The Portfolio-Driven Disposition Effect

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The Portfolio-Driven Disposition Effect

Engelberg, Henriksson, and Williams

One Slide Overview of Paper

Motivation

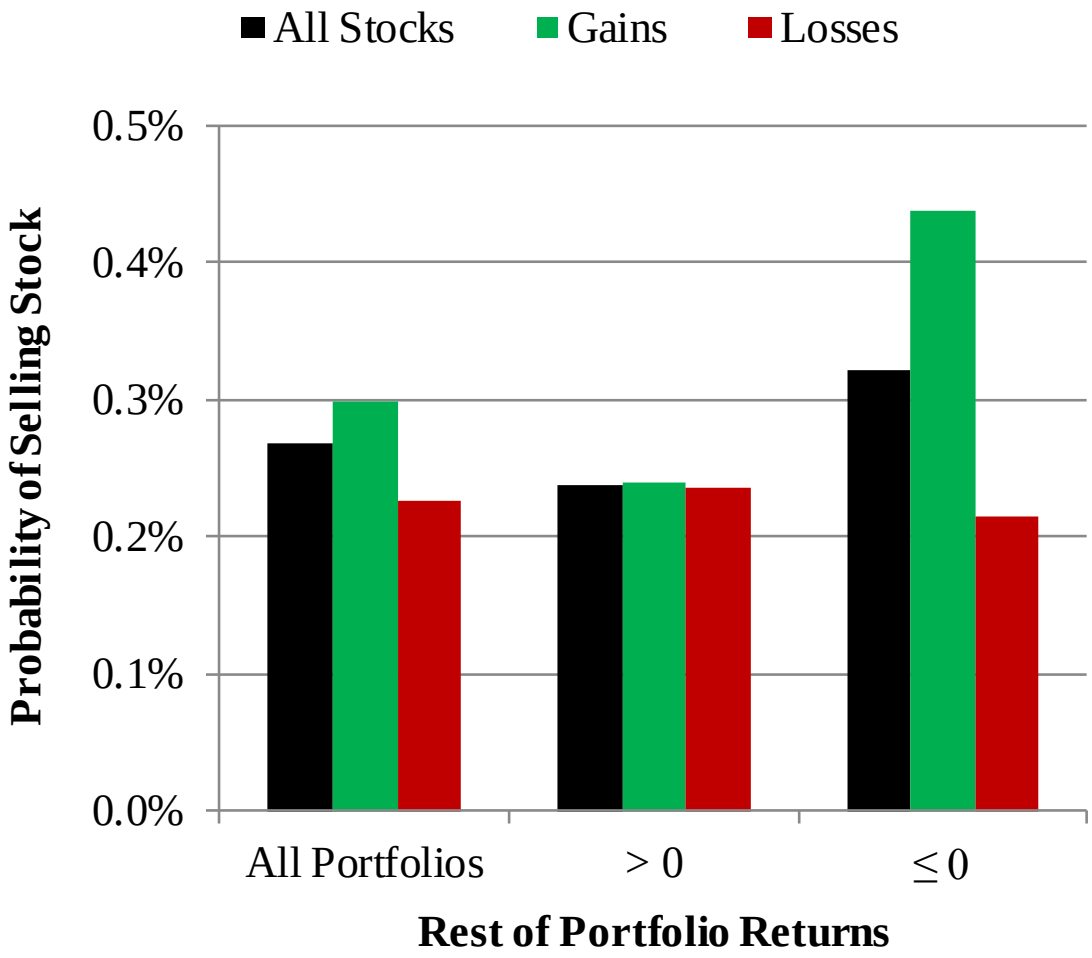
Data and Methodology

The Portfolio-Driven Disposition Effect

Possible Explanations

Concluding Remarks

Paper in One Picture



The Disposition Effect

The "disposition effect": Investors are more likely to sell a stock if it is at a gain than if it is at a loss (Shefrin and Statman, 1985)

One of the most robust phenomena in trading behavior:

- US retail stock investors (Odean, 1998)
- foreign retail investors (Grinblatt and Keloharju, 2001)
- institutional investors (Shapira and Venezia, 2001)
- homeowners (Genesove and Mayer, 2001)
- corporate executives (Heath, Huddart, and Lang, 1999)
- laboratory experiments (Frydman, Hartzmark, and Solomon, 2018)

Our Basic Question

Is the disposition effect affected by the performance of the investor's portfolio?

