move										Omitted	
Positive										0.0038	
										(0.0024)	
Positive Large										0.0077	***
										(0.0025)	
Intercept	0.0494	***	0.1129	***	0.0366	***	0.0438	***		0.0401	***
	(0.0019)		(0.0030)		(0.0032)		(0.0034)			(0.0037)	
Adj. R^2	0.0105		0.0342		0.1166		0.1182			0.1184	
N	29898		29898		29898		29898			29898	

Table XVIII
PGR and PLR by Daily Market Moves

This table shows the PGR (Proportion of Gains Realized) and PLR (Proportion of Losses Realized) for market moves. The market move proxy is the yield on the 3 year Korea Treasury Bond, which is the representative benchmark rate of the South Korean bond market. Days when the KTB yield moves up are classified as negative days, and days when the yield moves down are classified as positive days, in line with the effects on profits. We also classify days with no moves as a separate class. Positive and negative days are divided into high and low days by median market move. PGR is the number of realized gains divided by the sum of realized gains and paper (unrealized) gains, and PLR is the number of realized losses divided by the sum of realized losses and paper losses. The data is from the period of October 2012 to December 2013 for the Prop book, and for the entire 2012 for the RP book. The t-statistics test the null hypothesis that PGR and PLR ratios are equal. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Panel A: PGR and PLR by Market Move (in terms of profits)

	Negative		No Move		Positive	
Prop book PGR	0.132		0.141		0.201	
Prop book PLR	0.228		0.211		0.096	
Difference in Proportions	-0.096		-0.070		0.105	
t-statistic	-2.9	***	-1.5	*	4.0	
RP book PGR	0.030		0.011		0.016	
RP book PLR	0.078		0.033		0.076	
Difference in Proportions	-0.047		-0.023		-0.061	
t-statistic	-5.6	***	-2.8	***	-6.3	***

Panel B: PGR and PLR of Prop book on Positive days

	Low	High
PGR	0.184	0.223
PLR	0.144	0.044
Difference in Proportions	0.040	0.179
t-statistic	1.0	5.2

Panel C: PGR and PLR by Market Move (in terms of profits)

	Negative(Large)		Negative(Small)		No Move		Positive(Small)		Positive(Large)	
Prop book PGR	0.085		0.149		0.141		0.184		0.223	
Prop book PLR	0.299		0.190		0.211		0.144		0.044	
Difference in Proportions	-0.214		-0.041		-0.070		0.040		0.179	
t-statistic	-3.7	***	-1.1		-1.5	*	1.0		5.2	
RP book PGR	0.006		0.039		0.011		0.015		0.018	
RP book PLR	0.046		0.099		0.033		0.042		0.165	
Difference in Proportions	-0.040		-0.060		-0.023		-0.027		-0.148	
t-statistic	-4.0	***	-5.0	***	-2.8	***	-3.1	***	-5.9	***

Table XIX

PGR and PLR with Closing Prices

This table shows the PGR (Proportion of Gains Realized) and PLR (Proportion of Losses Realized) with variations of recent closing prices as the reference point. PGR is the number of realized gains divided by the sum of realized gains and paper (unrealized) gains, and PLR is the number of realized losses divided by the sum of realized losses and paper losses. The data is from the period of October 2012 to December 2013 for the Prop book, and for the entire 2012 for the RP book. The t-statistics test the null hypothesis that PGR and PLR ratios are equal. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	-1 day		-2 day		-3 day		-4 day		-5 day	
Prop book PGR	0.171		0.156		0.180		0.166		0.171	
Prop book PLR	0.258		0.237		0.197		0.209		0.200	
Difference in Proportions	-0.088		-0.081		-0.017		-0.042		-0.029	
t-statistic	-3.7	***	-3.7	***	-0.8		-2.0	**	-1.4	*
RP book PGR	0.014		0.020		0.022		0.022		0.023	
RP book PLR	0.056		0.046		0.042		0.042		0.039	
Difference in Proportions	-0.041		-0.026		-0.021		-0.020		-0.016	
t-statistic	-12.4	***	-8.0	***	-6.5	***	-6.4	***	-5.3	***

	-6 day		-7 day		-8 day		-9 day		-10 day	
Prop book PGR	0.166		0.156		0.161		0.157		0.145	
Prop book PLR	0.208		0.214		0.208		0.214		0.233	
Difference in Proportions	-0.042		-0.058		-0.047		-0.057		-0.088	
t-statistic	-2.0	**	-2.8	***	-2.2	**	-2.7	***	-4.0	***
RP book PGR	0.023		0.022		0.021		0.021		0.021	
RP book PLR	0.038		0.039		0.039		0.042		0.042	
Difference in Proportions	-0.015		-0.017		-0.018		-0.021		-0.021	
t-statistic	-5.1	***	-5.6	***	-6.1	***	-6.8	***	-6.8	***

Table XX
The Disposition Effect: Analysis Summary

This table aggregates the results of the various analysis methodologies presented in this paper. Panel A summarizes the results of our main methodology following O'dean (1998), of our total data and its subsets. We present the main variables of interest, PGR and PLR, together with any finding of the disposition effect (DE) and its statistical significance. Panel B shows coefficients of the variable *Gain* on the dependent variable *Sale*, for OLS and Logit regressions, and any finding of DE and its statistical significance.

Panel A		PGR	PLR	DE	Significance
	Entire Data Set	0.031	0.091	no	yes
Book Type	Prop Book	0.17	0.177	no	no
	RP Book	0.021	0.068	no	yes
Issuer Class	KTB	0.393	0.485	no	yes
	MSB	0.418	0.381	yes	no
	Other	0.025	0.065	no	yes
Bond Maturity	≤ 2Y	0.046	0.113	no	yes
	2Y – 5Y	0.019	0.071	no	yes
	5Y ≤	0.049	0.129	no	yes
Preceding BOK's MPC	1 week	0.155	0.187	no	no
	2 weeks	0.183	0.179	yes	no
Daily Benchmark Move	Negative	0.132	0.228	no	yes
	No move	0.141	0.211	no	yes
	Positive	0.201	0.096	yes	yes
	Low Positive	0.184	0.144	yes	no
	High Positive	0.223	0.044	yes	yes

Panel B		OLS	Logit	DE	Significance
	Entire Data Set	-0.0322	-1.1499	no	yes
Book Type	Prop Book	0.0100	0.1150	yes	no
	RP Book	-0.0252	-1.2021	no	yes
Issuer Class	KTB	-0.0832	-0.3909	no	yes
	MSB	0.0345	0.2337	yes	no
	Other	-0.0175	-0.9709	no	yes
Bond Maturity	≤ 2Y	-0.0318	-0.9899	no	yes
	2Y – 5Y	-0.0304	-1.3800	no	yes
	5Y ≤	-0.0816	-1.2876	no	yes
Preceding BOK's MPC	1 week	-0.0164	-0.5210	no	yes
	other	-0.0368	-1.4089	yes	yes
Daily Benchmark Move	Negative Large	-0.0544	-1.8562	no	yes
	Negative	-0.0204	-0.7559	no	yes
	No Move	-0.0351	-1.6085	no	yes
	Positive	-0.0245	-0.9941	no	yes
	Positive Large	-0.0433	-1.1707	no	yes

