The Contribution of Behavioral Finance to understanding Asset Pricing and Investment Choices

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Behavioral Finance: The Early Days

Behavioral Finance

- **Behavioral Finance challenges the rationality wisdom of traditional finance.**
- **In particular as described in Von Neumann-Morgenstern utility functions.**

Behavioral Finance

- It has long been recognized that a source of judgment and decision biases is that cognitive resources such as time, memory, and attention are limited. Since human information processing capacity is finite, there is a need for imperfect decision-making procedures, or heuristics, that arrive at reasonably good decisions cheaply
- However, there are other possible reasons for systematic decision errors. Feeling or emotion-based judgments can explain mood effects (market sentiment)

Behavioral Finance: Examples

Overreaction

A cognitive bias (investor overreaction to a long series of bad/good news) could produce predictable mispricing of stocks; DeBondt and Thaler (1985).

Extrapolation

Investors use past performance as an indicator of future performance in mutual fund and stock purchase decisions; Sirri and Tufano (1998), Grinblatt et al. (1995), Carhart, (1997).

Overconfidence

individuals trade too much, overconfidently thinking that they can pick winners, whereas the stocks they buy do worse than the stocks they sell; Odean (1998, 1999), Barber and Odean (2000).

Disposition effect

Investors are reluctant to sell losers (and mentally "declare" the loss), even though tax considerations should make them prefer selling a loser to selling a winner; Shefrin and Statman (1985), Odean (1998).

Behavioral Finance: Examples

Narrow framing (mental accounting)

Decision makers are excessively prone to treat problems as unique; their evaluation of single risky prospects neglects the possibility of pooling risks. Rather than looking at the whole portfolio as prescribed by traditional expected utility theory, investors tend to reach the best decision in each mental compartment; Kahneman and Lovallo (1993), Barberis and Huang (2004)

Loss Aversion

Loss aversion refers to the observed tendency for decision makers to weigh losses more heavily than gains. "losses hurt roughly twice as much as gains feel good"; Benartzi and Thaler (1985), Barberis and Huang (2004).

Analyst forecasts and recommendations are biased .

- Stock recommendations are predominantly buys over sells, by a seven to one ratio; Womack (1996).

- Analyst forecast errors are predictable based upon past accruals, past forecast revisions and other accounting value indicators

Do investor biases affect asset prices?

Puzzles:

- **Closed-end funds discount**
- **Firms are sometimes valued by the market as worth less than one division (Palm/3-Com).**
- **Virtually perfect substitutes trade at different prices (Royal Dutch/Shell)**
- **Increases in a country's bond yield relative to another country's bond yield forecasts future appreciation of that country's currency**

For a review see "Investor psychology in capital markets: evidence and policy implications", Daniela, Hirshleiferc and Teoh, JME, 2002.

Reactions to Behavioral Finance

Traditional Finance Professor

It is a collection of ad-hoc stories. Small anecdotes of little general value.

Psychology produces too many answers and no theory.

Practitioners

It is not really useful. Cannot make money on anomalies:

- **Many "anecdotes" apply to minuscule market value.**
- **all attempts on "January effect", "day of the week effect", etc, have been unsuccessful.**
- **For example, private investors are overconfident, so what!**

Does not tell me how to structure a portfolio. Little implications for investment choices.