- Researchers have hypothesized that investors derive utility over "paper gains/losses" (e.g., Barberis and Huang, 2001) and "realized gains/losses" (e.g., Barberis and Xiong, 2009; 2012)
- If investors derive utility over both sources of gains, then the disposition effect will likely be related to the performance of the investor's portfolio
  - If an investor's portfolio is down, she will have low utility due to her paper losses
  - She might therefore be eager to get a burst of realization utility by realizing a gain

Data

We use the large discount brokerage data analyzed by Barber and Odean (2000)

- $\sim$78,000 households and $\sim$158,000 accounts between 1991 and 1996

Unit of observation: (account, stock, date) triple

- Restrict attention to:
  - common stocks that can be merged to CRSP
  - (account, date) pairs such that the account has at least two common stocks on the given date

- Primary dataset sample size: $\sim$103 million obs
- "Sale conditioned dataset":
  - restrict attention to (account, days) such that the account sold stock on the given date
  - sample size: $\approx$ 1.4 million observations

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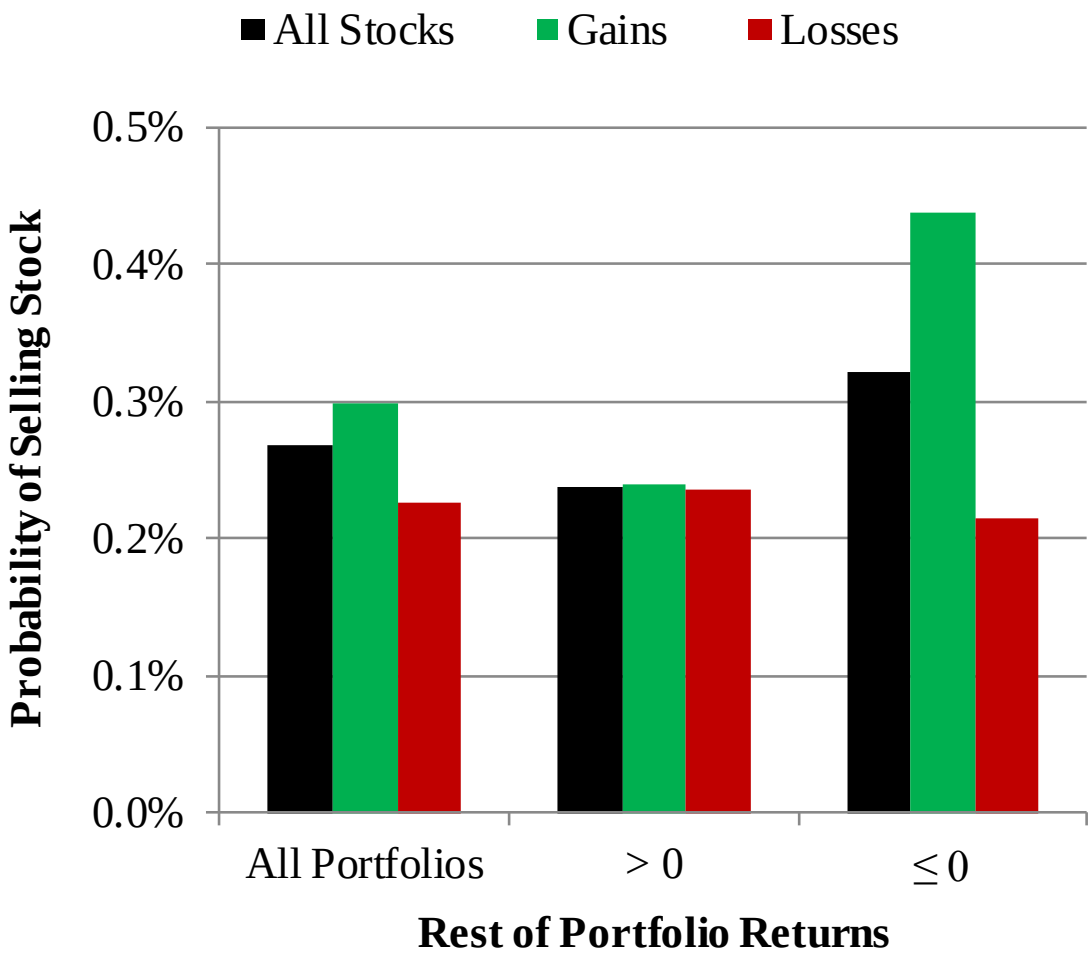
Portfolio-Driven Disposition Effect (Unconditional Sample)



