Loss Aversion? What Loss Aversion? Some Surprising Evidence from the Art Market

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Abstract

Loss aversion -- the tendency of investors unduly to delay selling assets that show losses -- has become an important component of modern "prospect theory," the "disposition effect," and behavioral finance. A number of articles have provided empirical evidence -- primarily drawn from the securities markets and from real estate transactions -- in support of the loss-aversion phenomenon.

To our knowledge, there has been no empirical test of the loss aversion phenomenon in the art market. The art market, though, provides an interesting (albeit, unconventional) opportunity to test the loss-aversion phenomenon: There now exists a long data series -- the Mei-Moses art price database -- that is drawn from auction-house records of repeat sales over time of the same piece of art. This data series thus provides the reference-point information -- the prior and subsequent purchase/sale prices of an artwork -- that is the heart of any effort to examine loss aversion.

This paper uses the Mei-Moses art price database to examine the presence or absence of loss-aversion behavior in the art market. Contrary to the findings of the reported studies in the securities and real estate markets, we do not find loss aversion to be an important phenomenon in the art market: We find that the short-term roundtrip purchase-and-sales of artworks have an unusually large fraction of observations that involve losses, as compared with longer-term roundtrips. This pattern is inconsistent with the behavior that is usually associated with loss aversion. These results are found in simple graphical representations of roundtrip gains or losses plotted against the holding periods that separate the purchases and sales of the same pieces of art and are supported by logit and least-squares regression frameworks that control for background trends, the type of art, and the initial purchase price of the artwork itself.

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I. Introduction

Loss aversion -- the tendency of investors unduly to delay selling assets that show losses -- has become an important component of modern "prospect theory," the "disposition effect," and behavioral finance. A number of articles have provided empirical evidence -- primarily drawn from the securities markets and from real estate transactions -- in support of the loss-aversion phenomenon.[1]

To our knowledge, however, there has been no direct empirical test of the loss aversion phenomenon in the art market.[2] The art market, though, provides an interesting (albeit, unconventional) opportunity to test the loss-aversion phenomenon: There now exists a long data series -- the Mei-Moses art price database (see Mei and Moses, 2002) -- that is drawn from auction-house records of repeat sales over time of the same piece of art. This data series thus provides the reference-point information -- the prior and subsequent purchase/sale prices of an artwork -- that is

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[1] See the articles cited in Part II.

[2] Beggs and Grady (2009) find anchoring in art auctions. Although anchoring could be consistent with loss aversion, they do not test for loss aversion directly. Also, their sample sizes (76 Impressionist Art transactions and 34 Contemporary Art transactions) are considerably smaller than the 2,257 observations that we use for our main regressions.

the heart of any effort to examine loss aversion.

This paper will use the Mei-Moses art price database to examine the presence or absence of loss-aversion behavior in the art market. Contrary to the findings of the reported studies in the securities and real estate markets, we do not find loss aversion to be an important phenomenon in the art market: We find that the short-term roundtrip purchase-and-sales of artworks have an unusually large fraction of observations that involve losses, as compared with longer-term roundtrips. This pattern is inconsistent with the behavior that is usually associated with loss aversion. These results are found in simple graphical representations of roundtrip gains or losses plotted against the holding periods that separate the purchases and sales of the same pieces of art and are supported by a least-squares regression framework that controls for background trends, the type of art, and the initial purchase price of the artwork itself.

This paper will proceed as follows: Section II will provide a brief review of the loss aversion literature. Section III briefly describes the Mei-Moses art price data base that is the basis for our empirical investigation of loss aversion in the art market. Section IV lays out the roundtrip price patterns that would be expected in the absence of loss aversion and in the presence of loss aversion. Section V provides some initial graphical findings, specifies a more specific set of econometric tests, and provides the empirical results of those tests. And Section VI offers a brief conclusion.

II. Literature Review

As was noted in the introduction, loss aversion by investors underlies the "disposition effect" and "prospect theory". The disposition effect (see Constantinides, 1985; Odean, 1998a, 1998b; Schlarbaum, et al., 1978; and Shefrin and Statman, 1985) refers to the tendency of investors to sell stocks that have appreciated in value (winners) sooner than stocks that have declined in prices (losers). In an efficient market this type of behavior is not expected.

This effect is attributed to asymmetric risk attitudes depicted in prospect theory for gains and losses (Kahneman and Tversky, 1979). According to the value function of prospect theory, gains lead to risk aversion, while losses lead to risk seeking. Kahneman and Tversky elaborated further on behavior in the loss domain, suggesting that what guides people is "loss aversion," namely people are not ready to entertain losses and will eventually take higher risk to try to mitigate facing sure losses. Usually a stock's purchase price serves as a reference point for evaluating decisions. If trading by an investor follows the disposition effect, it implies that the investor's decision to sell a stock depends on the purchase price. However, the price paid for the stock is a sunk cost at the time of sale, and absent tax considerations should not affect the timing of sale of a rational investor. A similar effect was also noted in the exercise of options and futures (see Chen, et al., 1998; Heath, et al., 1999; and Heisler, 1994), and in the sale of residential condominium apartments (see Genesove and Mayer, 2001).

III. The Mei-Moses Art Price Data Base Study

The Mei-Moses art price database is drawn from repeat sales at auctions.[3] The database starts with all American, nineteenth-century and Old Master, Impressionist and Modern, and Postwar and Contemporary paintings sold at the main U.S. sales rooms of Sotheby's and Christie's (and their predecessor firms) from 1925 through 2005. Any repeat sale of a painting during this time period provides an initial "purchase" price and the subsequent "sale" price and thus a "roundtrip" data point. In addition, if a painting had listed in its provenance a prior public sale at any auction house anywhere, that earlier "purchase" transaction becomes the basis for an additional roundtrip data point. Some of the original purchase dates extend back to the seventeenth century.

The repeat-sale database contains continuous observations from 1871 onward and sufficiently numerous observations from 1875 onward to permit the compilation of an annual art price index from that year to the present (Mei and Moses, 2002). Through the end of 2005 there were 8,907 repeat-sale pairs in the Mei-Moses database.