Appendix. South Korea's Bond Market

South Korea's financial markets have shown impressive growth during the past few decades, and have evolved into sophisticated markets that meet global standards in size, systems, and regulations. The amount of bonds outstanding has increased over twofold during the last decade, growing from 658 trillion Korean Won in 2004 to 1,465 trillion Korean Won in 2014. The ratio of bonds outstanding to GDP also increased from 75.1% in 2004 to 98.5% in 2014.[6] South Korea's bond market is classified into Government Bond, Municipal Bond, Bond Issues by Special Laws, Corporate Bond, and Foreign Bond sectors. Korea Treasury Bonds, or KTBs for short, are issued by the South Korean government and are the highest in credit quality among domestic bonds. Issuances are sizable, issuing schedules are regular and pre-announced, market depth is considerable, and liquidity is ample. Like U.S. Treasuries, Korea Treasury Bonds are traded very actively and act as market benchmark rates.

Insert Figure A1 about here

On each issuance date, the Ministry of Strategy and Finance (MoSF) sells the whole issuance amount to the 20 Primary Dealers (PDs)[7] through multi-price modified Dutch auction.[8] The Primary Dealers who have the privilege of participating in government auctions are entrusted with the task of acting as market-makers and liquidity providers in the secondary market for KTBs. There are two types

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[6] Source: "Korean Bond Market", issued by the Korea Exchange, Jan 2015.

[7] The Primary Dealers who act as underwriters in the primary market for KTBs submit their applications to the MoSF in June and December of each year. The applicants are reviewed on specified criteria such as financial integrity, trading record of KTB benchmark issues, trading record in the secondary bond market, and balance of KTB holdings. As of January 2015, there are 20 Primary Dealers, of which 10 are banks and 10 are securities companies. The Primary Dealership system was first introduced in 1999. The PD license is a highly valued and esteemed asset for financial institutions, and a PD whose license has been cancelled cannot re-apply within 2 years of its cancellation.

[8] In August 2000, the auction method was changed from conventional auction to Dutch auction. Concerns about falling bid-to-cover ratios and estrangement of auction prices from market rates caused the MoSF to modify the auction method to multi-price modified Dutch auction in September 2009.

of KTBs – nominal and inflation-linked. Nominal KTBs are fixed-coupon bonds issued in 3, 5, 10, 20, and 30 year maturities as fungible issues. Inflation-linked KTBs were first issued in March 2007, and have only one type of maturity, which is 10 years.

Insert Figure A2 about here

Municipal bonds are bonds issued by local governments to meet their fiscal needs or for other special purposes. Bond issues by Special Laws are papers issued by entities set up by special laws, the foremost being Monetary Stabilization Bonds (MSBs) issued by the Bank of Korea. Article 69 of The Bank of Korea Act allows the central bank to issue MSBs to financial institutions and individual investors as a tool for open market operations, the maximum maturity being 2 years. The corporate bond market is accessed by private enterprises to procure funding for corporate activities such as new investments, working capital, and repayment of outstanding debt. At the end of 2014, the amount outstanding was 492.5 trillion KRW (Korean Won) for Korea Treasury Bonds, 178.0 trillion KRW for Monetary Stabilization Bonds, and 349.2 trillion KRW for corporate bonds. The bond market's constant pace of growth since 2004 can be seen in Figure 1.[9] According to the Bank for International Settlements (BIS), South Korea's amount of bonds outstanding was 1,518.3 billion USD in Jun 2014, which is comparable to those of Canada (1,710.4 billion USD) and Australia (1,420.3 billion USD).

The Korean bond market boasts ample liquidity and market depth, especially in Korea Treasury Bonds and Monetary Stabilization Bonds. The bond market is divided into the electronic exchange (provided by the Korea Exchange, or KRX for short), and the over-the-counter (OTC) market. The proportion of electronic trades increased from 20.8% in 2004 to 34.6% in 2014. The yearly bond turnover ratio for 2014 was 272.6%, and the average daily traded volume was 16.2 trillion KRW. For

[9] Source: "Korean Bond Market", issued by the Korea Exchange, Jan 2015. Korea Treasury Bond figures are subsets of the total Government Bond sector. Monetary Stabilization Bond, Special Bond by Financial Institutions, Non-financial Institution Bond figures are subsets of the total Bond Issued by Special Laws segment.

the same year, Korea Treasury Bonds accounted for 71% of the total bond market trading volume and Monetary Stabilization Bonds for 15%, the two types making up most of the market volume. The bid-offer spreads for Korea Treasury Bonds are also very small, with PDs required to keep a maximum bid-offer spread of 2 won for 3 year, 3 won for 5 year, and 7 won for 10 year, which are all less than 1 basis point, or 0.01% in yield terms. Because the market is very liquid in these bonds, the actual market bid-offer is almost always narrower than this obligatory market making by primary dealers.

Analyzing the amount of bond holdings by investor type, securities firms account for 18.2%, banks 16.5%, foreign corporations 11.0%, insurance companies 17.9%, merchant banking and depository corporations 7.0%, financial investment companies 7.9%, foreigners 6.9%, and others (including pension funds) 14.5%.[10]

[10] Source: Korea Securities Depository, Financial Supervisory Service.

Figure A1

Listing Statistics by Bond Type, 2004~2014

The table shows amounts of bond outstanding by bond type and year of South Korea's bond markets. During the past decade the market has more than doubled in size.

Listing Statistics By Bond Type — Unit: Trillion KRW

Series	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Government Bond	178.7	223.8	258.3	274.7	285.0	329.9	360.2	390.5	412.6	452.7	492.5
Korea Treasury Bond	123.1	170.5	206.8	227.4	239.3	280.9	310.1	340.1	362.9	400.7	438.3
Municipal Bond	10.6	11.3	11.9	12.4	13.1	15.3	16.2	17.0	17.3	18.5	19.1
Bond Issued By Special Laws	292.5	318.1	323.3	334.7	338.7	405.1	470.1	493.3	530.9	579.2	595.4
Monetary Stabilization Bond	142.7	155.2	158.4	151.2	128.1	149.2	165.0	168.5	163.1	165.4	178.0
Special Bond by Financial Institutions	37.1	44.5	62.8	77.3	85.2	71.8	80.9	76.4	71.9	82.4	86.6
Non-financial Institution Bond	112.7	118.3	102.1	106.2	125.3	184.1	224.2	248.4	296.0	331.4	330.8
Corporate Bond	175.7	168.1	185.1	208.1	228.6	263.7	270.1	301.4	331.5	345.8	349.2
Foreign Bond	0.3	0.3	0.2	0.1	-	0.4	0.4	0.4	-	-	-
Total	657.8	721.4	778.7	829.9	865.3	1,014.5	1,117.0	1,202.7	1,292.5	1,396.1	1,456.2

Figure A2

Trading Volume by Bond Type, 2004~2014

The table shows amounts of bond traded by bond type and year. The market liquidity has also grown in line with the size of the overall market, Korea Treasury Bonds showing considerable market depth.