Using (New) Behavioral Finance to Derive Optimal Investment Choices

- **Prospect Theory**
- **Disappointment Aversion Theory**
- **Regret Theory**

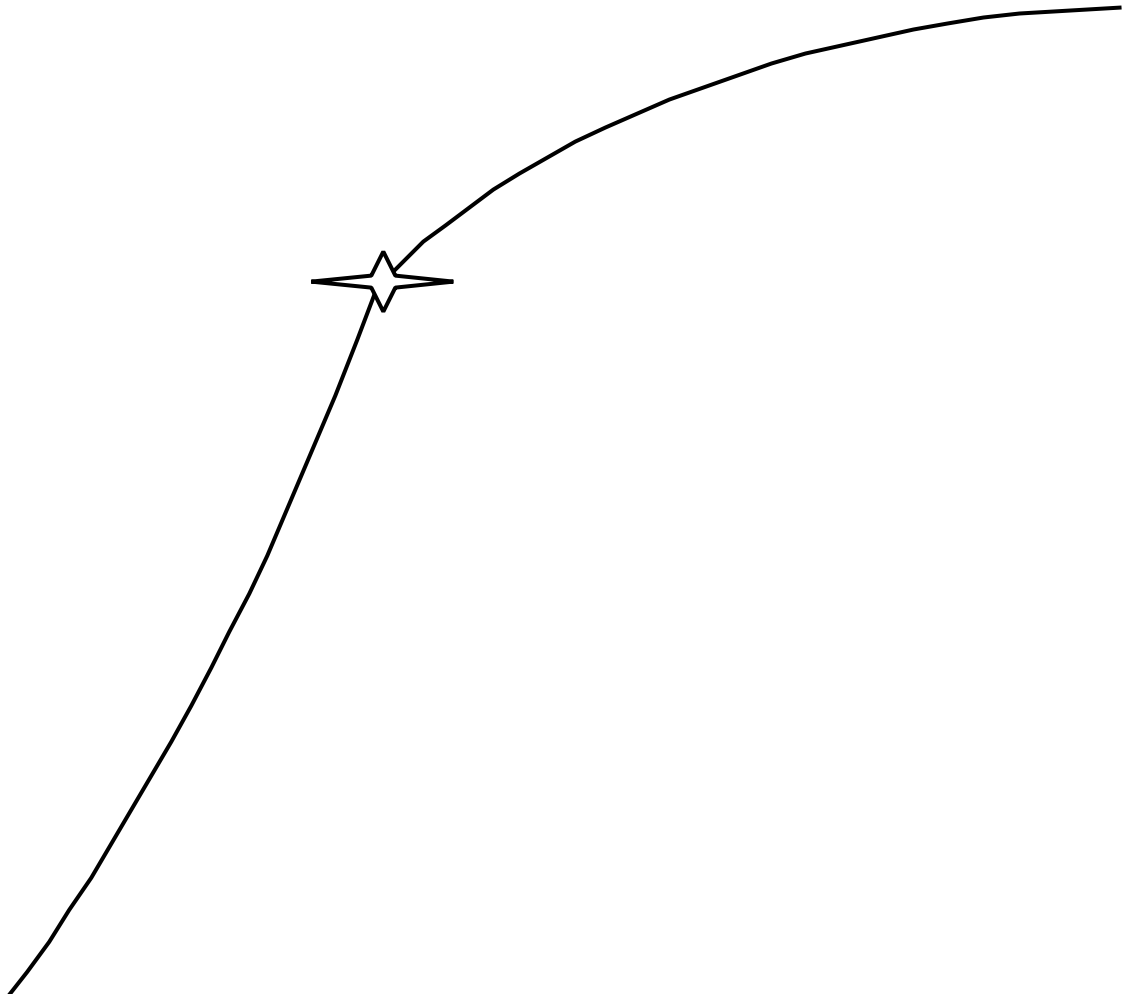
Prospect Theory (Nobel thinking)

A descriptive “theory” by Kahneman and Tversky:

A “Nobelized” collection of empirical observations and stories put into a comprehensive set

- **reference point**
- **loss aversion**
- **risk loving in the region of losses**
- **subjective weighted probabilities rather than "objective" probabilities** (people behave as if they regard extremely improbable events as impossible and extremely probable events as certain).