Since each repeat-sale pair has the initial price, the subsequent price, and the dates of the two transactions – and it is the identical item that has been bought and then subsequently sold -- the database provides an excellent basis for testing for the presence of loss-aversion in the art market.

[3] The database, including its advantages and disadvantages, is more thoroughly described in Mei and Moses (2002). Other discussions of art auctions and repeat sales data can be found in Baumol (1986), Ashenfelter (1989), Goetzmann (1993), Pesando (1993), Ginsburgh and Jeanfils (1995), Pesando and Shum (1996, 2008), Frey et al. (1999), Ashenfelter et al. (2001), Ashenfelter and Graddy (2003), Ginsburgh et al. (2006), Beggs and Graddy (2009), Mandel (2009), and Goetzmann et al. (2009).

IV. Expectations for Roundtrip Price Patterns

Suppose that the prices for pieces of art follow the pattern that would be expected in an efficient securities market and that art buyers do not exhibit loss aversion. With art prices following a Markov process (random walk) with zero trend, then (subsequent to an initial purchase) we would expect to observe a pattern of a symmetric and increasing dispersion of the gains and losses on the eventual sale (i.e., the roundtrip) of the same item, depending on the duration of the time between purchase and sale. The average gains per positive roundtrip and average losses per negative roundtrip should increase with duration and, for any given duration, should be roughly equal (in absolute value) to each other. Also, the simple percentages of roundtrips that show gains or losses for any duration should be approximately equal to 50%. Equivalently, the average duration of all roundtrips that show gains should be approximately equal to the average duration of all roundtrips that show losses.

If instead art prices exhibit a positive trend (as the Mei-Moses index reveals), then the dispersion will be skewed toward more nominal gains than nominal losses. Still, the ratio of average roundtrip nominal gains to average roundtrip losses should be relatively constant over all durations (albeit at a higher absolute value than the 1:1 ratio expected when there is zero trend), as should the ratio of the simple count of those roundtrips that show nominal gains and those that show losses. Equivalently, the average duration of all roundtrips that show nominal gains should still be approximately equal to the average duration of all roundtrips that show losses.

Let us now suppose instead that art sellers are subject to loss aversion and a disposition effect. Let us further assume that the reference point for a potential seller is her purchase price. If the art market has zero trend, we would expect to observe subsequent sales prices – at least for short-run roundtrips – that primarily show gains and that rarely show losses (instead of the symmetric dispersion that would be observed in the absence of loss aversion). As the duration of the roundtrip increases, there are then two possibilities: (a) Some loss-averse purchasers may finally

decide to sell (or, subsequent to their death, the art may be sold in an estate sale, or an heir who is not guided by the initial purchase price as a reference point may sell), thus skewing observed prices for longer-duration roundtrips toward showing losses; (b) Alternatively, loss-aversion may simply lead to the permanent disappearance of an item from the market and thus the skewing of even long-duration roundtrips toward showing gains.[4] For ease of discussion, we will label the former possibility "delayed loss realization" (DLR) and the latter possibility "permanent loss avoidance" (PLA).

Accordingly, for DLR we would expect to observe a higher fraction of roundtrips showing gains versus losses in the short run versus the long run and also to observe a higher ratio of average roundtrip gains to average losses for shorter durations and a lower ratio for longer durations. The average duration of all roundtrips with losses should be longer than the average duration of all roundtrips showing gains, and the ratio of the average duration of roundtrips with gains to the average duration of roundtrips with losses should decline as duration increases. For PLA the simple ratio of the number of roundtrips showing gains divided by the number of roundtrips showing losses should be quite high and roughly constant over all durations, as should the ratio of average roundtrip gains to average losses; similarly, the average duration of all roundtrips showing gains should be approximately equal to the average duration of all roundtrips showing losses.[5]

If art prices exhibit an upward trend and purchasers are subject to loss aversion and use nominal purchase prices as their reference points, then under either DLR or PLA there would be even fewer roundtrips with observed losses for each time duration. Consequently, the patterns just

[4] Offsetting this latter tendency, however, could be a tendency for art pieces with rising value to be retained indefinitely over generations within a family or to be donated to museums that decide to retain the items permanently.

[5] In essence, when there is no underlying trend in art prices, the pattern of nominal gains and losses under PLA is similar to the pattern observed when there is a rising trend in art prices and no loss aversion.

described for a zero underlying price trend would still be expected to be observed but with yet a higher ratio of roundtrips with nominal gains to roundtrips with losses and also higher ratios of average nominal roundtrip gains to losses.

Table 1 summarizes the expected patterns for the various possibilities that have been described in the preceding paragraphs. A clear prediction of a model with loss aversion is that we would expect to observe few loss transactions in the short run and thus should observe a high ratio of the number of roundtrips showing gains to the number of roundtrips showing losses for the short-duration roundtrips; for the longer run this ratio may decline (for DLR) as owners grudgingly but finally sell their "dogs", or it may remain high (for PLA) as owners permanently hide their losers or in the presence of an upward trend in art prices that allow even "dogs" to be sold at a nominal gain. A similar pattern would be expected for the ratios of average gains on roundtrips to average losses on roundtrips.

V. Initial Findings and Some Econometric Tests

A. Some initial findings.

Figure 1 displays the pattern of nominal gains and losses (where the reference point is the original purchase price[6]) – represented as the log of the ratio of sales price to purchase price -- against length of roundtrip (in years) for all 8,907 roundtrip pairs in the Mei-Moses database through 2005. As is readily apparent, there are a surprisingly large number of short-term transactions that display nominal losses. Overall, 17.9% of the 8,907 roundtrip pairs in the Mei-Moses database show losses. Figure 2 displays the pattern for just the 8,103 pairs in the database with an initial purchase in 1925 or later;[7] in this sample, 18.0% show losses. In Figure 3, the sample instead is restricted to just those roundtrips of 10 years or less; of these 2,970 roundtrips, 35.4% show losses.[8]

An immediate potential objection to the use of this database for inferences concerning loss aversion should be addressed: It might be argued that significant numbers of roundtrips could involve a seller who was a different entity than the original buyer, and this different seller might not have the original purchase price as a reference point. This issue would arise most directly if the original purchaser/owner died and the subsequent sale was by the owner's estate (or the beneficiary of the estate). It could also be the case that the original purchaser sold the painting to a different owner in an interim transaction that was not recorded in the Mei-Moses database (recall that the Mei-Moses database covers only transactions that went through a major auction house, and the interim transaction could be a privately arranged sale to a dealer or simply to another owner); the

[6] Unless otherwise indicated, these data exclude sellers' commissions and buyers' fees.

