

Disappointment in the Delegation of Currency Hedging Decision

Kurtay Ogunc
Texas A&M University

Abstract

There is evidence that disappointment is felt in situations where others are responsible for the bad experience (Zeelenberg, van Dijk and Manstead, 1998). Trustees and board members usually feel more responsible by the major decisions made on behalf of the fund, and have the tendency to blame the bad experiences resulting from secondary decisions on the investment consultant. We show that as the hedger becomes more disappointment-averse, a smaller forward position will be held. Institutional investors will be well advised to incorporate this result in currency hedging mandates to minimize the background risk resulting from delegated fund management.

Introduction

Delegated portfolio management takes on many forms depending on the context of the problem. In the case of international mandates, institutional investors are faced with the decision of what to do with the currency exposure that is a result of putting investment dollars into work around global markets. If they choose to hedge the volatility arising from currency fluctuations, these institutional funds (mostly the large and mega-large ones) hire currency overlay managers under the guidance of either the retainer consultant or a specialist consultant to manage the so-called exchange rate risk. In the practice of investment management, it is a well-known fact that the process under which one manages a portfolio of international securities and the process of managing the associated currency risk are completely independent. The former is called asset management, whereas the latter is dubbed as exposure management that does not require investing of actual dollars. A currency overlay program is not a direct investment; rather a risk management program implemented with such derivatives as forwards and futures. It is important to note that delegating the management of currency exposures to currency overlay managers adds further background risks to the overall portfolio. It is within this context that we believe institutional investors should incorporate relevant axiomatic tools to improve the decision-making process as it pertains to the management of international investments. Baptista (2012) documents that there exist mental account settings where the aggregate portfolio is mean-variance inefficient due to aggregate background risk in mental accounts. Given the theoretical results about the impact of background risk on mean-variance efficiency, I argue that the currency overlay mandates should explicitly include limits to hedging, if necessary. This paper provides a background risk minimizing solution for the problem of how to effectively incorporate currency hedging into international portfolio management from the perspective of disappointment-averse investors. Our contribution is to provide the link between disappointment aversion and background risk as well as a normative solution for the delegated agent problem.

Psychological Underpinnings

It is a well-established fact that people are guided by emotions, which often reflect a certain kind of benchmarking in the process. Benchmarks could take various forms, for instance, an explicit one could be the performance of a particular index or a more implicit one is the problem-specific reference point/subsistence level used to measure gains or losses. Many scholars from economics and psychology studied the manner in which regret influences decisions and people's emotional disposition. Regret could be defined as the pain relative to not having taken a better action, whereas disappointment is the pain from comparing the actual outcome with a better one. In other words, regret captures the difference between the performance of the selected portfolio and the performance of any other foregone portfolio; whereas disappointment captures the discrepancy between actual and expected performance. In developing the Prospect Theory¹ and postulating its advantages over Expected Utility Theory (EUT), Kahneman and Tversky (1979) argues that humans systematically violate the axioms of EUT in two important ways. First, experimental subjects tend to overweight outcomes that are considered certain, relative to outcomes that are merely probable, which is referred to as the certainty effect. In financial markets, this certainty effect make an investor risk averse in the case

¹ Prospect theory is a descriptive model of decision making under risk, developed by Kahneman and Tversky (1979) to explain numerous violations and anomalies of EUT.

of gains, as a small certain gain is preferred to a probable risky gain, but risk seeking in the case of losses, as a probable risky loss is preferred to a small certain loss. In addition, subjects tend to simplify decisions by disregarding components common to the alternative choices and focusing on components that differentiate the choices, which is called the cancellation effect. They formulate prospect theory based on this experimental evidence. This theory consists of an editing stage, where alternatives are put into perspective, and a choice stage. Utility is defined over gains and losses relative to a reference point rather than over the level of wealth as in EUT. Ogunc (2008) introduces a behavioral adjustment to the classical expected utility framework due to the apparent asymmetric compensation structure between currency overlay managers and institutional investors holding international portfolios.