Utility function in Prospect Theory



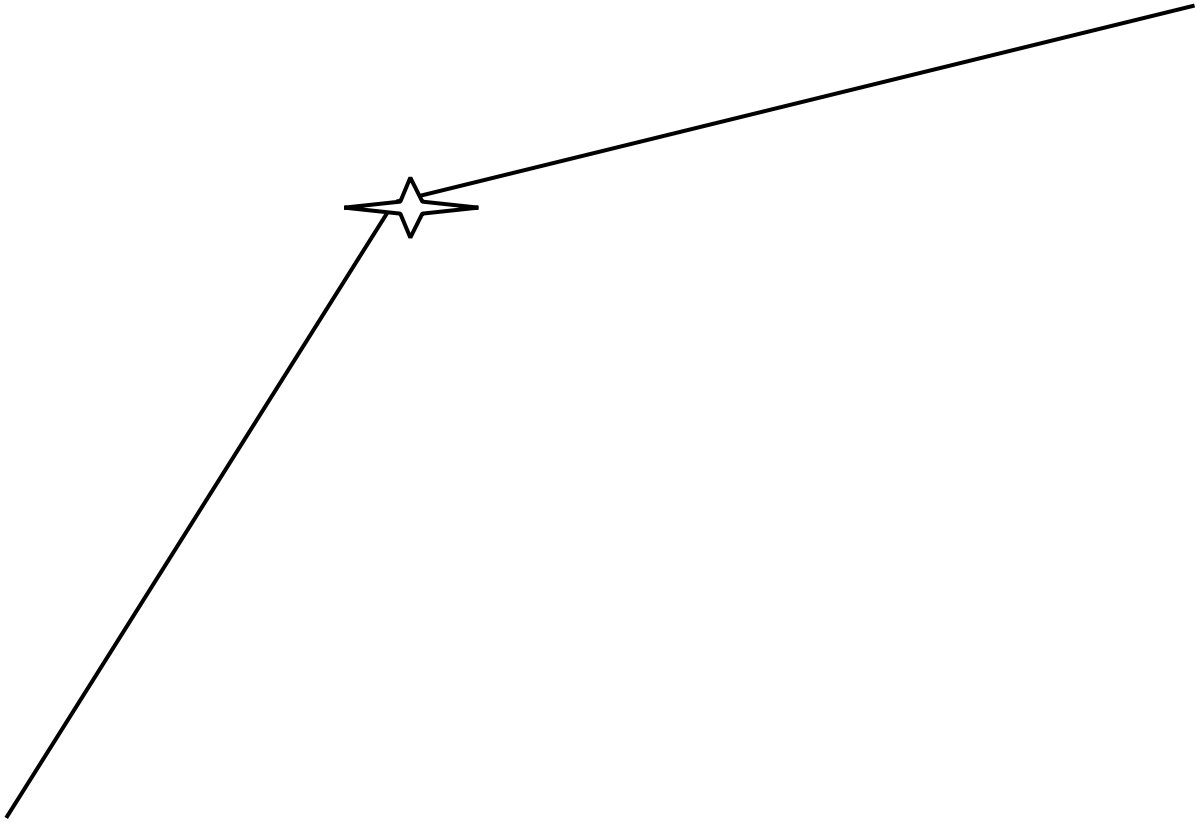
Applying Prospect Theory To Optimize Choices

- **Only One or two features of Prospect Theory are retained. Mainly loss aversion. Hence the appellation "Loss Aversion Theory"**
- **Barberis, Huang and Santos (2001), Berkelaar, Kouwenberg and Post (2004), Gomes (2005), Barberis and Huang (2004)**
- **For example, Barberis and Huang (2004) assume that some narrow-framed assets exhibit loss aversion in a piece-wise linear fashion in addition to traditional risk aversion:**

$$U(x) = v(x) + LA(x)$$

Where: *v(x)* is a traditional utility function (e.g. mean-variance) and *LA(x)* is the loss aversion term.