[7] The data for 1925 and after cover all the observed transactions that involve roundtrips. The transactions that involve purchase dates before 1925 are included in the data base only if they also involved a sale after 1925. Thus the earlier transactions are "backward filled" and may have different properties from the post-1925 data, which is why we offer the post-1925 data separately.

[8] The roundtrip duration data in the sample have been clumped into six-month intervals.

second owner would likely not consider the original purchase price to be the reference point.[9] To guard against these possibilities, we "cleaned" the 10-year roundtrip database to exclude transactions where the seller appeared to be a different party from the original buyer. This cleaning also excluded any artworks where new information about the provenance of the artwork subsequent to its purchase might cause the owner to have a different reference point.[10] This database cleaning reduced the sample size to 2,257 roundtrip observations, of which 35.1% were losses. These single-owner roundtrip data are portrayed in Figure 4 and will be the primary database that we use in our subsequent analyses.

Table 2 provides a more detailed examination of the data portrayed in Figure 4. As can be seen, over half of the very short-term transactions – the roundtrips that are concluded within a year – entailed losses. After the first year, the percentages of roundtrips of longer durations that entail losses are in the 30-40% range, with a modest downward trend as the duration grows. Similarly the geometric mean of the ratio of sales price to purchase price tends to grow with longer duration. These trends are surely due to the general upward trend of the art market. As we have noted above, the Mei-Moses index shows a substantial positive long-term upward trend for both the 1875-2005 period and for the more recent 1925-2005 period. The average annual increase for the longer period was 4.6%; for the more recent period, it was 8.1%.

This pattern of substantial percentages of loss transactions – and shorter-term loss transactions that exceed the percentages in later years -- is extremely difficult to reconcile with any

[9] But note that for a loss to be registered on the roundtrip in the Mei-Moses database, either the original owner or the subsequent owner (or both) would have had to have sold the painting at a loss – contrary to the loss aversion hypothesis.

[10] This new reference point might make it easier for a loss-averse investor to absorb the nominal loss relative to the original purchase price by saying to herself, in essence, "It's clear to me – and to the rest of the world -- that I made a mistake in buying this painting. There's no hiding that fact, so I might as well sell now." In addition, because our subsequent analysis will use the Mei-Moses index, whose initial year is 1875, we excluded an additional 36 observations for which the year of initial purchase preceded 1875.

notion of loss aversion.

This upward trend should skew the overall pattern of transactions toward showing nominal gains rather than losses; but there is no reason to believe that the trend should lead to the patterns just described.

The data that are described in Figures 1 through 4 and in Table 2 plot gains and losses against roundtrip duration using just nominal sales prices. If transactions costs -- sellers' commissions and buyers' fees, which (arguably) could be included in the reference prices that would influence loss aversion behavior -- were subtracted from these gains and losses, then the pattern would become even more heavily weighted toward showing short-term losses and thus is even more contrary to a loss-aversion pattern. And, of course, if price-index trends were also incorporated into what would be considered a (trend-corrected) gain or loss, yet more losses would appear.

B. A formal econometric test.

To investigate this matter further, we estimated the following regressions:

(1) GAINDUM = f(YEARSHELD, PURCHP, TYPEDUM, TREND, ARTINDEXRAT)

(2) SALEP/PURCHP = f(YEARSHELD, PURCHP, TYPEDUM, TREND, ARTINDEXRAT),

where:

GAINDUM = a binary variable that takes the value of 1 if the roundtrip transaction showed a gain, and 0 otherwise;[11]

SALEP/PURCHP = the ratio of the roundtrip sale price to the purchase price of an artwork; so that the ratio is symmetric for gains and losses, the log of the ratio is used;

YEARSHELD = The duration of the holding period; i.e., the amount of time between the purchase date and the sale date (rounded to the nearest half year);

[11] In the relatively few instances in which the sale price is exactly equal to the purchase price, the transaction is counted as a "gain".

PURCHP = the initial purchase price of the piece of art, expressed in logs;

TYPEDUM = a set of 1,0 dummy variables indicating the type (category) of the piece of art; the four categories are Old Masters (base case), American, Impressionist, and Post-War (e.g., $TYPEDUM_{AM}$ represents all American paintings);

ARTINDEXRAT = the ratio of the Mei-Moses price index in the sale year to the Mei-Moses index in the purchase year, expressed in logs; and

TREND = the year in which the sale occurs.

The variable YEARSHELD is the primary explanatory variables of interest.

We recognize that YEARSHELD variable may be endogenous: If purchasers are subject to loss aversion, the timing of sales will depend on whether a gain or loss is expected. However, this potential loss-aversion endogeneity (under "permanent loss avoidance") should bias the coefficient on the YEARSHELD variable to be positive, since only non-negative roundtrip transactions should be observed; or the potential endogeneity (under "delayed loss realization") could bias the coefficient to be negative, since the shorter duration roundtrips should be positive and the longer duration roundtrips should be negative. Neither version of the potential endogeneity should create the expectation of a zero coefficient.

The remaining RHS variables are, in essence, control variables. PURCHP controls for the initial purchase price of the artwork. If a buyer initially overpaid for his/her artwork, this would make a loss-sale (or a reduced gain) more likely. TYPEDUM allows us to take into account any special characteristics that might apply to the four broad categories of artworks indicated. ARTINDEXRAT allows us to correct for the underlying trend in the art market between the time of purchase and the time of sale. TREND allows us to take into account the year of the sale and thus any secular trends that might be present.