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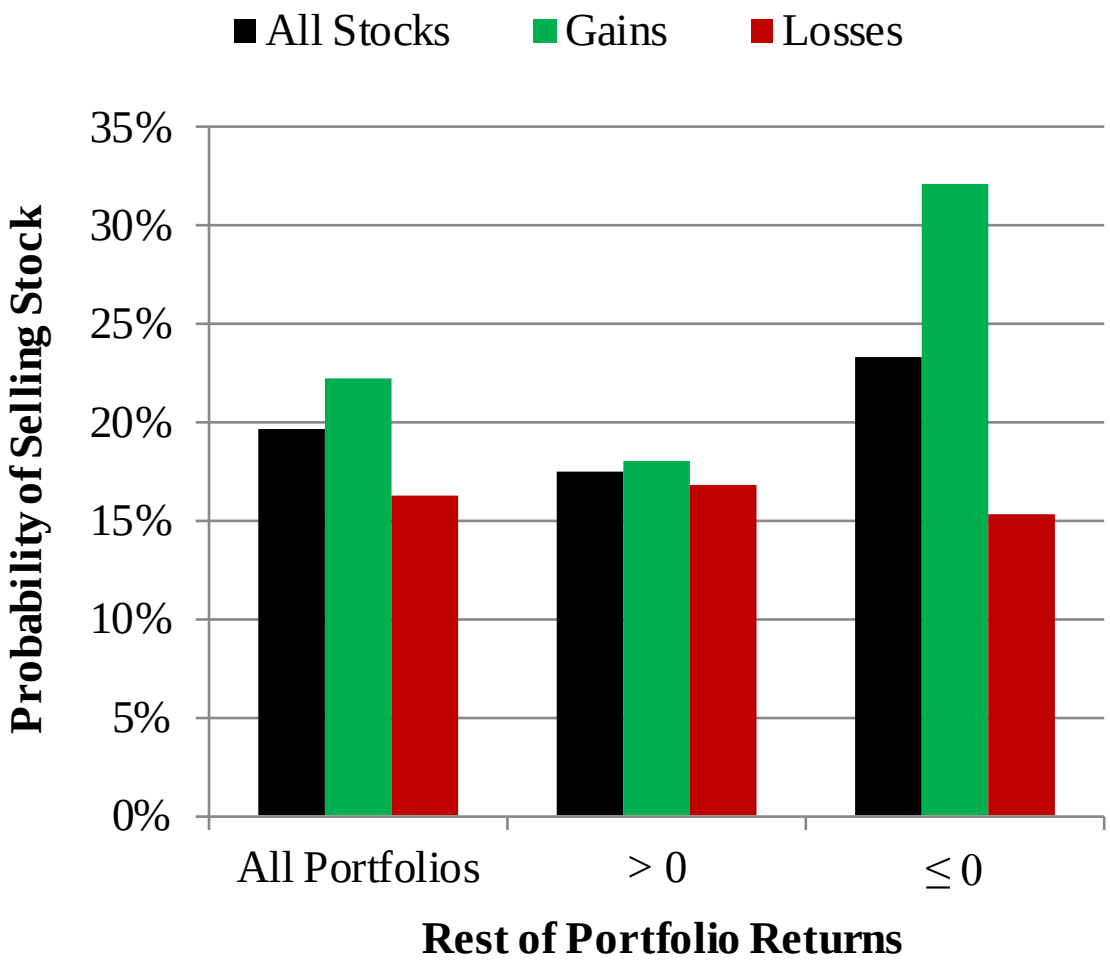


