Salient Attributes and Household Demand for Security Designs

Petra Vokata*

January 1, 2024

Abstract

Can salient attributes distort high-stakes investment decisions? Using a rich dataset of complex retail securities, I show banks add non-standard (fine-print) conditions to artificially increase advertised rates of headline return and downside protection—a phenomenon I term "enhancement." Enhancement increases headline returns by 11 percentage points, on average, but does not increase realized returns. Flexibly controlling for all other product attributes and using shocks to structuring costs of enhancement for identification, I find demand is highly elastic to enhancement. Investors are willing to pay 35–60 basis points for one percentage point of enhancement, which I show is inconsistent with rational portfolio choice. I then explore salience as the primary psychological mechanism that is consistent with my results. In total, I estimate investors lost $1.6 billion due to this salience distortion.

Keywords: Salience, Behavioral Inattention, Shrouding, Security Design, Household Finance, Reaching for Yield

JEL Classification: D18, G11, G23, G40, G50

---

*Fisher College of Business, The Ohio State University, 2100 Neil Avenue, 43210 Columbus, Ohio, USA and CEPR. vokata.1@osu.edu. I thank Daisy Wang and Hoa Briscoe-Tran for their excellent research assistance. I thank seminar and conference participants at the AFA (New Orleans) AFFECT Workshop, CEPR Household Finance Workshop, 6th CFPB Research Conference, Finance Down Under, 10th HEC-McGill Winter Finance Workshop, MFA, NBER Behavioral Finance Meeting, Virtual Derivatives Workshop; NFA; Canadian Derivatives Institute's Annual Conference; NZFM, Annual Meeting of the Swiss Society for Financial Market Research, WAPFIN Conference at New York University, Aalto University, Dartmouth College, Lund University, University of Washington (Foster), Ohio State University (Consumer Economics), Ohio State University (Finance), and Michael Boutros, Laurent Calvet, Claire Célérier, Lauren Cohen, David Feldman, Francisco Gomes, Andrei Gonçalves, Samuel Hartzmark, Victoria Ivashina, Matti Keloharju, Samuli Knüpfer, Jennifer Koski, Juhani Linnainmaa, David McLean, Cameron Peng, Gustavo Schwenkler, Kelly Shue, Simon Straumann, Richard Townsend, Boris Vallée, Baolian Wang, and Chen Wang for comments and discussions that benefited this paper. The paper subsumes results reported in the second chapter of my dissertation, for which I gratefully acknowledge financial support from the Academy of Finland, the OP Group Research Foundation, and the Foundation for Promoting the Finnish Securities Market.

1 Introduction

Much of marketing focuses on increasing the salience of desired attributes. In parallel, much of financial engineering focuses on enhancing these very attributes.[1] Rational choice theory implies such enhancement generally improves welfare as consumers accurately assess all attributes and choose products that maximize utility. Yet economists have long recognized that distortions can arise when inattentive consumers are overly influenced by a product's most salient attributes. Recent work on behavioral inattention, shrouding, and salience (see Bordalo, Gennaioli, and Shleifer 2022 and Gabaix 2019 for reviews) provides the psychological mechanisms for such salience distortions. However, careful empirical quantifications of these phenomena in high-stakes settings have been scarce.

I propose a novel approach to quantify salience distortions in a particular high-stakes context: the multi-trillion market for retail structured products.[2] The products I study (yield enhancement products, or YEPs) are characterized by two saliently advertised rates: headline return and downside protection level. I show issuers add non-standard conditions to artificially increase both of these rates—a phenomenon I term "enhancement". Enhancement is artificial insofar as it is largely irrelevant to both expected and realized returns. The key empirical finding is that, nevertheless, investors are willing to pay 35–60 basis points for one percentage point of enhancement. To interpret the results, I simulate a model of portfolio choice between a stock market, a risk-free bond, and a YEP. In the baseline setup with conventional CRRA utility, rational investors have zero willingness-to-pay for enhancement. I then augment the model with a simple formalization of salient thinking as a leading behavioral explanation of the results.

To fix ideas, consider the following product examples. Figure 1, Panel A, describes the payoff diagram of the simplest product variant: investors receive a 9.5% coupon (the headline return) unless the price of the underlying stock falls by more than 20% (the protection level

[1] For example, pooling and tranching of mortgages into AAA-rated securities enhances safety, portfolio insurance enhances safety by decreasing downside risk, and packaging of mutual funds into variable annuities enhances equity exposure.