Trading Volume by Bond Type — Unit: Trillion KRW

Series	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Government Bond	1,116.0	1,136.0	983.3	932.4	990.2	1,574.9	2,123.3	2,353.0	2,965.5	3,081.6	2,800.7
Korea Treasury Bond	1,056.9	1,162.0	927.5	877.1	923.8	1,484.3	1,956.1	2,282.1	2,881.5	2,981.7	2,679.1
Municipal Bond	8.7	6.9	7.3	8.0	10.2	11.4	20.9	11.9	13.9	13.3	14.1
Bond Issued By Special Laws	506.7	556.3	519.3	479.9	623.1	792.4	999.3	1,089.9	1,056.2	1,001.7	892.0
Monetary Stabilization Bond	416.5	468.4	417.2	386.2	448.7	537.0	707.8	808.2	750.3	707.3	614.5
Special Bond by Financial Institutions	41.9	48.6	71.4	63.2	113.6	149.6	172.8	158.9	115.3	122.2	121.4
Non-financial Institution Bond	48.3	39.2	30.7	30.5	60.7	105.8	118.4	122.8	190.6	172.2	156.1
Corporate Bond	162.1	133.0	127.1	120.1	158.2	197.6	216.7	236.0	252.6	251.2	262.3
Total	1,817.0	1,906.6	1,637.2	1,541.4	1,793.6	2,578.0	3,360.2	3,690.8	4,288.4	4,347.8	3,969.1

Table A1
Bond Market Interest Rate Moves

This table shows summary statistics for bond market moves in our sample period of 2012~2013. The average moves (calculated from the absolute values of daily market movements) of daily closing yields for benchmark KTBs were 1.5 bps for 1y, 2.2 bps for 3y, 2.6 bps for 10y, and 2.5bps for 20y. The maximum daily move of a benchmark KTB yield during this period was 22 basis points, or 0.22%, which was caused by a surprise rate cut from the Bank of Korea.

Unit: basis points

	1Y KTB	3Y KTB	5Y KTB	10Y KTB
Min	-22	-22	-22	-21
Max	13	15	17	16
Average Move	1.5	2.2	2.6	2.5

Table A2
Descriptive Statistics

This table shows descriptive statistics for the sample bond portfolios in years 2012~2013. N is the number of sell days, PL the number of paper losses, and PG the number of paper gains. RL and RG stand for realized losses and realized gains, respectively. Inventory and Profit/Loss figures are in units of million KRW. Profit/Loss numbers are calculated from purchase prices. Duration shows the average modified duration of the bond portfolios, in number of years.

	N	PL	PG	RL	RG	Inventory	Profit/Loss	Duration
Total	248	2,799	12,866	280	415	522,891	951	1.87
RP book	101	2,264	12,100	165	258	859,562	1,880	1.05
Prop book	147	535	766	115	157	158,785	28	2.59

Table A3
Disposition Effect OLS Regressions: Negative Large Days

This table shows the results of various OLS regression models on the potential sale of securities. The regressions are run on a subset of the data, when daily yield moves are greater than +2bps. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + b_5MPC_{it} + \epsilon_{it}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6
Gain	-0.0544	***	-0.0345	***	-0.0265	***	-0.0274	***	-0.0274	***	
	(0.0050)		(0.0052)		(0.0049)		(0.0049)		(0.0049)		
RP			-0.0848	***	0.0114		0.0107		0.0108		
			(0.0073)		(0.0078)		(0.0078)		(0.0078)		
KTB					0.3053	***	0.3059	***	0.3057	***	
					(0.0121)		(0.0122)		(0.0122)		
MSB					0.1741	***	0.1678	***	0.1676	***	
					(0.0163)		(0.0166)		(0.0167)		
Other					Omitted		Omitted		Omitted		
Short							Omitted		Omitted		
Medium							-0.0082	*	-0.0083	*	
							(0.0043)		(0.0043)		
Long							-0.0065		-0.0068		
							(0.0139)		(0.0140)		
MPC									0.0025		
									(0.0059)		
Intercept	0.0652	***	0.1261	***	0.0204	***	0.0272	***	0.0269	***	
	(0.0043)		(0.0068)		(0.0075)		(0.0084)		(0.0084)		
Adj. R^2	0.0229		0.0481		0.1607		0.1609		0.1608		
N	5090		5090		5090		5090		5090		

Table A4

Disposition Effect OLS Regressions: Negative Days

This table shows the results of various OLS regression models on the potential sale of securities. The regressions are run on a subset of the data, when daily yield moves are between 0~+2bps. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + \epsilon_{it}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6
Gain	-0.0204	***	-0.0094	**	-0.0056		-0.0043		-0.0056		
	(0.0040)		(0.0041)		(0.0040)		(0.0040)		(0.0040)		
RP			-0.0786	***	-0.0131	*	-0.0161	**	-0.0159	**	
			(0.0067)		(0.0069)		(0.0070)		(0.0070)		
KTB					0.3281	***	0.3322	***	0.3332	***	
					(0.0151)		(0.0152)		(0.0152)		
MSB					0.1898	***	0.1823	***	0.1825	***	
					(0.0137)		(0.0138)		(0.0138)		
Other					Omitted		Omitted		Omitted		
Short							Omitted		Omitted		
Medium							-0.0145	***	-0.0146	***	
							(0.0032)		(0.0032)		
Long							-0.0184		-0.0186		
							(0.0117)		(0.0117)		
MPC									0.0119	***	
									(0.0037)		
Intercept	0.0391	***	0.1037	***	0.0328	***	0.0416	***	0.0397	***	
	(0.0036)		(0.0065)		(0.0069)		(0.0072)		(0.0072)		
Adj. R^2	0.0029		0.0193		0.0870		0.0890		0.0900		
N	8293		8293		8293		8293		8293		

Table A5
Disposition Effect OLS Regressions: No Move Days

This table shows the results of various OLS regression models on the potential sale of securities. The regressions are run on a subset of the data, when daily yield moves are zero. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + \epsilon_{it}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6
Gain	-0.0351	***	-0.0281	***	-0.0247	***	-0.0232	***	-0.0232	***	
	(0.0041)		(0.0042)		(0.0041)		(0.0041)		(0.0041)		
RP			-0.0468	***	-0.0094		-0.0126	**	-0.0123	**	
			(0.0056)		(0.0058)		(0.0058)		(0.0058)		
KTB					0.2447	***	0.2494	***	0.2493	***	
					(0.0140)		(0.0140)		(0.0140)		
MSB					0.1051	***	0.0097	***	0.0996	***	
					(0.0113)		(0.0114)		(0.0114)		
Other					Omitted		Omitted		Omitted		
Short							Omitted		Omitted		
Medium							-0.0115	***	-0.0114	***	
							(0.0032)		(0.0032)		
Long							-0.0296	**	-0.0294	**	
							(0.0138)		(0.0138)		
MPC									-0.0026	***	
									(0.0033)		
Intercept	0.0443	***	0.0812	***	0.0391	***	0.0455	***	0.046	***	
	(0.0037)		(0.0058)		(0.0060)		(0.0063)		(0.0063)		
Adj. R^2	0.0115		0.0226		0.0777		0.0798		0.0798		
N	6172		6172		6172		6172		6172		