Analyzing the Disposition Effect

Standard methodology (e.g., Odean 1998)

- Compute the percentage of gains realized (*PGR*) and the percentage of losses (*PLR*) realized
- A "disposition effect" is said to exist if $PGR > PLR$

As previous researchers have noted, this is equivalent to estimating the regression:

$$Sale_{i,j,t} = \beta_0 + \beta_1 Gain_{i,j,t} + \varepsilon_{i,j,t},$$

where *Sale* and *Gain* are dummies for the stock being sold and the stock being at a gain, respectively

Straightforward to verify that $\beta_1 = PGR - PLR$

Analyzing the Disposition Effect (cont.)

Advantage of regression methodology: researchers can control for a host of factors

Our baseline regression specification:

$$\begin{aligned} Sale_{i,j,t} &= \beta_0 + \beta_1 Gain_{i,j,t} + \beta_2 PortfolioGain_{i,j,t} \\ &\quad + \beta_3 Gain_{i,j,t} \times PortfolioGain_{i,j,t} + \varepsilon_{i,j,t}, \end{aligned}$$

where $PortfolioGain_{i,j,t}$ denotes a dummy for the rest of the investor's portfolio being at a gain

Analyzing the Disposition Effect (cont.)

Coefficient of interest:

$$
\begin{aligned}
\beta_3 \quad = \quad & \Big\{ \mathbf{Pr}(\text{Sell stock} \,\big|\, \text{stock at gain, portfolio at gain}) \\
& \qquad - \mathbf{Pr}(\text{Sell stock} \,\big|\, \text{stock at loss, portfolio at gain}) \Big\} \\
& - \Big\{ \mathbf{Pr}(\text{Sell stock} \,\big|\, \text{stock at gain, portfolio at loss}) \\
& \qquad - \mathbf{Pr}(\text{Sell stock} \,\big|\, \text{stock at loss, portfolio at loss}) \Big\} \\
= \quad & \{\text{Disp Effect} \,\big|\, \text{portfolio} \uparrow\} - \{\text{Disp Effect} \,\big|\, \text{portfolio} \downarrow\}
\end{aligned}
$$

Regression Results (Unconditional Dataset)

	Sale	*Sale*
Gain	0.00226***	0.00365***
	(17.31)	(23.52)
PortfolioGain	0.00022***	0.00173***
	(4.13)	(19.13)
Gain $\times$ *PortfolioGain*	-0.00220***	-0.00281***
	(22.94)	(22.68)
Observations	102,821,233	102,821,233
R^2	0	0.012
Date FE	No	Yes
Account FE	No	Yes
Stock FE	No	Yes

Standard errors are clustered across three dimensions (date, account, and stock) following the procedure of Cameron, Gelbach, and Miller (2011)

Regression Results (Sale-Conditioned Dataset)

	Sale	*Sale*
Gain	0.166***	0.162***
	(29.38)	(34.40)
PortfolioGain	0.015***	0.067***
	(2.76)	(21.73)
Gain × *PortfolioGain*	-0.154***	-0.134***
	(26.23)	(29.92)
Observations	1,397,274	1,397,274
R^2	0.021	0.173
Date FE	No	Yes
Account FE	No	Yes
Stock FE	No	Yes

Standard errors are clustered across three dimensions (date, account, and stock) following the procedure of Cameron, Gelbach, and Miller (2011)

Possible Explanations

Some possible explanations for the portfolio-driven disposition effect

1. Attention/salience effects
2. Portfolio rebalancing
3. Unobserved investor skill
4. Utility over both paper gains/losses and realized gains/losses

Attention/Salience Effects?