Table 3 provides the descriptive statistics for these variables.

We estimate equation (1) with a simple bivariate logit estimation (the coefficients that are

reported are the marginal effects) and equation (2) with ordinary least squares (OLS). In order to allow the Mei-Moses art index to be used (ARTINDEXRAT), we restrict the sample to those observations where the initial purchase occurred in 1875 or later; fortunately, this causes the loss of only one observation from the data that were described in Table 2.

C. The econometric results.

Table 4 provides the regression results of the estimation of Equations (1) and (2). As can be seen, the coefficients on the YEARSHELD variable are insignificantly different from zero in both regressions. These insignificantly-different-from-zero coefficients are difficult to reconcile with loss aversion behavior. As was explained above, loss aversion behavior should yield either positive or negative coefficients, but not zero coefficients.

The coefficients on the remaining variables are all highly significant. As expected, the coefficient on the initial purchase price (PURCHP) is negative: A higher initial purchase price reduces the likelihood and amount of the roundtrip gain.[12] The three TYPE coefficients all show significant positive deviations from the Old Masters base case. As expected, the size of the Mei-Moses price index gain during the period of the roundtrip exerts a positive influence on the likelihood and size of the roundtrip gain of the transaction itself. And the time trend also exerts a positive influence on the likelihood and the size of the roundtrip gain.

D. Robustness tests.

This section offers some robustness tests that support the basic results.

1. Replace YEARSHELD with YH dummy variables.

In our first set of robustness tests, we replace the YEARSHELD variable with a set of 0-1

[12] We recognize that, at least for the second regression, this negative coefficient could also be influenced by the presence of PURCHP in the denominator of the dependent variable. But this kind of linkage cannot explain the highly significant coefficient in the first regression.

dummy variables (YH_{t-t+1}) that represent the duration (in years) of the roundtrip over an interval (e.g., YH_{1-2} represents all transactions with a roundtrip duration of 1-2 years). This is to check against the possibility that the coefficient on the YEARSHELD variable might be masking some significant annual variations.

As can be seen in Table 5, when we replace YEARSHELD with the YH dummy variables, all of the coefficients on these dummy variables are insignificantly different from zero. The coefficients on the other variables remain quite similar to their values in Table 4.

2. Include pre-sale estimate as an explanatory variable.

It might be the case that sellers who sold at a loss were surprised and had not expected to experience a loss. Before directly testing this possibility, we note that sellers could always protect themselves by establishing a reserve price below which the painting would not be allowed to sell.

Nevertheless, we can test whether this "surprise factor" is important. Beginning in 1973 the auction houses have been providing pre-sale "low" and "high" price estimates for most art auctions. There were 1,928 sales transactions in our database that occurred in 1973 or later, of which 1,884 sales transactions (97.7%) had pre-sales estimates. As can be seen in Table 6, of these 1,884 sales transactions, 612 involved a roundtrip loss for the seller. Of those 612 roundtrip loss transactions, for 575 (94.0%) transactions the "low" pre-sale estimate was below the original purchase price; the median value for the ratio (R_L) of the low estimate to the original purchase price was 0.61, and the mean of this ratio was also 0.61. As another way of "slicing" these data, consider that there were 1,012 (= 575 + 437) roundtrip transactions in which R_L was below 1.0, and of these roundtrips 56.8% experienced losses. Accordingly, it seems unlikely that the sellers who experienced roundtrip losses could have been wholly surprised by these losses.

As a further test, we included alternative ratio measures of the pre-sale estimates to the original purchase price – using the "low" estimate (R_L), the "high" estimate (R_H), and the

average of the two ($R_{HL)}$ – as alternative explanatory variables in our regressions. The results are found in Table 7. As can be seen, the basic outcomes do not change.

3. OLS regression for GAINDUM.

In place of the logit regression that has GAINDUM as its dependent variable, we ran a simple OLS ("linear probability") regression. As can be seen in Table 8, the coefficient on YEARSHELD becomes statistically significant but is a small -0.7% per year, or a negative 7% over the maximum 10-year holding period in our sample. All of the other coefficients remain largely unchanged.

4. Compare our "cleaned" regression results with regressions that are run on the heretofore excluded data points.

Recall that we "cleaned" our sample by excluding observations where there appeared to be a change of owner or a death/estate sale or there appeared to be a change in provenance of the painting, because such changes might eliminate the purchase price as the reference point. As a final robustness check, we make use of these heretofore excluded transactions. Since these excluded transactions are unlikely to exhibit loss aversion, and since our findings thus far indicate an absence of loss aversion in our "cleaned" sample, we would expect that regressions that are run on these heretofore excluded data points should look similar to our primary regressions in Table 4.

In Table 9 we show the results for the regressions that are run over the previously excluded observations, as well as for our primary regression results from Table 4. As can be seen, the coefficient on the crucial variable – YEARSHELD – is insignificantly different from zero in these new regressions, just as was true for our primary regressions. The coefficients on the continuous variables are roughly similar for the two samples; but the coefficients on the TYPEDUM variables are insignificant in the new regressions, whereas they are highly significant in our primary regressions. A Chow F-test for the Ln(SALEP/PURCHP) regressions, and a similar F-test for the logit regressions, indicate that the two samples are significantly different (which supports our

decision to focus our efforts on the cleaned sample); this result is clearly driven (at least for the OLS regressions) by the differing coefficients on the TYPEDUM variables.

V. Conclusion

As this paper has demonstrated, loss aversion does not seem to be present in the art market. This conclusion is revealed by the straightforward observation of the pattern of a surprisingly large number of sales transactions that involve losses for the sellers, even before transactions costs are taken into account. This conclusion is further supported by regressions in which the probability of a gain or a loss, or the log of the ratio of the sale price/purchase price, against the number of years that a painting was held, controlling for other possible influences, yields coefficients that are insignificantly different from zero. Robustness checks support this conclusion.