Table A6
Disposition Effect OLS Regressions: Positive Days

This table shows the results of various OLS regression models on the potential sale of securities. The regressions are run on a subset of the data, when daily yield moves are between -2~0bps. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + b_5MPC_{it} + \epsilon_{it}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6
Gain	-0.0245	***	-0.0169	***	-0.0142	***	-0.0117	***	-0.0118	***	
	(0.0036)		(0.0036)		(0.0036)		(0.0036)		(0.0036)		
RP			-0.0683	***	-0.0206	***	-0.0259	***	-0.0263	***	
			(0.0053)		(0.0056)		(0.0056)		(0.0056)		
KTB					0.2650	***	0.2693	***	0.2694	***	
					(0.0126)		(0.0127)		(0.0127)		
MSB					0.1280	***	0.1201	***	0.1196	***	
					(0.0124)		(0.0125)		(0.0124)		
Other					Omitted		Omitted		Omitted		
Short							Omitted		Omitted		
Medium							-0.0169	***	-0.0167	***	
							(0.0026)		(0.0026)		
Long							-0.0162		-0.0156		
							(0.0103)		(0.0102)		
MPC									0.0110	***	
									(0.0028)		
Intercept	0.0396	***	0.0971	***	0.0458	***	0.0555	***	0.0530	***	
	(0.0033)		(0.0055)		(0.0059)		(0.0060)		(0.0061)		
Adj. R^2	0.0040		0.0186		0.0616		0.0650		0.0662		
N	11277		11277		11277		11277		11277		

Table A7
Disposition Effect OLS Regressions: Positive Large Days

This table shows the results of various OLS regression models on the potential sale of securities. The regressions are run on a subset of the data, when daily yield moves are more negative than -2bps. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + \epsilon_{it}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in table II. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6
Gain	-0.0433	***	-0.0221	***	-0.0283	***	-0.0270	***	-0.0309	***	
	(0.0057)		(0.0057)		(0.0056)		(0.0055)		(0.0056)		
RP			-0.1159	***	-0.0188	**	-0.0226	***	-0.0213	***	
			(0.0069)		(0.0079)		(0.0079)		(0.0079)		
KTB					0.2632	***	0.2607	***	0.2620	***	
					(0.0124)		(0.0125)		(0.0124)		
MSB					0.2025	***	0.1907	***	0.1903	***	
					(0.0160)		(0.0161)		(0.0161)		
Other					Omitted		Omitted		Omitted		
Short							Omitted		Omitted		
Medium							-0.0172	***	-0.0170	***	
							(0.0034)		(0.0034)		
Long							0.0231	*	0.0233	*	
							(0.0122)		(0.0121)		
MPC									0.0202	***	
									(0.0037)		
Negative Large											
Negative											
No Move											
Positive											
Positive Large											
Intercept	0.0641	***	0.1534	***	0.0599	***	0.0723	***	0.0691	***	
	(0.0054)		(0.0075)		(0.0083)		(0.0086)		(0.0086)		
Adj. R^2	0.0068		0.0387		0.0967		0.1001		0.1031		
N	8434		8434		8434		8434		8434		

Table A8

Disposition Effect Logit Regressions: Total Data

This table shows the results of various logit models on the potential sale of securities. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{ijt}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it},$ for security *i* at time *t*. All independent variables are binary. *Gain* takes a value of 1 if the security is at a gain from its weighted average purchase price and 0 otherwise. *RP* takes a value of 1 if the security belongs to the RP book and 0 if it belongs to the Prop book. *KTB* takes a value of 1 if the security is a Korea Treasury Bond and 0 otherwise, and *MSB* is similarly defined for Monetary Stabilization bonds. Bonds are classified as short, medium, or long according to their maturity – consistent with prior specifications in this paper, short-term bonds are those with maturities less than 2 years, medium-term bonds have maturities between 2~5 years, and long-term bonds have maturities longer than 5 years. The dummy variables *Medium* and *Long* take a value of 1 if security *i* belongs to the respective category at time *t* and 0 otherwise, short-term maturity being the omitted category. *MPC* takes a value of 1 if the observation falls within a week before the MPC date, and 0 otherwise. NegL, Neg, Pos, and PosL are variables related to daily yield moves of each security – NegL takes a value of 1 if the yield move is +2bps or larger, Neg takes a value of 1 if the yield move is between 0~+2bps, Pos takes a value of 1 if the yield move is between 0~-2bps, and PosL takes a value of 1 if the yield move is more negative than -2bps. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Gain	-1.1499	***	-0.7137	***	-0.6740	***	-0.6598	***	-0.6907	***	-0.7388	***
	(0.0731)		(0.0790)		(0.0808)		(0.0806)		(0.0809)		(0.0826)	
RP			-1.179	***	-0.3876	***	-0.548	***	-0.5621	***	-0.5855	***
			(0.0809)		(0.1114)		(0.1148)		(0.1147)		(0.1154)	
KTB					2.9907	***	3.3172	***	3.3332	***	3.3192	***
					(0.1271)		(0.1377)		(0.1377)		(0.1391)	
MSB					2.3339	***	1.8926	***	1.8942	***	1.8916	***
					(0.1339)		(0.1395)		(0.1394)		(0.1404)	
Other					Omitted		Omitted		Omitted		Omitted	
Short							Omitted		Omitted		Omitted	
Medium							-0.9766	***	-0.9723	***	-1.0178	***
							(0.0928)		(0.0929)		(0.0940)	
Long							-0.6775	**	-0.6800	**	-0.7213	***
							(0.2333)		(0.2346)		(0.2355)	
MPC									0.5030	***	0.5169	***
									(0.0808)		(0.0813)	
Negative Large											0.3991	***
											(0.1508)	
Negative											0.6217	***
											(0.1325)	
No Move											Omitted	
Positive											0.4319	***
											(0.1301)	
Positive Large											0.7973	***
											(0.1324)	
Intercept	-2.9911	***	-1.9025	***	-3.3877	***	-2.8807	***	-2.9903	***	-3.4140	***
	(0.0581)		(0.0699)		(0.1188)		(0.1273)		(0.1287)		(0.1615)	
Adj. R^2	0.0055		0.0151		0.0309		0.0339		0.0348		0.0358	
N	39391		39391		39391		39391		39391		39391	