Hartzmark (2015) shows that investors often sell their best and worst performing stocks (the "rank effect")

- If an investor has one stock that is a winner and the rest are losers:
  - Her portfolio is performing poorly,
  - The portfolio-disposition effect and the rank effect both predict her to sell the winner

To address this possibility, we partition the sample:

- "Extreme" stocks (best or worst stock in investor's portfolio)
- non-extreme stocks (all the others)

Coefficient of our interaction term ($Gain \times PortfolioGain$) is very similar in both samples

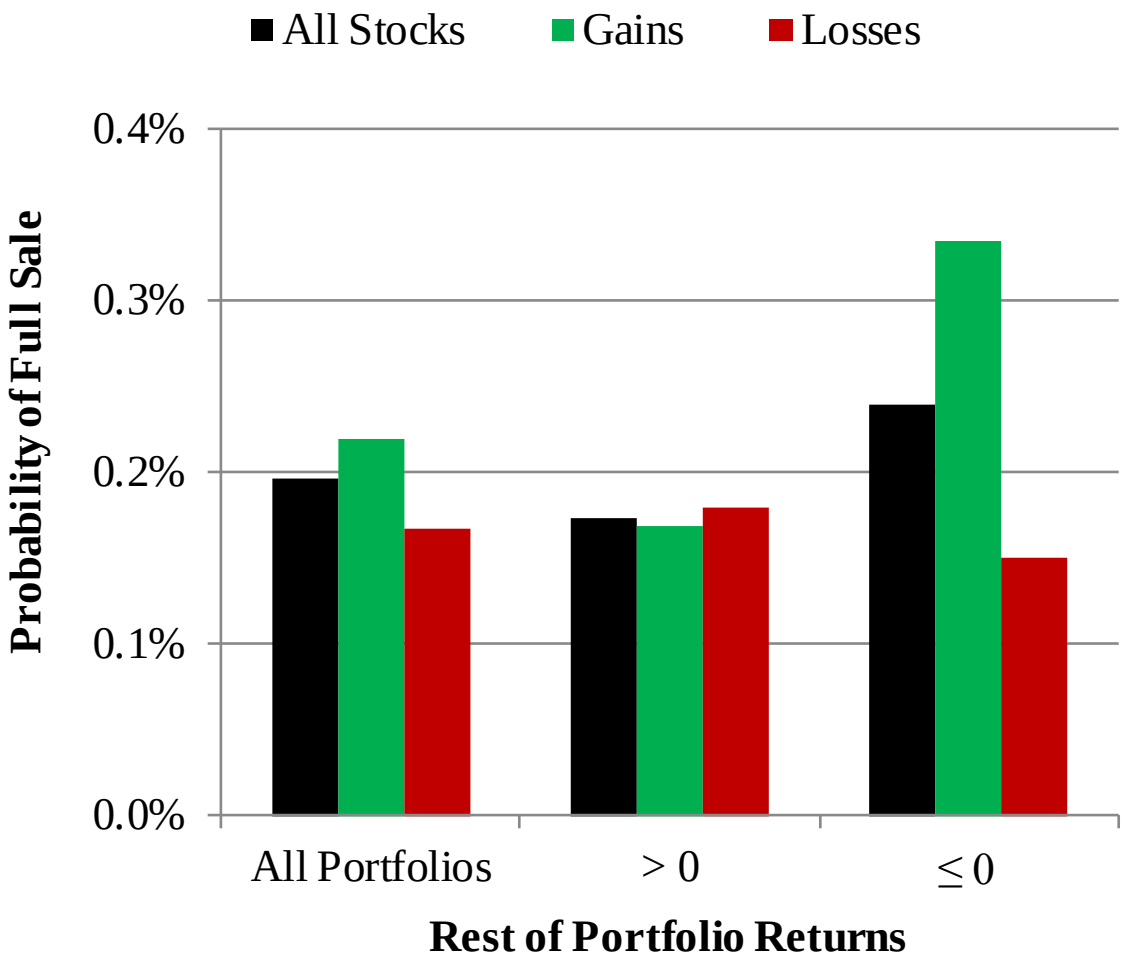
Portfolio Rebalancing?