Shefrin (2000) presents an example from financial markets that would help us differentiate these closely related but distinct concepts of regret and disappointment. It was late July of 1998 when financial markets were jittery about economic problems in Asia and the market had just fallen by 20 percent. Imagine a conversation between you and two of your friends, George and Paul. George had a lot of his portfolio in stocks and was fretting about a severe market decline. In the end, he decided to sell his stocks and buy CDs instead. Paul, instead, had been holding CDs which had just matured. He thought that the market would rebound and considered buying mutual fund shares. However, he renewed his CDs. Thereafter, the market appreciated by over 25 per cent. Both investors held CD portfolios during this period. Both would have been better off by holding stocks. The question is; which one feels worse about the situation? Most people would say George is not only disappointed about the outcome but also experiences regret stemming from the action he took. So, he seems to be worse off emotionally. Quite brilliantly, this example proves the point that behavioral concepts are typically path-dependent. In other words, where you start, what you think and when should lead to distinct emotions at the end. I claim that comparison is the psychological basis for benchmarking. Moreover, regret and disappointment are important factors when it comes to managing investment portfolios that are connected to a certain kind of benchmarking mechanism. I agree with Shefrin that people are hard-wired to engage in comparison, and measure themselves against some yardstick. The challenge becomes how to come up with the most relevant benchmark in any given situation so that whatever actions we might take would minimize the probability of yielding regret and/or disappointment ex-post.

Within the context of international portfolio management, regret could arise from the decision of hedging or not hedging the currency exposure, whereas disappointment results from the implementation of the hedging decision. In the case of disappointment, the decision maker does not second-guess the path chosen, but feels unhappy or dissatisfied with the way the decision was implemented. Simply put, regret is much more painful than disappointment as it cuts deep in the heart of the decision making process. Using behavioral and imaging data, Chua et al. (2009) postulates that regret produces a stronger desire to change choice and a stronger negative affective reaction to the outcome of their choice. Their findings suggest that regret and disappointment share a general neural network but differ in both the magnitude of subjective feelings and with regret activating some regions with greater intensity.

People are especially prone to feeling the regret of a decision that turned out badly when they feel responsible for that decision. Institutional investors such as pension plans and endowments transfer responsibility when they engage the services of money managers. In addition to transferring the responsibility of managing the funds at the institutions, board members hire consultants for advice on which money managers to choose for the institutional

portfolio. It could be conjectured that trustees at various pension funds and endowments create a psychological option for themselves by taking these actions on behalf of the institution for which they serve as fiduciaries. When the portfolios perform well, they can take the credit, otherwise, they can shift the blame to the money managers and investment consultants. In the U.K., Unilever sued Merrill Lynch Asset Management for negligence and reportedly settled the case outside the court system at the expense of the money management firm. So, we started witnessing legal actions against money managers that perform below par for not having adhered to the guidelines set forth by the client. There is also one more reason why institutions find the (partial) transfer of responsibility appealing: cognitive limitations. We would argue that some fiduciaries are unable to differentiate between payoff-irrelevant information (also called ‘noise’) and payoff-relevant information, mostly due to cognitive biases in processing information. Lastly, the fact that investors have the tendency to evaluate gains and losses frequently leads to second-guessing and consequently to regret or disappointment.