A puzzle now arises: Why is loss aversion absent in the art market, when it appears to be present in securities and housing markets? Perhaps the nature of most art transactions – involving investments by wealthy individuals, with the use of discretionary funds – makes it easier for art buyers to acknowledge financial mistakes, and to move on? Perhaps buyers recognize that they have gotten some use value from the art and are thereby more willing to sell at a loss (as is typical, say, in the automobile market)? Perhaps the art collecting process itself is what brings utility to investors; although selling at a loss is surely less desirable than selling at a gain, the loss transaction nevertheless allows the redeployment of the funds for new objects. We offer these conjectures but recognize that addressing them would require a wholly different set of tests, perhaps with a different data set. We leave for future research by ourselves and others a more complete exploration of these ideas and alternatives that can better explain the findings of this paper.

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Table 1: Predictions for the Patterns of Roundtrip Gains and Losses in the Art Market

		Random walk with zero trend			Random walk with positive trend		
Gain and loss categories		**Absence of loss aversion**	**Delayed loss realization**	**Permanent loss avoidance**	**Absence of loss aversion**	**Delayed loss realization**	**Permanent loss avoidance**
Number of roundtrips with gains; number of roundtrips with losses		Approximately equal to each other for all durations	Higher ratio of roundtrips showing gains to roundtrips showing losses for shorter durations; lower ratio for longer durations	Number of roundtrips with gains exceeds the number of roundtrips with losses at all durations; ratio is constant over all durations	Number of roundtrips with gains exceeds the number of roundtrips with losses at all durations; ratio is constant over all durations	Higher ratio of roundtrips showing gains to roundtrips showing losses for shorter durations; lower ratio for longer durations	Number of roundtrips with gains exceeds the number of roundtrips with losses at all durations; ratio is constant over all durations
Average roundtrip gains; average roundtrip losses		Both increase with duration; approximately equal to each other for all durations	Higher ratio of average roundtrip gains to losses for shorter durations; lower ratio for longer durations	Both increase with duration; average gains exceed average losses at all durations; ratio is constant over all durations	Both increase with duration; average gains exceed average losses at all durations; ratio is constant over all durations	Higher ratio of average roundtrip gains to losses for shorter durations; lower ratio for longer durations	Both increase with duration; average gains exceed average losses at all durations; ratio is constant over all durations
Average duration of roundtrips with gains; average duration of roundtrips with losses		Approximately equal to each other at all durations	Ratio may be above or below 1.0; ratio declines as duration increases	Approximately equal to each other at all duration	Approximately equal to each other at all durations	Ratio may be above or below 1.0; ratio declines as duration increases	Approximately equal to each other at all duration

Table 2: Roundtrip Gains and Losses, Single-Owner Ten-Year Holding Period

Holding period	Number of roundtrip transactions	% of roundtrips showing losses	Geometric average of sales price/purchase price
Less than 1 year	118	52.5%	0.916
1-2 years	132	37.9	1.063
2-3 years	187	38.0	1.115
3-4 years	274	40.9	1.156
4-5 years	235	38.3	1.262
5-6 years	241	34.4	1.265
6-7 years	233	28.8	1.408
7-8 years	264	32.2	1.491
8-9 years	295	31.9	1.415
9-10 years	279	28.0	1.646
0-10 years	2258	35.1%	1.302

Table 3: Descriptive Statistics

Variable	Mean	St. dev.	Median	Min	Max
GAINDUM	0.65	0.48	1.00	0.00	1.00
SALEP/PURCHP	1.94	5.00	1.25	0.08	185.26
YEARSHELD	5.9	2.70	6.0	0.5	10.0
PURCHP	$250,054	$972,216	$35,200	$12.50	$22,552,500
$TYPEDUM_{Am}$	0.17	0.38	0.00	0.00	1.00
$TYPEDUM_{Imp}$	0.39	0.49	0.00	0.00	1.00
$TYPEDUM_{P\text{-}W}$	0.12	0.32	0.00	0.00	1.00
ARTINDEXRAT	1.50	0.80	1.34	0.42	6.17
Sample size = 2,257 obs.					

Table 4: Regressions with YEARSHELD
(z- and t-statistics in parentheses; marginal coefficients for logit)

Dependent variable:		GAINDUM		Ln (SALEP/PURCHP)
Estimation method:		Logit		OLS
Constant		-		-20.76***
				(9.50)
YEARSHELD		-0.002		0.004
		(0.46)		(0.70)
Ln (PURCHP)		-0.06***		-0.11***
		(7.91)		(12.19)
$TYPEDUM_{Am}$		0.17***		0.22***
		(7.00)		(5.64)
$TYPEDUM_{Imp}$		0.11***		0.17***
		(4.48)		(5.25)
$TYPEDUM_{P-W}$		0.16***		0.42***
		(5.78)		(8.96)
Ln (ARTINDEXRAT)		0.55***		0.89***
		(17.00)		(27.43)
TREND		0.01***		0.01***
		(6.73)		(9.57)
		Pseudo R^2 0.20		Adj. R^2 0.36
n		2,257		2,257

*** significant at the 1% level

Table 5: Regressions with YH Dummy Variables
(z- and t-statistics in parentheses; marginal coefficients for logit)