Suppose an investor's portfolio is doing poorly, and she has some winners and some losers:

- The winners likely comprise a large proportion of her holdings
  - the losers must have significantly depreciated in value
- If she wants to rebalance her portfolio:
  - partially liquidate her winners
  - use proceeds to invest in other stocks
  - portfolio-driven disposition effect

Does the portfolio disposition effect disappear when we restrict attention to *complete* liquidations?

Probability of Completely Liquidating a Position (Unconditional Sample)



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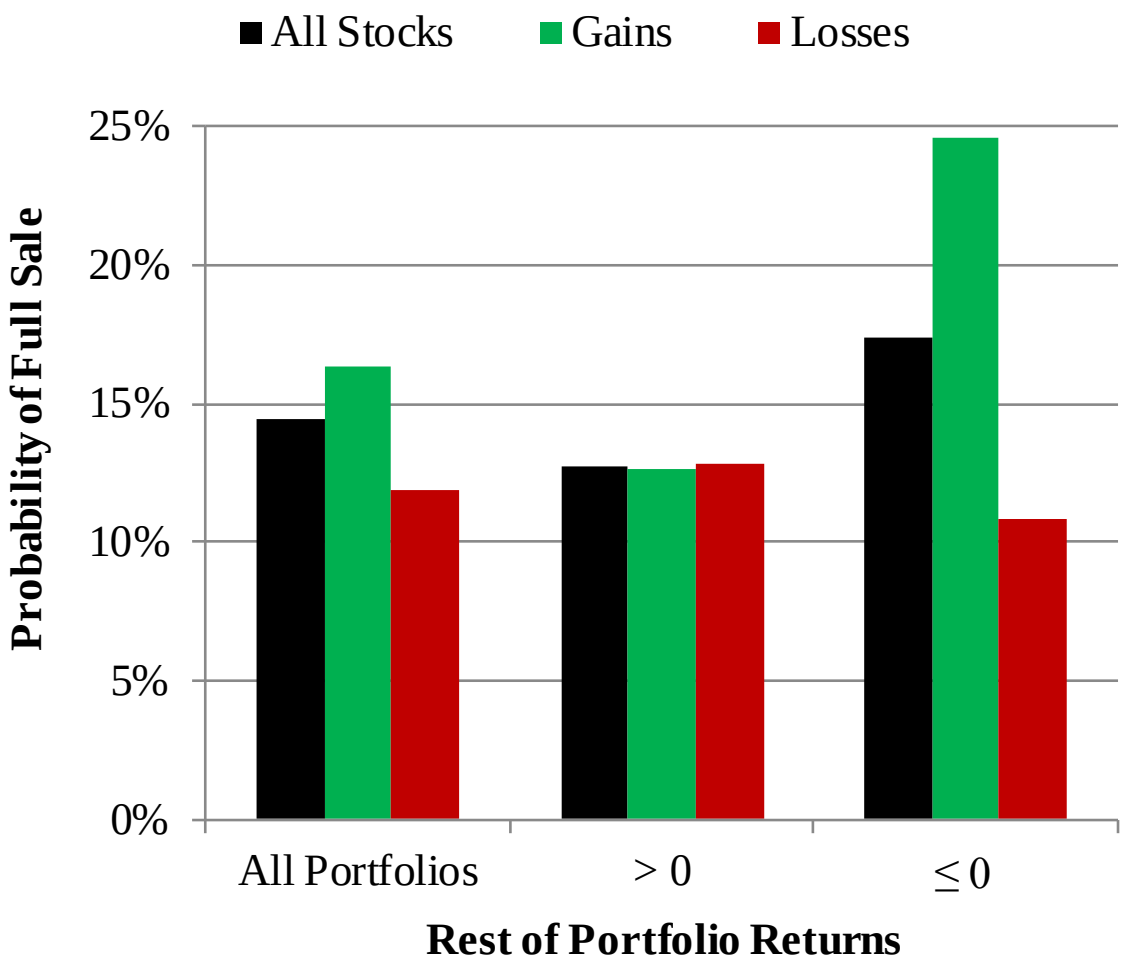

Portfolio Rebalancing? (cont.)