Table A9
Disposition Effect Logit Regressions: Prop Book only

This table shows the results of various logit models on the potential sale of securities. The analysis focuses on a subset of our data, which are the trades in the Proprietary trading book. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{ijt}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it},$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2	Model 3		Model 4		Model 5		Model 6	
Gain	0.1150			-0.1439		-0.1585		-0.1530		-0.2017	
	(0.1251)			(0.1396)		(0.1403)		(0.1405)		(0.1480)	
KTB				3.3577	***	3.3811	***	3.3765	***	3.3696	***
				(0.1951)		(0.2049)		(0.2050)		(0.2078)	
MSB				3.0852	***	2.9405	***	2.9388	***	2.9725	***
				(0.2221)		(0.2690)		(0.2691)		(0.2713)	
Other				Omitted		Omitted		Omitted		Omitted	
Short						Omitted		Omitted		Omitted	
Medium						-0.2143		-0.2121		-0.1984	
						(0.2314)		(0.2315)		(0.2323)	
Long						0.0092		0.0171		0.0272	
						(0.3432)		(0.3435)		(0.3453)	
MPC								-0.1456		-0.1397	
								(0.1744)		(0.1753)	
Negative Large										0.2977	
										(0.2454)	
Negative										0.6294	**
										(0.2461)	
No Move										Omitted	
Positive										0.5799	**
										(0.2408)	
Positive Large										0.6027	**
										(0.2343)	
Intercept	-2.3034	***		-4.0520	***	-3.8990	***	-3.8718	***	-4.3008	***
	(0.0942)			(0.1857)		(0.2424)		(0.2444)		(0.3025)	
R^2	0.0003			0.1565		0.1569		0.1571		0.1601	
N	2992			2992		2992		2992		2992	

Table A10
Disposition Effect Logit Regressions: RP Book only

This table shows the results of various logit models on the potential sale of securities. The analysis focuses on a subset of our data, which are the trades in the RP book. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{ijt}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it},$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Gain	-1.2021 ***		-1.0571 ***	-0.9805 ***	-1.0313 ***	-1.0766 ***
	(0.0918)		(0.0956)	(0.0959)	(0.0962)	(0.0978)
KTB			2.7898 ***	3.2016 ***	3.2231 ***	3.1900 ***
			(0.2396)	(0.2503)	(0.2497)	(0.2528)
MSB			1.4874 ***	1.1568 ***	1.1397 ***	1.1377 ***
			(0.2224)	(0.2232)	(0.2237)	(0.2242)
Other			Omitted	Omitted	Omitted	Omitted
Short				Omitted	Omitted	Omitted
Medium				-1.0702 ***	-1.0544 ***	-1.1542 ***
				(0.1067)	(0.1068)	(0.1095)
Long				-0.8680 **	-0.8408 **	-0.9139 **
				(0.4015)	(0.4024)	0.4014
MPC					0.7130 ***	0.7518 ***
					(0.0912)	(0.0922)
Negative Large						0.6362 ***
						(0.1915)
Negative						0.6521 ***
						(0.1591)
No Move						Omitted
Positive						0.4020 **
						(0.1565)
Positive Large						0.9179 ***
						(0.1609)
Intercept	-3.2760 ***		-3.4559 ***	-3.1394 ***	-3.3263 ***	-3.8240 ***
	(0.0745)		(0.0807)	(0.0835)	(0.0884)	(0.1522)
R^2	0.0040		0.0071	0.0103	0.0119	0.0130
N	36399		36399	36399	36399	36399

Table A11
Disposition Effect Logit Regressions: KTBs

This table shows the results of various logit models on the potential sale of securities. The analysis focuses on a subset of our data, which are bonds belonging to the Korea Treasury Bonds (KTBs) category. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + \epsilon_{ijt}$

(5) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + b_5MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + b_5MPC_{it} + b_{6,1}NegL_{it} + b_{6,2}Neg_{it} + b_{6,3}Pos_{it} + b_{6,4}PosL_{it} + \epsilon_{it},$

for security *i* at time *t*. All independent variables are binary, the definitions being similar to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3	Model 4		Model 5		Model 6	
Gain	-0.3909	**	-0.4015	**		-0.3925	**	-0.3748	**	-0.3805	**
	(0.1678)		(0.1684)			(0.1706)		(0.1713)		(0.1833)	
RP			-0.4372	*		-0.3830		-0.3751		-0.3810	
			(0.2460)			(0.2487)		(0.2497)		(0.2508)	
Short						Omitted		Omitted		Omitted	
Medium						0.4875		0.4951	*	0.5241	*
						(0.2991)		(0.2998)		(0.3009)	
Long						0.6373	*	0.6527	*	0.6777	*
						(0.3705)		(0.3715)		(0.3733)	
MPC								-0.4304	*	-0.4211	*
								(0.2204)		(0.2214)	
Negative Large										0.4339	
										(0.3029)	
Negative										0.6520	**
										(0.3248)	
No Move										Omitted	
Positive										0.4265	
										(0.3194)	
Positive Large										0.5015	*
										(0.2978)	
Intercept	-0.6118	***	-0.5425	***		-1.0112	***	-0.9483	***	-1.4034	***
	(0.1268)		(0.1322)			(0.3106)		(0.3124)		(0.4016)	
R^2	0.0078		0.0125			0.0175		0.0231		0.0294	
N	694		694			694		694		694	

Table A12
Disposition Effect Logit Regressions: MSBs

This table shows the results of various logit models on the potential sale of securities. The analysis focuses on a subset of our data, which are bonds belonging to the Monetary Stabilization Bonds (MSBs) category. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_5 MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_5 MPC_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it,}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. In addition to the bonds category, the maturity variables are not included in the regressions, as MSBs are short-term by definition (MSBs can only be issued up to 2 years). Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3	Model 4	Model 5		Model 6	
Gain	0.2337		-0.0349				-0.0274		-0.0408	
	(0.2267)		(0.2378)				(0.2392)		(0.2526)	
RP			-1.1992	***			-1.1921	***	-1.2078	***
			(0.2585)				(0.2597)		(0.2629)	
MPC							-0.0819		-0.0779	
							(0.2840)		(0.2870)	
Negative Large									0.4442	
									(0.4079)	
Negative									0.7767	**
									(0.3669)	
No Move									Omitted	
Positive									0.4073	
									(0.3850)	
Positive Large									0.7684	**
									(0.3800)	
Intercept	-1.6352	***	-1.0295	***			-1.0174	***	-1.4955	***
	(0.1612)		(0.1959)				(0.2003)		(0.3258)	
R^2	0.0020		0.0458				0.0459		0.0570	
N	530		530				530		530	