LA function



Disappointment Aversion Theory

Gul's preferences (1991) extend the expected utility framework by discriminating good and bad outcomes, i.e. outcomes above or below the certainty equivalent; bad outcomes are more heavily weighted than good outcomes. As a result, agents are more sensitive to bad outcomes and less to good ones, hence the name "disappointment aversion" preferences. See Ang, Bekaert and Liu (2005).

$$U(m_x) = \frac{1}{K}\left(\int_{-\infty}^{m_x} U(x).dF(x) + A\int_{m_x}^{+\infty} U(x).dF(x) \right)$$

$$A<1$$

Disappointment Theory

- **Disappointment Theory is similar in spirit to loss aversion theory (first order risk aversion). But the reference point is endogeneous (certainty equivalent) rather than arbitrary.**
- **Loss aversion models the shape of the utility function, while disappointment models the probabilities.**

Regret Theory

- **Adds a new psychological dimension to investment choices.**

Nobel Prize Thinking

- *"I should have computed the historical covariance of the asset classes and drawn an efficient frontier. Instead I visualized my grief if the stock market went way up and I wasn't in it-or if it went way down and I was completely in it. My intention was to minimize my future regret, so I split my [pension scheme] contributions 50/50 between bonds and equities."*

Harry Markowitz.

As quoted in Jason Zweig, "How the Big Brains Invest at TIAA-CREF", *Money*, 27(1), p114, **January 1998**.

Regret

- **Regret is defined as a cognitively-mediated emotion of pain and anger when, with hindsight, we observe that we took a bad decision in the past and could have taken one with better outcome.**
- **As stated by Bell (1985), regret is a psychological reaction to making a wrong choice on the basis of actual outcomes, where a better investment decision could have been taken. Ex post, one compares the investment outcome with the best outcome that could have been achieved.**
- **Regret is such a powerful negative emotion that the prospect of its future experience may lead individuals to make seemingly sub-optimal, non-rational decisions relative to the expected utility paradigm.**

Regret (2)

- Contrary to mere disappointment (prospect Theory), which is experienced when a negative outcome happens relative to prior expectations, regret is experienced relative to the best outcome of alternative choices that could have been made.
- There is an extensive literature in experimental psychology, and, to a lesser extent, neurobiology that supports the assumption that regret influences decision-making under uncertainty beyond disappointment and traditional uncertainty measures
- As the opening quote suggests, the anticipation of future regret was strong enough to turn Harry Markowitz away from his very own portfolio allocation theory when faced with a financial decision on his pension plan.

Regret Theory

- Based on this concept of regret, Loomes and Sugden (1982) and Bell (1982) derived independently an economic theory of regret.
- A theory of choices under uncertainty that explains many observed violations of the axioms used to build the traditional expected utility approach (Allais' paradox, etc..).
- Regret theory assumes that agents are rational but base their decisions not only on expected value of payoffs but also on expected regret. They maximize their (modified) expected utility.
- So they care about the portfolio expected return and volatility (as in mean variance) but also about expected regret.
- It is parsimonious yet axiomatic.

Regret Theory

$$U(x,y) = v(x) + f(v(x) - v(y))$$

- where *U(x,y)* is the modified utility of achieving *x*, knowing that *y* could have been achieved. *v(x)* is the traditional utility function, also called value function or choiceless utility. It is the "value" or utility that an investor would derive from outcome *x* if he experienced it without having to choose.
- This value function is assumed to be monotonically increasing and concave (risk aversion) as in traditional finance.
- The difference *v(x) – v(y)* is the value loss/gain of having chosen *x* rather than a the best foregone choice *y*. The regret function *f*(.) is monotonically increasing and decreasingly concave, with *f*(0) = 0.

Regret Theory and Risk

Regret introduces introduces two dimensions of risk.

- **Loosely speaking, the first one is traditional volatility, linked to deviations of the chosen portfolio return from its expected value.**

- **The second one is regret risk, linked to deviations of the chosen portfolio returns from the return of the best forgone alternative.**

Investor exhibit traditional risk aversion, but also regret aversion.

The two types of risks are neither identical nor fully correlated. Intuitively, regret induces a higher sensitivity to low-probability states with large payoffs. Compared to traditional investors who dislike volatility, regret-averse investors will bias their portfolios towards assets with high volatility, because these assets have a chance of a larger return relative to less volatile assets thereby creating the potential for large regret if they are not purchased.