Dependent variable:	GAINDUM	Ln (SALEP/PURCHP)
Estimation method:	Logit	OLS
Constant	-	-20.76***
		(9.50)
YH_{1-2}	0.08	0.02
	(1.58)	(0.26)
YH_{2-3}	0.05	-0.004
	(0.99)	(0.05)
YH_{3-4}	0.01	0.03
	(0.12)	(0.50)
YH_{4-5}	-0.001	0.06
	(0.20)	(0.90)
YH_{5-6}	-0.05	-0.08
	(0.79)	(1.07)
YH_{6-7}	0.02	0.001
	(0.39)	(0.02)
YH_{7-8}	-0.02	0.04
	(0.39)	(0.51)
YH_{8-9}	0.04	0.04
	(0.88)	(0.54)
YH_{9-10}	0.02	0.05
	(0.39)	(0.71)
Ln (PURCHP)	-0.06***	-0.11***
	(8.01)	(12.28)
$TYPEDUM_{Am}$	0.17***	0.23***
	(7.05)	(5.72)
$TYPEDUM_{Imp}$	0.11***	0.17***
	(4.38)	(5.26)
$TYPEDUM_{P-W}$	0.16***	0.41***
	(5.62)	(8.87)
Ln (ARTINDEXRAT)	0.55***	0.89***
	(17.00)	(27.47)
TREND	0.01***	0.01***
	(6.72)	(9.60)
	Pseudo R^2 0.20	Adj. R^2 0.36
n	2,257	2,257

*** significant at the 1% level

Table 6: Art Auctions in Which There Are Pre-Sale Estimates

	Sales with Losses	Sales with Gains
Number of sales	612	1272
Number of sales where $R_L < 1.0$	575	437
Median R_L	0.61	1.16
Mean R_L	0.61	1.79
Range of R_L	0.03-1.76	0.09-105.3

Note: R_L = low estimate/original purchase price

Table 7: Regressions Where Pre-Sale Estimates Are Available
(z- and t-statistics in parentheses; marginal coefficients for logit)

Dependent variable:	GAINDUM			Ln(SALEP/PURCHP)		
Regression method:	Logit			OLS		
Constant	-	-	-	-18.60*** (6.70)	-17.21*** (-6.25)	-16.34*** (5.93)
YEARSHELD	0.0004 (0.10)	0.0004 (0.10)	0.0002 (0.04)	-0.0002 (0.06)	-0.001 (0.14)	-0.001 (0.17)
Ln (PURCHP)	-0.02 2.46)	-0.02** (2.15)	-0.01** (2.06)	-0.03*** (5.64)	-0.03*** (5.16)	-0.03*** (4.91)
$TYPEDUM_{Am}$	0.11*** (5.03)	0.10*** (4.60)	0.10*** (4.38)	0.11*** (4.16)	0.10*** (3.72)	0.09*** (3.47)
$TYPEDUM_{Imp}$	0.07*** (2.80)	0.08*** (3.37)	0.09*** (3.78)	0.06*** (2.58)	0.08*** (3.46)	0.09*** (4.12)
$TYPEDUM_{P-W}$	0.09*** (3.53)	0.10*** (4.04)	0.10*** (4.38)	0.15*** (5.01)	0.16*** (5.59)	0.18*** (6.06)
Ln (ARTINDEXRAT)	0.17*** (4.91)	0.16*** (4.65)	0.16*** (4.71)	0.22*** (8.42)	0.21*** (8.15)	0.22*** (8.31)
TREND	0.01*** (3.30)	0.01*** (3.11)	0.01*** (2.93)	0.01*** (6.85)	0.001*** (6.34)	0.01*** (5.93)
Ln (R_L)	0.61*** (18.00)	-	-	0.82*** (53.05)	-	-
Ln (R_{HL})	-	0.62*** (18.09)	-	-	0.83*** (53.77)	-
Ln (R_H)	-	-	0.61*** (18.09)	-	-	0.83*** (53.24)
Pseudo R^2	0.44	0.45	0.44	-	-	-
Adj. R^2	-	-	-	0.75	0.75	0.75
n	1,844	1,844	1,844	1,844	1,844	1,844

*** significant at the 1% level
** significant at the 5% level

Table 8: OLS Regression for GAINDUM
(t-statistics in parentheses)

Dependent variable:		GAINDUM
Estimation method:		OLS
Constant		-12.17***
		(8.29)
YEARSHELD		-0.007
		(2.02)
Ln (PURCHP)		-0.05***
		(8.64)
$TYPEDUM_{Am}$		0.16***
		(6.19)
$TYPEDUM_{Imp}$		0.09***
		(3.90)
$TYPEDUM_{P\text{-}W}$		0.15***
		(4.82)
Ln (ARTINDEXRAT)		0.42***
		(19.36)
TREND		0.01***
		(8.69)
		Adj. R^2 0.22
n		2,257

*** significant at the 1% level

Table 9: Regressions on Previously Excluded Observations, as Well as Original Sample
(z- and t-statistics in parentheses; marginal coefficients for logit)

Dependent variable:	GAINDUM		Ln(SALEP/PURCHP)	
Estimation method:	Logit		OLS	
Data sample:	Previously excluded obs.	Original sample	Previously excluded obs.	Original sample
Constant	-	-	-6.32**	-20.76***
			(2.05)	(9.50)
YEARSHELD	-0.01	-0.002	-0.002	0.004
	(1.39)	(0.46)	(0.16)	(0.70)
Ln (PURCHP)	-0.004	-0.06***	-0.06***	-0.11***
	(0.36)	(7.91)	(3.75)	(12.19)
$TYPEDUM_{Am}$	0.03	0.17***	-0.04	0.22***
	(0.40)	(7.00)	(0.04)	(5.64)
$TYPEDUM_{Imp}$	0.06	0.11***	0.10	0.17***
	(1.19)	(4.48)	(1.34)	(5.25)
$TYPEDUM_{P-W}$	0.11	0.16***	0.06	0.42***
	(1.59)	(5.78)	(0.52)	(8.96)
Ln (ARTINDEXRAT)	0.62***	0.55***	1.11***	0.89***
	(10.72)	(17.00)	(16.63)	(27.43)
TREND	0.001	0.01***	0.003**	0.01***
	(0.89)	(6.73)	(2.14)	(9.57)
Pseudo R^2	0.19	0.20		
Adj. R^2			0.33	0.36
n	676	2,257	676	2,257

*** significant at the 1% level
** significant at the 5% level

Figure 1: Log(SalePrice/PurchPrice) against Holding Period (complete Mei-Moses sample, 1875-2005)