Table A13
Disposition Effect Logit Regressions: Other

This table shows the results of various logit models on the potential sale of securities. The analysis focuses on a subset of our data, which are bonds excluding KTBs and MSBs. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{ijt}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it,}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Gain	-0.9709	***	-0.9997	***			-0.9131	***	-0.9573	***	-1.0016	***
	(0.0946)		(0.0970)				(0.0974)		(0.0977)		(0.0992)	
RP			0.2265				-0.0641		-0.0684		-0.1072	
			(0.1836)				(0.1857)		(0.1859)		(0.1866)	
KTB												
MSB												
Other												
Short							Omitted		Omitted		Omitted	
Medium							-1.1285	***	-1.1150	***	-1.1979	***
							(0.1055)		(0.1056)		(0.1081)	
Long							-1.0424	**	-1.0292	**	-1.0965	**
							(0.5047)		(0.5049)		(0.5054)	
MPC									0.7562	***	0.7821	***
									(0.0911)		(0.0920)	
Negative Large											0.5415	***
											(0.1994)	
Negative											0.6339	***
											(0.1602)	
No Move											Omitted	
Positive											0.4582	***
											(0.1558)	
Positive Large											0.9323	***
											(0.1611)	
Intercept	-3.5319	***	-3.7226	***			-3.1078	***	-3.3109	***	-3.7759	
	(0.0780)		(0.1755)				(0.1816)		(0.1846)		(0.2190)	
R^2	0.0024		0.0025				0.0060		0.0077		0.0087	
N	38167		38167				38167		38167		38167	

Table A14
Disposition Effect Logit Regressions: Short-term Bonds

This table shows the results of various logit models on the potential sale of securities. The analysis focuses on a subset of our data, which are bonds belonging to the short-term (bonds with less than 2 years to maturity) category. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_5 MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_5 MPC_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it},$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4	Model 5		Model 6	
Gain	-0.9899	***	-0.7675	***	-0.6773	***		-0.7092	***	-0.7463	***
	(0.0941)		(0.0987)		(0.0996)			(0.0999)		(0.1011)	
RP			-1.4291	***	-0.6665	***		-0.6912	***	-0.7096	***
			(0.1218)		(0.1456)			(0.1454)		(0.1469)	
KTB					1.9493	***		1.9759	***	1.9029	***
					(0.3041)			(0.3045)		(0.3091)	
MSB					1.7731	***		1.7747	***	1.7806	***
					(0.1480)			(0.1478)		(0.1489)	
Other					Omitted			Omitted		Omitted	
MPC								0.5679	***	0.5742	***
								(0.0975)		(0.0982)	
Negative Large										0.2920	
										(0.2034)	
Negative										0.5292	***
										(0.1540)	
No Move										Omitted	
Positive										0.4118	***
										(0.1482)	
Positive Large										0.7622	***
										(0.1589)	
Intercept	-2.9094	***	-1.7913	***	-2.7045	***		-2.8267	***	-3.2124	***
	(0.0755)		(0.1122)		(0.1554)			(0.1568)		(0.1924)	
R^2	0.0050		0.0105		0.0173			0.0189		0.0202	
N	19848		19848		19848			19848		19848	

Table A15
Disposition Effect Logit Regressions: Medium-term Bonds

This table shows the results of various logit models on the potential sale of securities. The analysis focuses on a subset of our data, which are bonds belonging to the medium-term (bonds with 2~5 years to maturity) category. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_5MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_5MPC_{it} + b_{6,1}NegL_{it} + b_{6,2}Neg_{it} + b_{6,3}Pos_{it} + b_{6,4}PosL_{it} + \epsilon_{it,}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Gain	-1.3800	***	-0.5376	***	-0.5755	***			-0.5997	***	-0.6258	***
	(0.1218)		(0.1348)		(0.1429)				(0.1437)		(0.1515)	
RP			-2.3135	***	-0.2896				-0.2925		-0.3375	*
			(0.1322)		(0.2005)				(0.2002)		(0.2025)	
KTB					3.8488	***			3.8580	***	3.8451	***
					(0.1993)				(0.1989)		(0.2016)	
Other					Omitted				Omitted		Omitted	
MPC									0.3400	**	0.3581	**
									(0.1512)		(0.1520)	
Negative Large											0.6023	**
											(0.2621)	
Negative											0.8304	***
											(0.2649)	
No Move											Omitted	
Positive											0.3778	
											(0.2731)	
Positive Large											0.8311	***
											(0.2529)	
Intercept	-3.1494	***	-2.1351	***	-4.2870	***			-4.3547	***	-4.9154	***
	(0.0944)		(0.1007)		(0.2133)				(0.2154)		(0.3008)	
R^2	0.0059		0.0210		0.0456				0.0458		0.0466	
N	18870		18870		18870				18870		18870	

Table A16

Disposition Effect Logit Regressions: Long-term Bonds

This table shows the results of various logit models on the potential sale of securities. The analysis focuses on a subset of our data, which are bonds belonging to the long-term (bonds with more than 5 years to maturity) category. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_5 MPC_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_5 MPC_{it} + b_{6,1} NegL_{it} + b_{6,2} Neg_{it} + b_{6,3} Pos_{it} + b_{6,4} PosL_{it} + \epsilon_{it},$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Model 6 failed to converge, and the results are shown with warnings.

	Model 1		Model 2		Model 3		Model 4	Model 5		Model 6	
Gain	-1.2876	***	-0.6365		-0.6062			-0.6050		-0.8838	
	(0.4185)		(0.5012)		(0.5061)			(0.5093)		(0.5709)	
RP			-3.7349	***	-0.6073			-0.5676		-0.7253	
			(0.4649)		(0.7063)			(0.7119)		(0.7801)	
KTB					3.6714	***		3.7261	***	3.7199	***
					(0.8247)			(0.8319)		(0.8612)	
Other					Omitted			Omitted		Omitted	
MPC								0.5075		0.5170	
								(0.4949)		(0.5469)	
Negative Large										11.8521	
										(166.20)	
Negative										12.2920	
										(166.20)	
No Move										Omitted	
Positive										11.9342	
										(166.20)	
Positive Large										13.0429	
										(166.20)	
Intercept	-2.0223	***	-0.1633		-3.8563	***		-4.0411	***	-15.9382	
	(0.3547)		(0.4423)		(0.9411)			(0.9708)		(166.20)	
R^2	0.0118		0.1188		0.1366			0.1379		0.1580	
N	673		673		673			673		673	

Table A17
Disposition Effect Logit Regressions: MPC

This table shows the results of various logit models on the potential sale of securities. The analysis focuses on a subset of our data, which are observations that fall within a week before a MPC date, in which the central bank makes decisions regarding the target rate. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. All observations in this subset fall within a week before a MPC date. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + b_{6,1}NegL_{it} + b_{6,2}Neg_{it} + b_{6,3}Pos_{it} + b_{6,4}PosL_{it} + \epsilon_{it},$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Gain	-0.5210	***	-0.2499		-0.1694		-0.1142				-0.2416	
	(0.1582)		(0.1664)		(0.1699)		(0.1688)				(0.1745)	
RP			-1.2482	***	-0.3403		-0.5337	**			-0.5506	**
			(0.1657)		(0.2186)		(0.2251)				(0.2295)	
KTB					2.2744	***	2.5231	***			2.4627	***
					(0.2694)		(0.2854)				(0.2923)	
MSB					1.9281	***	1.4998	***			1.4488	***
					(0.2723)		(0.2813)				(0.2861)	
Other					Omitted		Omitted				Omitted	
Short							Omitted				Omitted	
Medium							-0.9735	***			-1.0813	***
							(0.1552)				(0.1580)	
Long							-0.3101				-0.3939	
							(0.4052)				(0.4101)	
Negative Large											1.1446	***
											(0.3319)	
Negative											1.2053	***
											(0.2705)	
No Move											Omitted	
Positive											1.0032	***
											(0.2606)	
Positive Large											1.5077	***
											(0.2624)	
Intercept	-3.1422	***	-2.2777	***	-3.3192	***	-2.8258	***			-3.7232	***
	(0.1416)		(0.1712)		(0.2410)		(0.2536)				(0.3321)	
R^2	0.0010		0.0059		0.0148		0.0194				0.0238	
N	9493		9493		9493		9493				9493	