- **Traditional utility is only defined over the portfolio held by the investor. What matters is only what you own.**
- **Modified utility also "value" a comparison with other portfolios that could have been chosen. There are two attributes in the utility function.**
- **Regret theory is clearly relevant to investors who compare the performance of their portfolio to forgone alternatives that they could have chosen, or to peers and benchmark portfolios whose performance could have been achieved (this not benchmarking, because the benchmark is known only ex-post)**
- ***Loosely speaking*, traditional expected utility cares about risk in the form of the volatility of the chosen portfolio. Regret theory ALSO cares about regret risk in the form of deviation from better alternatives.**

Examples where Regret Theory applies

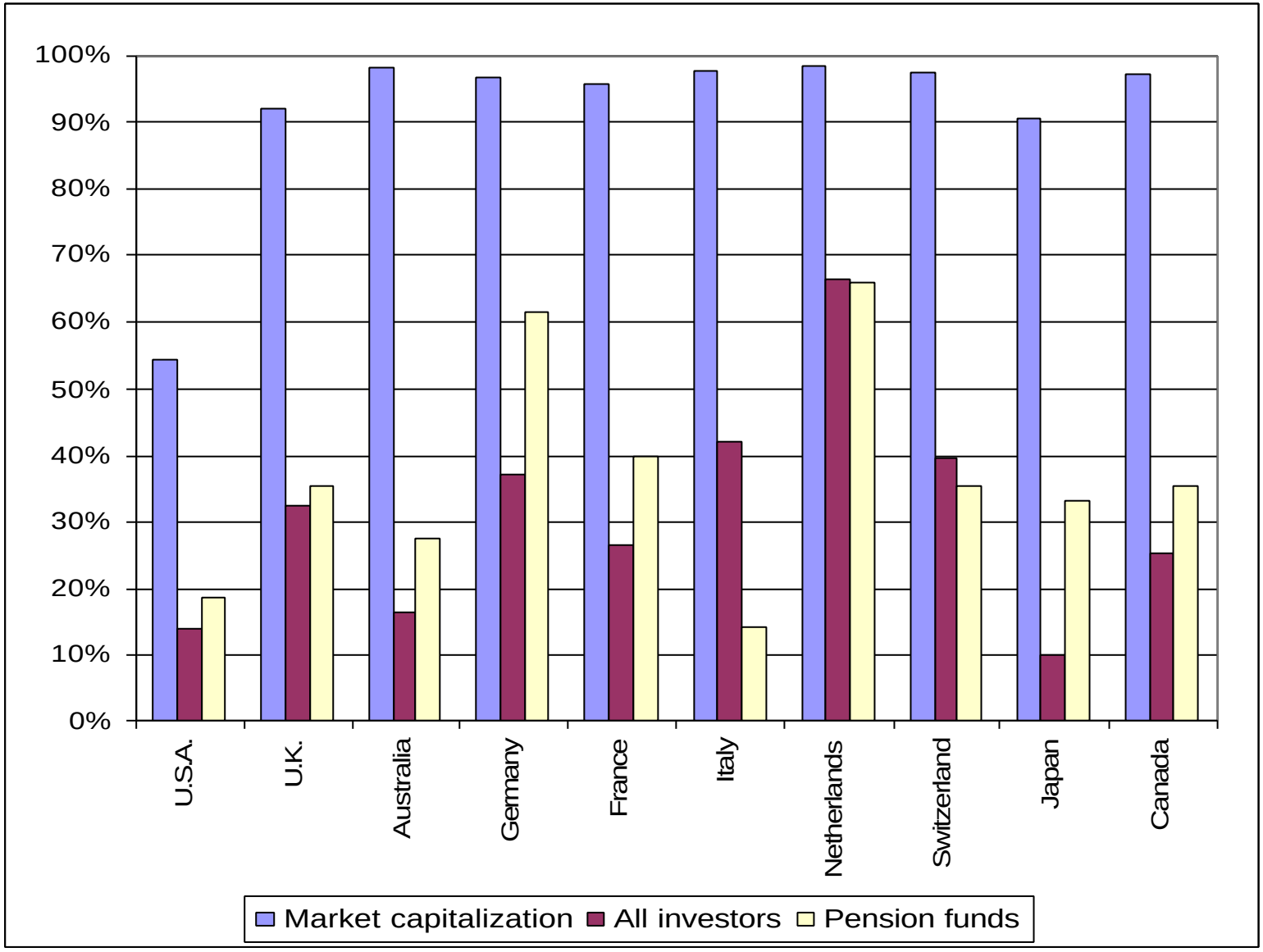
Regret Risk: Example of asset allocation