Scholars in the field of behavioral finance and economics have been trying to explain the similarities and differences between psychological concepts, which are widely cited as important elements of the decision making process in the practice of investment management. For instance, the notion of multiple ‘mental accounts’ could help explain the difference between the regret aversion and loss aversion that is considered to be a fuzzy difference, to say the least. One could pose the following question; if regret aversion signifies the fear of regretting decisions after the event², then, what is its relation to loss aversion? The difference becomes clear when one remembers that regret may also occur when a particular decision has not been made. Had we, for instance, not bought a particular share, against the advice of a friend, and the share then turns out to be a winner, then regret kicks in, even though there was no actual loss. Not acting is a decision – you choose to not act. On the one hand, there are ‘payment effect’ mental accounts to which the actual money is booked. On the other hand, people also keep ‘non-payment effect’ mental accounts, which record those sums that might have been received if a particular decision had not been made, which means that these payments do not affect the actual state of the capital. Gains foregone take the place of a loss in the case of evaluation of a non-payment effect project; the relative gain, on the other hand, will be replaced by the loss not incurred. Dissonance occurs when the decision against the project is regretted because it would have produced a profit. The degree of regret aversion, as with loss aversion, can be seen from the increase in the non-payment effect ‘regret function’ in the vicinity of the reference point. The dissonance is great and the regret aversion pronounced if the decision against the project was accompanied by considerable commitment. As with loss aversion, a decision maker anticipates the dissonance when considering the realization of a particular project. If there is agreement that a commitment a priori leads to distortions and therefore that all decisions must be made free from any commitment as far as possible, then any problems arising from regret aversion will be resolved of their own accord. I would argue that people should try to keep their own commitments to a minimum to be able to make decisions free from regret or loss aversion. Moreover, the perception of a possible deficit results in risk aversion from a ‘need for control’ perspective as regret or loss aversion is from a ‘need to be free from dissonance’ perspective.

² See Loomes and Sugden (1982 and 1987) for details on regret aversion and related issues.

Literature Review

Jiang, Ma and An (2013) examines international portfolio selection with exchange rate risk based on Behavioral Portfolio Theory (BPT) due to Shefrin and Statman (2000), which argues that BPT investors with multiple accounts segregate their portfolios into distinct mental accounts, overlooking covariances among these accounts. The BPT approach allows investors' risk attitudes and investment goals to vary by market as illustrated in Baptista (2012) and Das et al. (2010). In contrast to those papers, Jiang et al. includes not only risky assets but also a risk-free asset. The paper documents that the optimal BPT portfolio contains the traditional mean-variance efficient portfolio without consideration of exchange rate risk, and an uncorrelated component constructed to hedge against exchange rate risk. They conclude that the higher the exchange rate risk, the higher the proportion of total funds placed in the risk-free asset, given the failing probability and threshold return level. This is also consistent with findings in the literature that higher background risk enhances investors' demand for protective savings. He and Xiong (2013) analyzes a delegated asset management problem in which a principal hires a fund manager to invest his money in a multi-market environment. The model highlights a trade-off between encouraging the manager to pursue the efficient investment strategy and the agency cost of incentivizing that. More importantly, this tradeoff becomes especially severe when the manager can access negatively skewed risk outside his primary market. The basic tenet of the paper is that if fund managers are not incentivized properly, they would venture into other markets creating negatively skewed distributions of return for their institutional clients. As far as our framework is concerned there is little or no concern regarding the venturing of currency managers into other markets than foreign exchange markets as this is explicitly addressed in currency overlay mandates. Moreover, currency overlay managers are by definition in the business of managing only currency exposures for their institutional clients. Hence, our disappointment-averse framework is similar in spirit to the formulation in Dybvig, Farnsworth and Carpenter (2010), which shows that imposing portfolio restrictions can improve the efficiency of incentive provisions when the principal can directly observe the fund manager's investment positions.

Rationale for Disappointment Aversion

This paper extends the disappointment aversion framework, introduced by Gul (1991)³, to currency hedging decision by institutional investors, and investigate the optimal hedging behavior for a disappointment-averse investor. Palacios-Huerta (1999) lists many of the advantages of the axiomatic model of Gul, who not only offers good intuition as to why the independence axiom is so often violated but also leads to a class of preferences with acceptable normative properties capable of accommodating many experimental results. His generalization of the EUT is based on a weaker alternative independence axiom and retains as much of the insight offered by EUT as possible. A significant difference in this framework is that, unlike the notion of risk aversion, feelings of disappointment violate the separability axioms that impose the assumption that preferences are independent across states. Stated differently, outcomes in events that did not occur affect attitudes towards outcomes that did. Regret, on the other hand,

³ Grant and Kajii (1998) and Skiadas (1997) provided two other notions of disappointment aversion. Grant *et al.* (2001) demonstrate how different formalizations lead to different notions of disappointment aversion by comparing the models of Gul, Grant & Kajii, and Skiadas.