Multivariate regressions also cast doubt on the portfolio rebalancing explanation:

- Portfolio-driven disposition effect is very strong when sample is restricted to complete liquidations

Another test of portfolio rebalancing:

- When an investor liquidates a stock at a gain and her portfolio is at a loss, is she likely to reinvest the proceeds or keep it as cash?
  - Portfolio rebalancing $\Longrightarrow$ reinvest
  - Empirically, investors are disproportionately *unlikely* to reinvest the proceeds in this scenario

Unobserved Skill?

Grinblatt, Keloharju, and Linnainmaa (2012) show that Finnish investors with high IQ have superior stock-picking ability and exhibit less of a disposition effect

Perhaps:

- Skilled investors' portfolios are generally at a gain
- Skilled investors don't exhibit a disposition effect

We test this possibility in two ways:

1. Examine how our results vary among levels of investor sophistication
2. Examine scenarios where *PortfolioGain* is more likely the result of luck than skill
    - If portfolio-driven disposition effect is driven by unobserved skill, we should find a stronger disposition effect when an investor's portfolio is doing well due to luck

Unobserved Skill? (Investor Sophistication)

We follow Dhar and Zhu (2006) in using employment and income as proxies for sophistication

- Employment: professional ("professional/technical" or "administrative/managerial") versus non-professional ("white collar/clerical," "blue collar/craftsman," or "service/sale")
- Income: high ($\geq \$100,000$) versus low ($\leq \$40,000$)

Portfolio-driven disposition effect is present among all types of investors

Unobserved Skill? (*PortfolioGain* Driven by Luck)

For each stock in an investor's portfolio, decompose the performance based on its DGTW performance (Daniel, Grinblatt, Titman, and Wermers, 1997)

- One component is based on the stock's characteristics (size, book-to-market, and momentum)
- Other component is its performance relative to its matched portfolio

Motivation: while retail investors might be able to pick stocks that will perform well compared to their matched portfolios, it is unlikely they can time the Fama-French HML, SMB, and MOM factors

We find that the disposition effect is equally strong whether an investor's portfolio performs well due to "skill" (stocks' performance relative to matched portfolios) or "luck" (performance driven by HML, SMB, and MOM factors)

Utility over Paper Gains/Losses and Realized Gains/Losses?

In the standard model, investors' utility is based on their consumption

- Changes in portfolio value affect expected utility through the expected change in future consumption

Prospect theory: investors derive utility of gains/losses relative to a benchmark (e.g., purchase price)

- This idea has been applied to both *paper* (i.e., unrealized) gains/losses as well as *realized* gains/losses

Utility over Paper Gains/Losses and Realized Gains/Losses? (cont.)

If investors derive utility from both paper and realized gains/losses:

- when portfolio is performing poorly, utility is low due to paper losses
  - investor is psychologically fragile
  - investor might seek a burst of realization utility by selling a winner
- when portfolio is performing well, utility is high due to paper gains
  - investor is psychologically strong
  - investor is willing to sell a losing position and take the disutility from realizing a loss

Utility over Paper Gains/Losses and Realized Gains/Losses? (cont.)

Investors act as though they do not "close" their mental accounts when they liquidate a stock and reinvest the proceeds into a new stock (Frydman, Hartzmark, and Solomon, 2018)

- They "roll" their initial investment amount as the benchmark value for their *new* stock

Consider the following four possible scenarios:

- stock is up, rest of portfolio is up,
- stock is up, rest of portfolio is down,
- stock is down, rest of portfolio is up,
- stock is down, rest of portfolio is down.

Prediction: The likelihood of reinvesting proceeds from a sale should be *smallest* when the liquidated stock is up and the rest of the portfolio is down

Utility over Paper Gains/Losses and Realized Gains/Losses? (cont.)