Table A18
Disposition Effect Logit Regressions: non-MPC

This table shows the results of various logit models on the potential sale of securities. All observations in this subset do not fall within a week before a MPC date. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + \epsilon_{it}$

(6) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + b_{6,1}NegL_{it} + b_{6,2}Neg_{it} + b_{6,3}Pos_{it} + b_{6,4}PosL_{it} + \epsilon_{it,}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5	Model 6	
Gain	-1.4089	***	-0.9098	***	-0.9009	***	-0.8968	***		-0.9188	***
	(0.0857)		(0.0930)		(0.0951)		(0.0951)			(0.0969)	
RP			-1.8913	***	-0.4337	***	-0.5844	***		-0.6013	***
			(0.0948)		(0.1299)		(0.1339)			(0.1344)	
KTB					3.2305	***	3.5802	***		3.5747	***
					(0.1462)		(0.1604)			(0.1614)	
MSB					2.4844	***	2.0372	***		2.0390	***
					(0.1551)		(0.1623)			(0.1631)	
Other					Omitted		Omitted			Omitted	
Short							Omitted			Omitted	
Medium							-0.9869	***		-1.0082	***
							(0.1164)			(0.1176)	
Long							-0.7878	***		-0.8105	***
							(0.2832)			(0.2838)	
Negative Large										0.1549	
										(0.1707)	
Negative										0.3709	**
										(0.1544)	
No Move										Omitted	
Positive										0.2128	
										(0.1541)	
Positive Large										0.4651	***
										(0.1582)	
Intercept	-2.9577	***	-1.7986	***	-3.4249	***	-2.9142	***		-3.1400	***
	(0.0637)		(0.0765)		(0.1380)		(0.1491)			(0.1851)	
R^2	0.0081		0.0195		0.0380		0.0405			0.0408	
N	29898		29898		29898		29898			29898	

Table A19
Disposition Effect Logit Regressions: Negative Large Days

This table shows the results of various logit models on the potential sale of securities. The regressions are run on a subset of the data, when daily yield moves are greater than +2bps. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + \epsilon_{it}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6
Gain	-1.8562	***	-1.2834	***	-1.0500	***	-1.1285	***	-1.1366	***	
	(0.1944)		(0.2156)		(0.2211)		(0.2256)		(0.2255)		
RP			-1.6795	***	0.1126		0.0703		0.0763		
			(0.2091)		(0.2862)		(0.2882)		(0.2880)		
KTB					3.5022	***	3.5679	***	3.5569	***	
					(0.3067)		(0.3111)		(0.3106)		
MSB					2.7501	***	2.3267	***	2.3027	***	
					(0.3597)		(0.3997)		(0.4007)		
Other					Omitted		Omitted		Omitted		
Short							Omitted		Omitted		
Medium							-0.5861	**	-0.6024	**	
							(0.2561)		(0.2570)		
Long							-0.3377		-0.3573		
							(0.5843)		(0.5860)		
MPC									0.2248		
									(0.2662)		
Intercept	-2.6625	***	-1.7333	***	-3.9633	***	-3.5067	***	-3.5284	***	
	(0.1171)		(0.1440)		(0.3129)		(0.3648)		(0.3653)		
R^2	0.0187		0.0305		0.0600		0.0609		0.0610		
N	5090		5090		5090		5090		5090		

Table A20
Disposition Effect Logit Regressions: Negative Days

This table shows the results of various logit models on the potential sale of securities. The regressions are run on a subset of the data, when daily yield moves are between 0 and +2bps. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + b_5MPC_{it} + \epsilon_{it}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6
Gain	-0.7559	***	-0.3579	**	-0.2711		-0.2470		-0.2975	*	
	(0.1536)		(0.1662)		(0.1723)		(0.1716)		(0.1727)		
RP			-1.6939	***	-0.3889		-0.4989	**	-0.5017	**	
			(0.1770)		(0.2423)		(0.2505)		(0.2516)		
KTB					3.1627	***	3.5364	***	3.5961	***	
					(0.2922)		(0.3196)		(0.3219)		
MSB					2.5339	***	2.1558	***	2.1812	***	
					(0.2713)		(0.2814)		(0.2819)		
Other					Omitted		Omitted		Omitted		
Short							Omitted		Omitted		
Medium							-0.9168	***	-0.9322	***	
							(0.1916)		(0.1924)		
Long							-0.9397	*	-0.8843		
							(0.5471)		(0.5430)		
MPC									0.5618	***	
									(0.1717)		
Intercept	-3.2010	***	-2.0543	***	-3.5473	***	-3.1229	***	-3.2359	***	
	(0.1237)		(0.1546)		(0.2598)		(0.2769)		(0.2811)		
R^2	0.0027		0.0117		0.0289		0.0319		0.0331		
N	8293		8293		8293		8293		8293		

Table A21

Disposition Effect Logit Regressions: No Move Days

This table shows the results of various logit models on the potential sale of securities. The regressions are run on a subset of the data, when daily yield moves are zero. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + b_5MPC_{it} + \epsilon_{it}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6
Gain	-1.6085	***	-1.2768	***	-1.2337	***	-1.1932	***	-1.1875	***	
	(0.2091)		(0.2207)		(0.2258)		(0.2253)		(0.2256)		
RP			-1.4931	***	-0.5128	*	-0.8098	***	-0.7935	***	
			(0.2305)		(0.2829)		(0.3009)		(0.3018)		
KTB					3.0851	***	3.9877	***	3.9790	***	
					(0.3527)		(0.4339)		(0.4343)		
MSB					2.0514	***	1.5651	***	1.5609	***	
					(0.3328)		(0.3477)		(0.3479)		
Other					Omitted		Omitted		Omitted		
Short							Omitted		Omitted		
Medium							-1.6044	***	-1.6061	***	
							(0.3713)		(0.3719)		
Long							-15.0967		-15.0847		
							(749.70)		(751.90)		
MPC									-0.1767		
									(0.2709)		
Intercept	-3.0713	***	-2.0984	***	-3.2732	***	-2.6624	***	-2.6342	***	
	(0.1492)		(0.1900)		(0.2922)		(0.3190)		(0.3216)		
R^2	0.0087		0.0145		0.0274		0.0319		0.0320		
N	6172		6172		6172		6172		6172		