involves comparing outcomes in a given event with those that would have occurred in the same event had the agent chosen a different act or lottery or portfolio for that matter. Disappointment involves comparing outcomes from different events in the same act or lottery. In principle, one could be disappointed without ever having choices to make. The preferences will be a one parameter extension of standard iso-elastic preferences in the usual expected utility framework. They have the characteristic that good outcomes that are above the certainty equivalent are downweighted relative to bad outcomes. It is shown that disappointment aversion utility displays first order risk aversion, where the risk premium is proportional to standard deviation, as opposed to variance in the case of expected utility. This feature helps one to account for the phenomenon that individuals are risk averse with respect to gambles which yield a large loss with small probability (as in the stock market) but risk loving with respect to gambles that involve winning a large prize with small probability (as in lottery gambles).

On the practical side, the use of disappointment-averse preferences is particularly beneficial in the case of currency hedging decisions of institutional investors due to the complexity of the issue and resulting behavioral concerns of fiduciaries. There is further evidence that disappointment is felt in situations where others are responsible for the bad experience (Zeelenberg, van Dijk and Manstead, 1998). The decision makers at institutional funds; i.e., board members, choose to hire an investment consultant as a way to transfer a portion of the fiduciary risk. The purpose of the retainer agreement between the investment consulting firm and the institutional fund is to benefit from the expertise of the consultant on such major decisions as asset allocation, manager selection, risk management and performance evaluation. Within this context, there are secondary decisions to be made on such matters as the use of hedge funds, investing in venture capital, and active/passive currency hedging of international portfolios. These secondary decisions are usually carried out by the recommendation of the consultant rather than the typical framework utilized in the case of major decisions listed above. It is exactly the relationship between the consultant and the fund that is the source of disappointment when things do not work out the way the consultant presented to the fund in the first place. Trustees and board members usually feel more responsible by the major decisions made on behalf of the fund, and have the tendency to blame the bad experiences resulting from secondary decisions on the consultant. Hence, the disappointment aversion framework is the ideal setting to incorporate behavioral issues in the decision making process as opposed to the regret aversion framework put forth by Michenaud and Solnik (2008), which argues that institutional investors experience regret for having chosen a currency exposure that proves to be inappropriate ex-post.

On the technical front, both disappointment aversion and loss aversion, according to the prospect theory of Kahneman and Tversky (1979), define the utility function asymmetrically over gains and losses relative to a reference point. For a loss-aversion utility function, the reference point is arbitrarily exogenously chosen, whereas disappointment-averse utility function determines the reference point endogenously that could be updated over time. The second appealing aspect of this kind of framework is that it is fully axiomatic and provides a normative theory, eliminating the need for ad hoc techniques witnessed in the descriptive theoretical frameworks. Thirdly, the fact that standard preferences are a special case of disappointment-averse preferences with the loss aversion parameter put equal to one. Thus, one could capture

many of the asymmetric affects of loss aversion without resorting to behavioral theory⁴. Ironically, in their exposition of the regret aversion framework for currency hedging decision, Michenaud and Solnik (2008) also states that disappointment is easier to model as the benchmark expectation for a given investment is usually set as a fixed number (possible the current situation), while in regret theory one has to wait for the realization of the best investment strategy in the investment decisions universe. Given all the practical and technical rationale, disappointment aversion framework should be explicitly incorporated in the currency hedging decision under uncertainty. I postulate that this is the ideal setting to incorporate behavioral and agency issues as it pertains to delegated asset management issue at institutional funds.

The Proposed Model

The preferences of a disappointment averse agent could be summarized by $[U(R), \beta]$, where U is a conventional utility function describing the utility of earning the rate of return R from a given investment, and $\beta \geq 0$ is a parameter that measures the degree of disappointment aversion. In the absence of disappointment aversion, the agent's utility level is simply $[U(R)]$. Now, we will define the expected utility of a disappointment-averse agent as $V(\beta)$ with β representing the degree of disappointment aversion. Suppose that the agent faces uncertain rates of return, R , in n states of nature. Let μ denote the certain return that yields the same utility level as the uncertain return: $V(\beta) = U(\mu)$. This means, the investor is indifferent between the prospect of a safe return and risky return in n states of nature. The agent reveals disappointment aversion if she attaches extra disutility to circumstances, where the realized return is below μ .