	Reinvest	*Reinvest*
LossGain	0.104***	0.056***
	(14.73)	(13.08)
LossLoss	0.070***	0.025***
	(12.55)	(6.25)
GainGain	0.028***	0.016***
	(5.19)	(4.83)
Constant	0.344***	
Observations	189,623	189,623
R^2	0.006	0.32
Date FE	No	Yes
Account FE	No	Yes
Stock FE	No	Yes

Standard errors are clustered across three dimensions (date, account, and stock)

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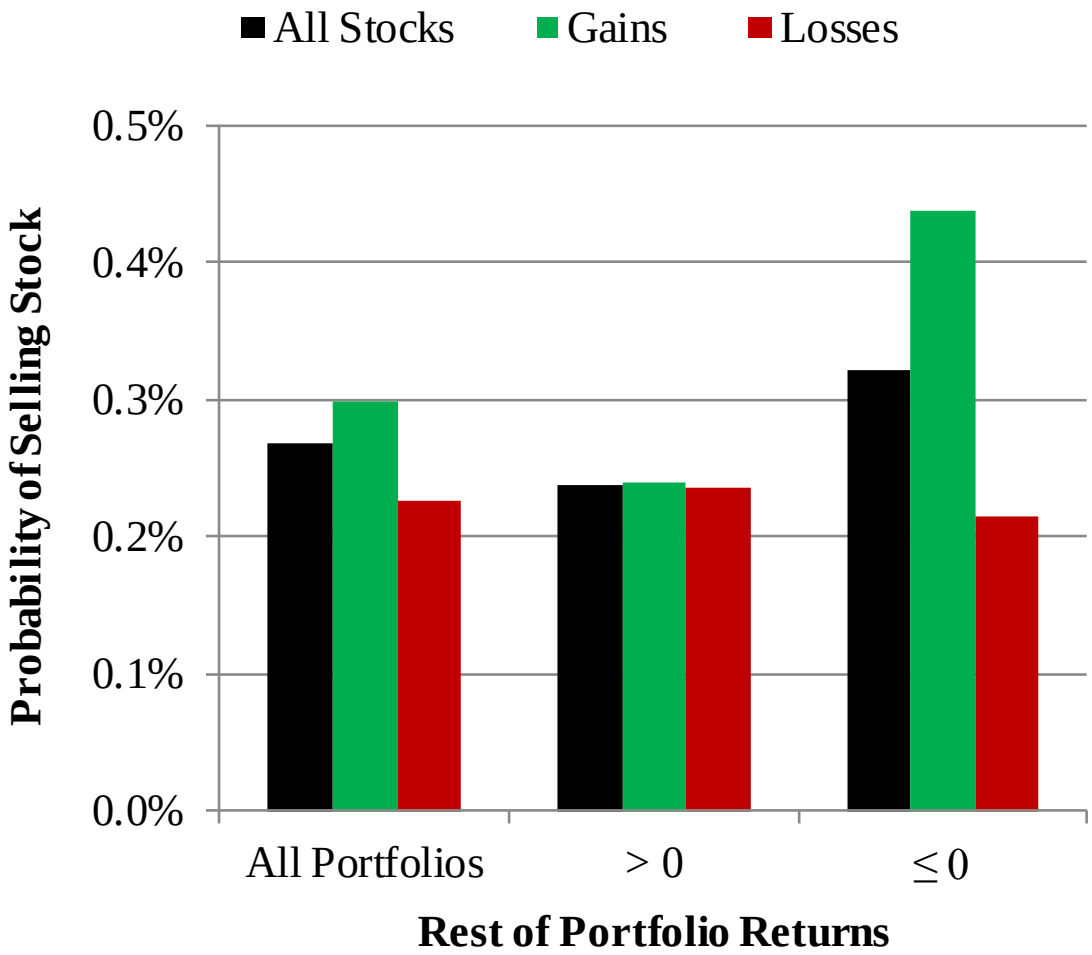

Explanation most consistent with the data: investors derive utility from both paper gains/losses and realized gains/losses

Future Direction

An and Wang (2018), in an independent and contemporaneous paper, also document the moderating effect of portfolio performance on the disposition effect

- They show the result holds in both the Odean dataset and among Chinese investors

They provide evidence that the phenomenon is driven by hedonic mental accounting

We are in the process of combining and unifying our papers

- An, Engelberg, Henriksson, Wang, and Williams (2019) should be available on SSRN in the near future