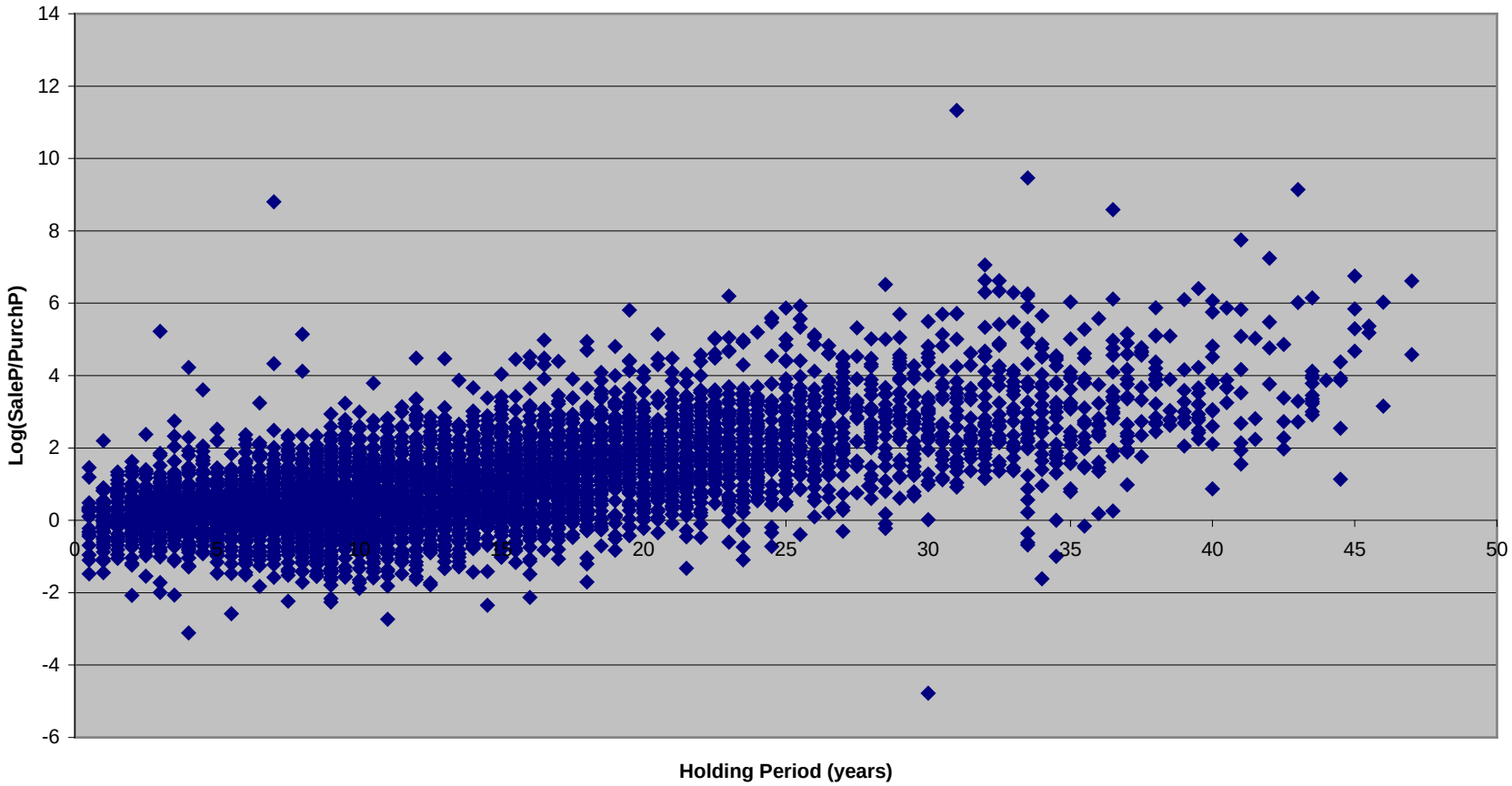

Figure 2: Log(SalesPrice/PurchasePrice) against Holding Period (Mei-Moses sample 1925 onward)