The disappointment-averse utility function could be defined as⁵:

$$(1) V(\beta) = E[U(R)] - \beta E[U(\mu) - U(R) | R < \mu]$$

$E[U(\mu) - U(R) | R < \mu]$ is the expected value of $U(\mu) - U(R)$, conditional on the realized return being below the certainty equivalent return. In other words, the term $E[U(\mu) - U(R) | R < \mu]$ measures the average disappointment. It is the expected discrepancy between the certainty equivalence utility and the actual utility in states of nature where the realized return is below the certainty-equivalent return. Basically, the disappointment-averse expected utility equals the conventional expected utility, adjusted downwards by a measure of disappointment aversion, β , times the "conditional expected disappointment."

We will now define two states of nature, whereby the agent earns the return R in state 1 or 2, and $R_1 > R_2$ with probabilities $(\alpha, 1 - \alpha)$, respectively. Now, we are in a position to re-define $V(\beta)$:

$$(2) V(\beta) = \alpha U(R_1) + (1 - \alpha)U(R_2) - \beta(1 - \alpha)[V(\beta) - U(R_2)]$$

⁴ Different treatments of an investor's asymmetric response to gains and losses are given by Roy (1952), Stutzer (2003), and Maenhout (2004), who model agents with the objective of minimizing the possibility of undesirable outcomes.

⁵ Tapiero (2005) uses the same functional form to model the asymmetric valuation of losses in the management of inventories. In doing so, he provides a justification for the Value-at-Risk (VaR) approach, which was introduced to the literature because of the risk problems facing financial institutions. He uses ex-post, disappointment decision-making arguments in an interdisciplinary manner.

Further rearranging of the terms helps separate the utilities of earning R_1 and R_2 :

$$(3) V(\beta) = \alpha[1 - (1 - \alpha)\delta]U(R_1) + (1 - \alpha)(1 + \alpha\delta)U(R_2)$$

$$\text{where } \delta = \frac{\beta}{1 + (1 - \alpha)\beta}$$

If the agent is disappointment-averse, that is $\beta > 0$, he attaches extra weight $(1 - \alpha)\alpha\delta$ to bad states; i.e., in the case of R_2 , when is disappointed (relative to the probability weight used in the conventional utility), and attaches a lesser weight $-\alpha(1 - \alpha)\delta$ to good states. Note that when $\beta = 0$, $V(\cdot)$ simplifies to the conventional expected utility.

We define R_1 and R_2 as follows:

$$(4) R_1 = W(\mu_f - \mu_{c1} - c_f) + \mu_{c1} + \mu_L$$

$$(5) R_2 = W(\mu_f - \mu_{c2} - c_f) + \mu_{c2} + \mu_L$$

$$\text{where } \mu_{c1} = \ln\left(\frac{S_{11}}{S_0}\right) \text{ and } \mu_{c2} = \ln\left(\frac{S_{12}}{S_0}\right) \text{ and } S_{11} < S_{12}. \text{ Stated differently, in the case of}$$

an international portfolio, the good state refers to the spot currency rate being smaller than the one in the bad state. This refers to the fact that a smaller spot rate indicates appreciation of the foreign currency against the U.S. dollar, providing higher return on invested capital due to currency movements. All the remaining variables are as defined before.