- **You are an institutional asset manager choosing the allocation between bonds and equity. Your forecast is no risk premium on equity. Would you allocate zero to equity?**

Regret Risk: Foreign equity investment

- **You are a Japanese institutional asset manager choosing the equity allocation between foreign and Japanese stocks. The average foreign allocation of your Japanese peers is 20%. Would you decide to invest 90% in foreign stocks, as suggested by the world market capitalization?**

Ratio of Foreign Equity Holdings to Total Equity Holdings per Nationality of Investors



Regret Risk: Example of currency hedging

- **You are an American manager invested in European stocks. You wonder whether you should hedge the currency risk (selling euro forward against dollars). Your forecast is that the exchange rate is unpredictable (no risk premium). Would you hedge the currency risk fully (100% hedge ratio)?**

Currency Hedging is a Dimension where Regret Applies

- as stressed by Statman (2005), currency hedging is a dimension where regret clearly applies.
- For example, an American investor who decided not to hedge currency risk would have incurred a currency loss of some 40% on its eurozone assets from late 1998 to late 2000, with a vast regret of not having fully hedged.
- Conversely a fully-hedged American investor would have missed the 50% appreciation of the euro from late 2001 to late 2004. Again, a vast regret of not having taken the "right" hedging decision.
- Different mental compartment (“narrow framing”)
- Selling short the dollar is an emotional issue.

Solnik and Michenaud (2006)

- **This the first attempt to apply RT, as originally developed by Loomes and Sugden (1982) and Bell (1982), to investment choices. Technical reasons might have hindered such developments.**

  Currency hedging decisions are simple enough to model in the framework of RT. The ex-post optimal currency hedging choice is only one of two decisions: minimum allowed hedging (longest allowed position in the foreign currency) if the foreign currency appreciated, or maximum allowed hedging (shortest allowed position in the foreign currency) if the foreign currency depreciated. When no currency short sales are allowed, this translates in no hedging if the foreign currency appreciated, or full hedging if the foreign currency depreciated.

- **We provide normative recommendations for currency hedging that differ markedly from those of traditional utility (MV) or disappointment theory. They could explain the observed diversity in currency hedging policies.**

Solnik and Michenaud (2006)

- In the absence of prior on currencies (pure currency risk), traditional theories recommend 100% currency hedging.
- We find a 50% currency hedging for a very-regret-averse investor.