Table A22
Disposition Effect Logit Regressions: Positive Days

This table shows the results of various logit models on the potential sale of securities. The regressions are run on a subset of the data, when daily yield moves are between -2bps and zero. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1 Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1 Gain_{it} + b_2 RP_{it} + b_{3,1} KTB_i + b_{3,2} MSB_i + b_{4,1} Medium_{it} + b_{4,2} Long_{it} + b_5 MPC_{it} + \epsilon_{it}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6
Gain	-0.9941	***	-0.6692	***	-0.6324	***	-0.5438	***	-0.5407	***	
	(0.1525)		(0.1605)		(0.1648)		(0.1641)		(0.1650)		
RP			-1.7228	***	-0.7182	***	-1.0706	***	-1.1333	***	
			(0.1641)		(0.2221)		(0.2331)		(0.2331)		
KTB					2.7190	***	3.3609	***	3.3677	***	
					(0.2784)		(0.3179)		(0.3168)		
MSB					2.0514	***	1.5372	***	1.5130	***	
					(0.2887)		(0.2998)		(0.2998)		
Other					Omitted		Omitted		Omitted		
Short							Omitted		Omitted		
Medium							-1.4953	***	-1.4928	***	
							(0.2231)		(0.2231)		
Long							-1.3371	**	-1.3416	**	
							(0.5355)		(0.5411)		
MPC									0.6121	***	
									(0.1523)		
Intercept	-3.1897	***	-1.9771	***	-3.0798	***	-2.4437	***	-2.5864	***	
	(0.1275)		(0.1571)		(0.2351)		(0.2498)		(0.2525)		
R^2	0.0033		0.0110		0.0205		0.0256		0.0269		
N	11277		11277		11277		11277		11277		

Table A23

Disposition Effect Logit Regressions: Positive Large Days

This table shows the results of various logit models on the potential sale of securities. The regressions are run on a subset of the data, when daily yield moves are more negative than -2bps. The dependent variable *Sale* takes a value of 1 on days when there is a sale of a certain security, and 0 otherwise. Our model specifications are:

(1) $Sale_{it} = b_0 + b_1Gain_{it} + \epsilon_{it}$

(2) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + \epsilon_{it}$

(3) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + \epsilon_{it}$

(4) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + \epsilon_{it}$

(5) $Sale_{it} = b_0 + b_1Gain_{it} + b_2RP_{it} + b_{3,1}KTB_i + b_{3,2}MSB_i + b_{4,1}Medium_{it} + b_{4,2}Long_{it} + b_5MPC_{it} + \epsilon_{it}$

for security *i* at time *t*. All independent variables are binary, the definitions being identical to those in Table A8. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6
Gain	-1.1707	***	-0.5628	***	-0.8390	***	-0.8039	***	-0.9735	***	
	(0.1620)		(0.1781)		(0.1785)		(0.1792)		(0.1846)		
RP			-2.0619	***	-0.4986	**	-0.6520	***	-0.6253	***	
			(0.1608)		(0.2331)		(0.2400)		(0.2369)		
KTB					2.7816	***	2.8710	***	2.9493	***	
					(0.2561)		(0.2705)		(0.2698)		
MSB					2.5086	***	1.9801	***	2.0025	***	
					(0.2899)		(0.3054)		(0.3042)		
Other					Omitted		Omitted		Omitted		
Short							Omitted		Omitted		
Medium							-0.9179	***	-0.8929	***	
							(0.1701)		(0.1704)		
Long							0.1126		0.0846		
							(0.3711)		(0.3794)		
MPC									0.8492	***	
									(0.1573)		
Intercept	-2.6805	***	-1.4845	***	-2.9203	***	-2.3585	***	-2.5388	***	
	(0.1407)		(0.1581)		(0.2526)		(0.2725)		(0.2707)		
R^2	0.0051		0.0208		0.0369		0.0408		0.0439		
N	8434		8434		8434		8434		8434		

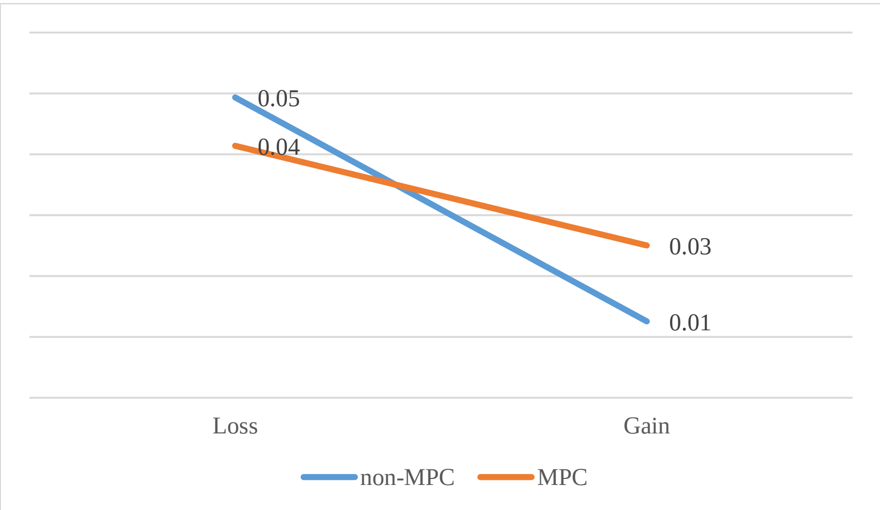
Table A25
The Disposition Effect: Interaction Models – Gain*MPC

This table shows the results of OLS and Logit regressions with *Sale* as the dependent variable and *Gain*, *MPC*, and the interaction term *Gain*MPC* as independent variables. Panel A shows OLS regression results, and Panel B shows logit regression results for the same model specifications. Panel C shows the predicted probabilities from of the dependent variable *Sale* for the Prop and RP books, from the logit regression. Standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Panel A: OLS	Prop		RP		Total	
Gain	0.0124		-0.0296	***	-0.0368	***
	(0.0122)		(0.0020)		(0.0022)	
MPC	-0.0182		-0.0045		-0.008	*
	(0.0206)		(0.0042)		(0.0045)	
Gain*MPC	-0.0042		0.0187	***	0.0204	***
	(0.0266)		(0.0045)		(0.0048)	
Constant	0.0942	***	0.0373	***	0.0494	***
	(0.0088)		(0.0019)		(0.0020)	
Adj.R^2	0.0001		0.0075		0.0081	
Observations	2992		36399		39391	

Panel B: Logit	Prop		RP		Total	
Gain	0.1370		-1.6103	***	-1.4089	***
	(0.1385)		(0.1111)		(0.0857)	
MPC	-0.2340		-0.1326		-0.1844	
	(0.2597)		(0.1951)		(0.1553)	
Gain*MPC	-0.0267		1.1934	***	0.8879	***
	(0.3276)		(0.2228)		(0.1799)	
Constant	-2.2637	***	-3.2513	***	-2.9578	***
	(0.1025)		(0.0821)		(0.0637)	
R^2	0.0012		0.0066		0.0070	
Observations	2992		36399		39391	

Panel C: Predicted Probability of *Sale*



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