The objective is to find an optimal hedging behavior by maximizing the disappointment-averse utility function, $V(\beta)$. On taking partial derivative with respect to W , we have

$$(6) \frac{\partial V(\beta)}{\partial W} = \alpha[1 - (1 - \alpha)\delta]U'(R_1)(\mu_f - \mu_{c1} - c_f) + (1 - \alpha)(1 + \alpha\delta)U'(R_2)(\mu_f - \mu_{c2} - c_f)$$

The optimal value of W , W^* , must satisfy the following condition: $\frac{\partial V(\beta)}{\partial W} = 0$. The

optimal forward position should equate the following two terms:

$$(7) \alpha[1 - (1 - \alpha)\delta]U'(R_1)(\mu_f - \mu_{c1} - c_f) = -(1 - \alpha)(1 + \alpha\delta)U'(R_2)(\mu_f - \mu_{c2} - c_f)$$

If we assign the same probability to states 1 and 2, this relationship could be simplified further. Given the fact that $\alpha = (1 - \alpha)$;

$$\begin{aligned} \alpha[1 - (1 - \alpha)\delta]U'(R_1)(\mu_f - \mu_{c1} - c_f) &= -(1 - \alpha)(1 + \alpha\delta)U'(R_2)(\mu_f - \mu_{c2} - c_f) \\ (8) \alpha(1 - \alpha\delta)U'(R_1)(\mu_f - \mu_{c1} - c_f) &= -\alpha(1 + \alpha\delta)U'(R_2)(\mu_f - \mu_{c2} - c_f) \\ (\alpha - \alpha^2\delta)U'(R_1)(\mu_f - \mu_{c1} - c_f) &= (\alpha + \alpha^2\delta)U'(R_2)(\mu_{c2} - \mu_f - c_f) \end{aligned}$$

When α increases, the RHS increases more than the LHS. As a result, $U'(R_1)$ must increase to restore the equality. That is, R_1 must decrease, or equivalently, W^* must decrease. In other words, an increase in the probability of the good state occurring reduces the optimal forward position, which is an intuitive conclusion based on the definition of the good state. That is, the higher the probability of the foreign currency appreciating, the less likely it is to hedge these currency positions. In other words, the institutional investor benefits more by not hedging a

significant portion of the foreign exchange exposure. It could also be shown that $\frac{\partial W^*}{\partial \beta} < 0$. As the investor becomes more disappointment-averse, a smaller forward position will be held.

Concluding Remarks

This paper extends the disappointment aversion framework, introduced by Gul (1991), to currency hedging decision by institutional investors, and investigates the optimal hedging behavior for a disappointment-averse investor holding diversified international portfolios. The use of disappointment-averse preferences is particularly beneficial in the case of currency hedging decisions of institutional investors due to the complexity of the issue and resulting behavioral concerns of fiduciaries. Given the decision making framework at institutional funds that employ outside managers, I posed the question of how these funds should establish mandates for the management of currency exposure arising from international investing. It has been widely recognized that allocating assets into international securities exposes institutional investors to the volatility in currency markets. Within this context, even no action regarding the management of the currency exposure may result in significant losses when the foreign currency depreciates significantly during the investment horizon. Moreover, the fact that some currencies are known to trend over extended periods of time magnifies the risks arising from international investments. In this paper, I have made a case for an axiomatic framework to address the possible disappointment faced by institutional investors using currency overlay managers, which are charged to manage the currency exposure with the goal of improving the financial efficiency at these funds. Results provide a rationale for institutional investors to incorporate disappointment aversion in currency hedging mandates with the goal of minimizing background risk. In subsequent work, I intend to build upon a unified parameterization of an expected utility model corrected for regret and disappointment effects a la Laciana and Weber (2008), which argues that while both regret and disappointment increase with increases in the discrepancy between obtained outcome and considered counterfactual outcome, regret effects should increase in an accelerating fashion, whereas disappointment effects should increase in a decelerating fashion. There is a new fascinating paper by Blavatsky (2014), which generalizes the first-generation disappointment models to allow for the possibility that a decision maker may experience not only disappointment/elation but also misfortune (bitter disappointment) and euphoria (extreme elation). He postulates that the proposed theory extends the financial approach to decision making as it is based on the trade-off not only between expected utility and utility variance but also skewness.