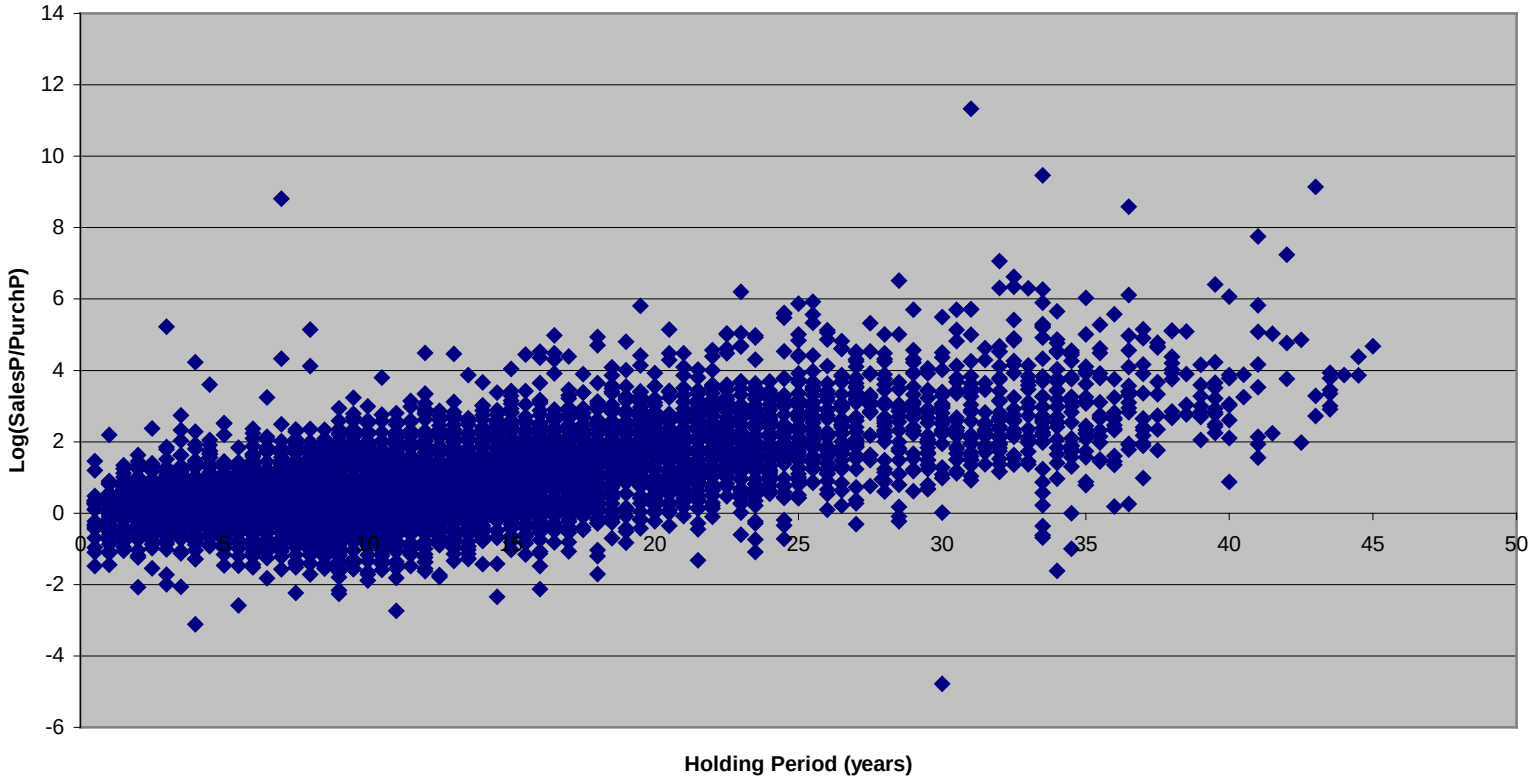

Figure 3: Log (SalesP/PurchaseP) against holding period, Mei-Moses 10-year-or-less holding period, all observations

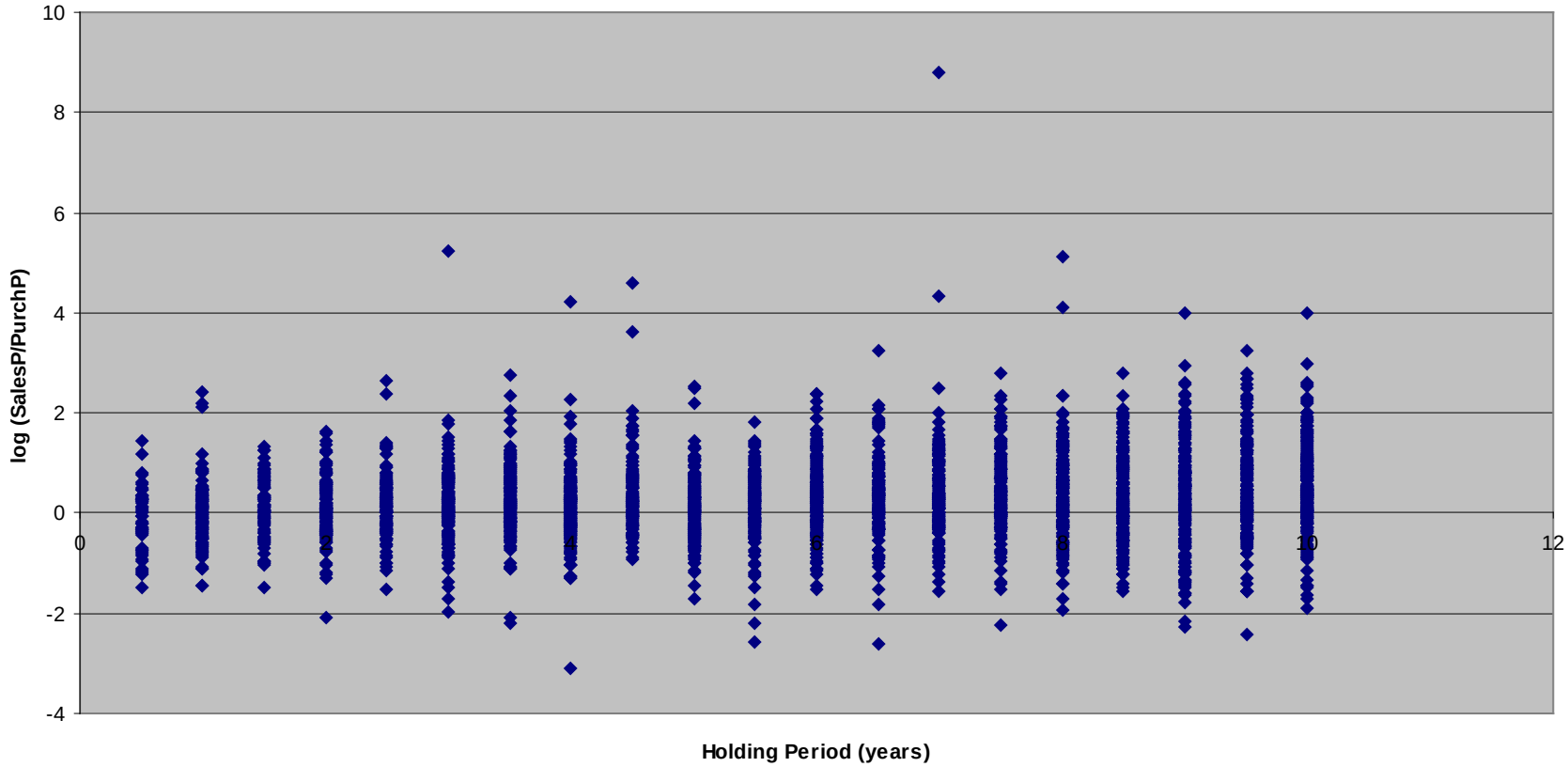

Figure 4: Log (SalesP/PurchaseP) against holding period, Mei-Moses 10-year-or-less holding period, single owner