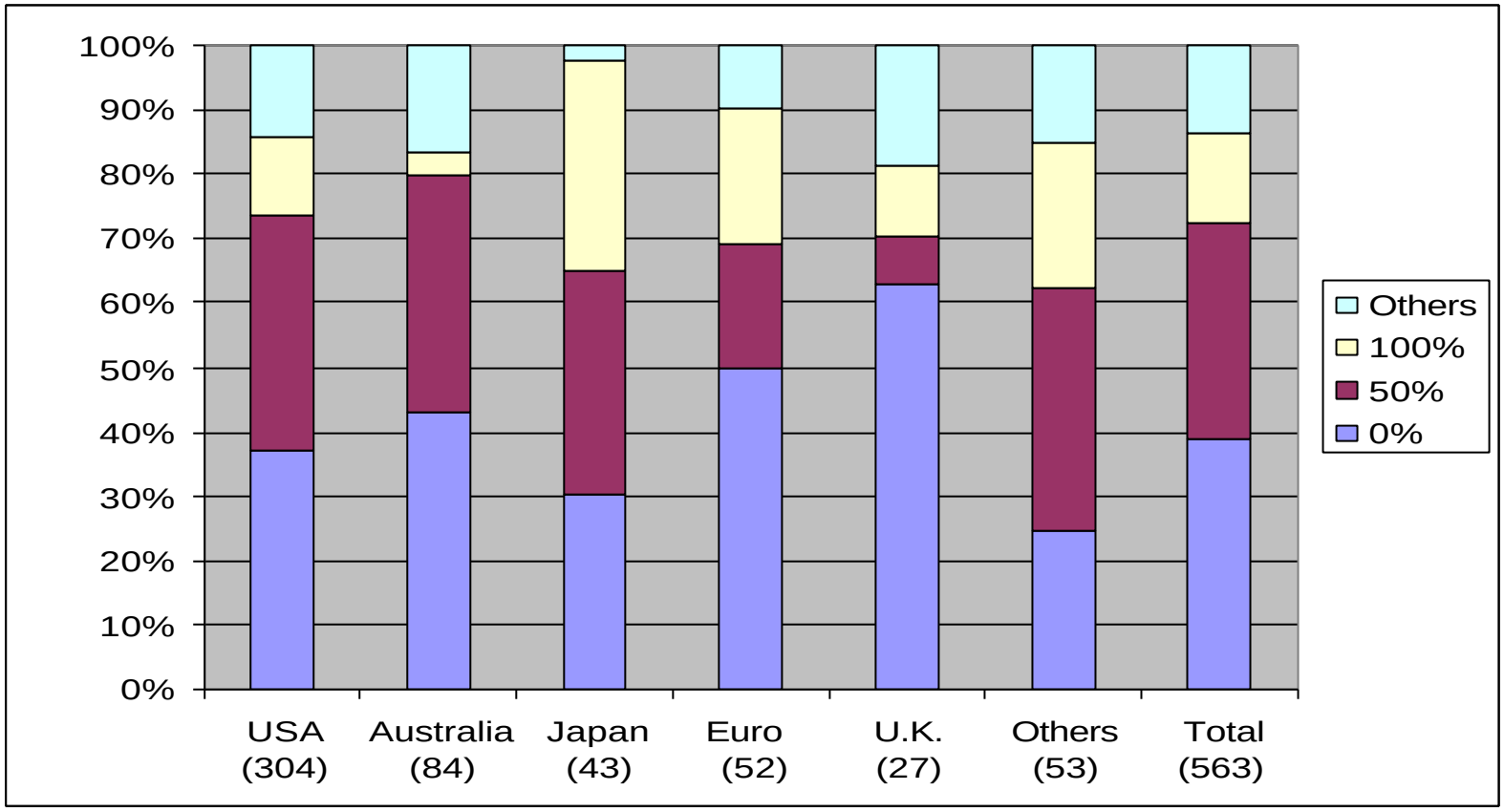
Optimal Hedge Ratio

$$h^* = 1 - \frac{\Sigma_{s+}}{\Sigma_s} \times \frac{r}{r + l}$$

$$- \frac{\overline{s}}{\Sigma_s} \times \frac{1}{r + l}$$

$$+ \frac{\mathrm{cov}(r, s)}{\Sigma_s} \times \frac{l}{l + r}$$

Distribution of Accounts by Base Currency and Hedge Ratio
Russell Mellon 2005



Hedge	USD	AUD	YEN	EUR	GBP	Others	Total
0%	113	36	13	26	17	13	218
50%	111	31	15	10	2	20	189
100%	37	3	14	11	3	12	80
Others	43	14	1	5	5	8	76
Total	304	84	43	52	27	53	563

Conclusions