REFERENCES

- Baptista, A. M., 2012, "Portfolio Selection with Mental Accounts and Background Risk" *Journal of Banking and Finance* 36, 968-980.
- Blavatsky, P. R., 2014, "A Theory of Decision-Making under Risk as a Tradeoff between Expected Utility, Expected Utility Deviation and Expected Utility Skewness" Working Paper, Available at SSRN: <http://ssrn.com/abstract=2505828> or <http://dx.doi.org/10.2139/ssrn.2505828>
- Chua, H. F., R. Gonzales, S. Taylor, R. C. Welsh, and I. Liberzon, 2009, "Decision-related Loss: Regret and disappointment" *NeuroImage* 47, 2031-2040.
- Das, S., H. Markowitz, J. Scheid, and M. Statman, 2010, "Portfolio Optimization with Mental Accounts" *Journal of Financial and Quantitative Analysis* 45/2, 311-334.
- Dybvig, P., H. Farnsworth, and J. Carpenter, 2010, "Portfolio Performance and Agency" *Review of Financial Studies* 23, 1-23.
- Grant, S., and A. Kajii, 1998, "AUSI Expected Utility; an Anticipated Utility Theory of Relative Disappointment Aversion" *Journal of Economic Behavior and Organization* 37, 277-290.
- Grant, S., A. Kajii, and B. Polak, 2001, "Different Notions of Disappointment Aversion" *Economics Letters* 70, 203-208.
- Gul, F., 1991, "A Theory of Disappointment Aversion" *Econometrica* 59, 667-686.
- He, Z., and W. Xiong, 2013, "Delegated Asset Management, Investment Mandates, and Capital Immobility" *Journal of Financial Economics* 107, 239-258.
- Jiang, C., Y. Ma, and Y. An, 2013, "International Portfolio Selection with Exchange Rate Risk: A Behavioral Portfolio Theory Perspective" *Journal of Banking and Finance* 37, 648-659.
- Kahneman, D., and A. Tversky, 1979, "Prospect Theory: An Analysis of Decision under Risk" *Econometrica* 47, 263-291.
- Laciana, C. E., and E.U. Weber, 2008, "Correcting Expected Utility for Comparisons between Alternative Outcomes: A Unified Parameterization of Regret and Disappointment" *Journal of Risk and Uncertainty* 36, 1-17.
- Loomes, G., and R. Sugden, 1982, "Regret Theory: An Alternative Theory of Rational Choice under Uncertainty" *The Economic Journal* 92, 805-824.
- Loomes, G., and R. Sugden, 1987, "Testing for Regret and Disappointment in Choice under Uncertainty" *The Economic Journal* 97, 118-129.

Maenhout, P., 2004, "Robust Portfolio Rules and Asset Pricing" *Review of Financial Studies* 17, 951-983.

Michenaud, S., and B. Solnik, 2008, "Applying Regret Theory to Investment Choices: Currency Hedging Decisions" *Journal of International Money and Finance* 27, 677-694.

Ogunc, K., 2008, "Behavioral Currency Hedging for International Portfolios" *International Review of Financial Analysis* 17, 716-727.

Palacios-Huerta, I., 1999, "The Aversion to the Sequential Resolution of Uncertainty" *Journal of Risk and Uncertainty* 18, 249-269.

Roy, A. D., 1952, "Safety First and the Holding of Assets" *Econometrica* 20, 431-449.

Shefrin, H., 2000, *Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing*, Boston, Harvard Business School Press.

Shefrin, H., and M. Statman, 2000, "Behavioral Portfolio Theory" *Journal of Financial and Quantitative Analysis* 35, 127-151.

Skiadas, C., 1997, "Subjective Probability under Additive Aggregation of Conditional Preferences" *Journal of Economic Theory* 76, 242-271.

Stutzer, M. J., 2003, "Portfolio Choice with Endogenous Utility: A Large Deviations Approach" *Journal of Econometrics* 116, 365-386.

Tapiero, C. S., 2005, "Value at Risk and Inventory Control" *European Journal of Operational Research* 163, 769-775.

Zeelenberg, M., W. W. van Dijk, and A. S.R. Manstead, 1998, "Reconsidering the Relation between Regret and Responsibility" *Organizational Behavior and Human Decision Processes* 74(3), 254-272.