[2] As of May 2022, global outstanding volume is estimated at $2 trillion, with America and Europe each accounting for approximately $0.5 trillion and Asia accounting for $1 trillion (see https://www.structuredretailproducts.com/news/details/78173). Vokata (2021) introduces the dataset used in this paper and documents a median invested amount of $25,000. The focus of this earlier work is on the market performance, similar to Henderson and Pearson (2011) and Henderson, Pearson, and Wang (2022).

or barrier) at maturity. If it does, the return decreases in proportion to the price drop of the underlying below this barrier. I call this security design plain-vanilla because it is akin to writing a plain-vanilla European put option. Panel B of Figure 1 describes the payoff diagram of a nearly identical product issued on the same date by the same issuer and linked to the same underlying stock. In addition to the simple design, however, this product includes a knock-in barrier option which effectively weakens the downside risk protection: if the price of the underlying falls below the protection level on *any date* before maturity (not just at maturity), the investors participate in *any fall* in the price of the underlying (not just below the protection level). This weaker protection allows the issuer to offer more attractive headline rates, specifically an 18% coupon and a 35% protection level. I refer to this substitution—of inferior security design for more attractive headline rates—as enhancement.

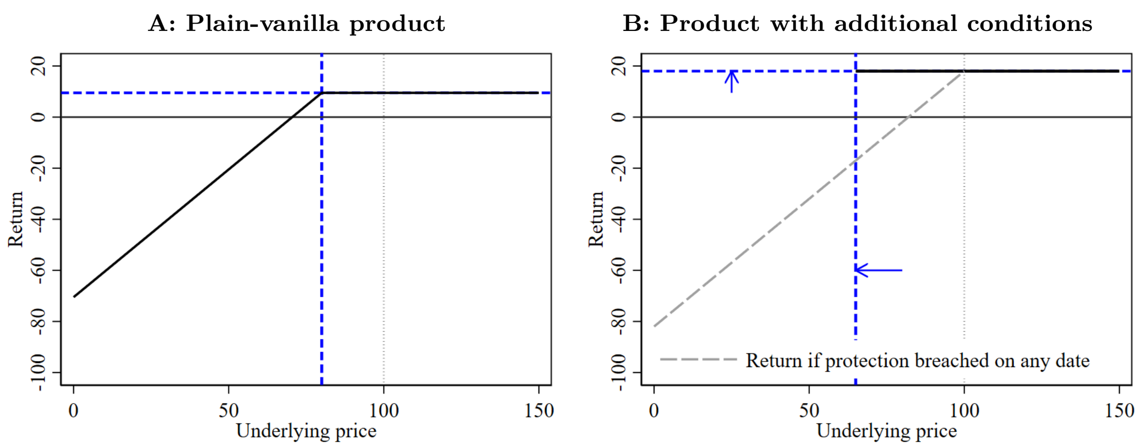


Figure 1. Payoff Diagrams

The figures show payoff diagrams for two nearly identical products issued on the same date by the same bank and linked to the same underlying stock that differ only in their security design. Plain-vanilla product (Panel A) pays a 9.5% coupon, also called headline return, (marked with a horizontal blue line) if the price of the underlying does not fall by more than the downside protection of 20% (marked with a vertical blue line). The product with additional conditions (Panel B) includes a knock-in barrier option which enhances its headline rates to an 18% coupon and a 35% protection level. The products have a 6-month maturity. To make enhancement easier to see, the figures use a one-year maturity.

I start my analysis by documenting novel stylized facts using data on 28,000 products sold to U.S. households. First, the magnitude of enhancement in the market is substantial and plays a first-order role when setting headline rates. A key advantage of my setting is that I observe the input costs of YEPs in the prices of listed options. I use this data to isolate the fraction of headline rates attributable to additional conditions and define a measure of enhancement equal to the spread in headline returns between the product and its corresponding plain-vanilla counterfactual. On average, additional conditions enhance headline returns by 11 percentage points, corresponding to more than 85% of the average headline return in my sample. The second stylized fact is that enhancement is positively correlated with product fees. I define the fee as the annualized embedded markup, i.e., the difference between the product price and its fair value. On average, investors pay an extra 38–56 basis points for a percentage point of enhanced headline returns.

I next estimate an investor demand model for yield enhancement products. I borrow from standard approaches in the industrial organization literature (Berry, 1994) adapted to investors' discrete choice of financial products (Baker, Egan, and Sarkar, 2022; Egan, 2019). The advantage of studying YEPs is that their payoffs are entirely characterized by a few pre-determined attributes. I can flexibly control for these attributes since banks often issue close substitutes that are identical in all attributes except for security design. My estimates imply that investors have been willing to pay 35–61 basis points per percentage point of enhancement. The estimated willingness to pay is close to the observed price of enhancement in the data, suggesting that banks extract the large majority of investor surplus from enhancement.

The demand estimates are robust to instrumenting enhancement with a cost-based instrument. A unique feature of the market allows me to isolate the mechanism and provide a falsification test of the instrument validity. Headline rates are commonly fixed prior to the beginning of the offering period over which investors can purchase the products. I find that demand is elastic to cost shocks to enhancement that occur prior to fixing and therefore translate to lower headline rates but is perfectly inelastic to cost shocks that occur when headline rates are fixed. These patterns support the assumption that cost shocks affect demand only through their impact on headline rates.

In the next part of the paper, I consider several rational explanations for enhancement effects. The rich data on YEPs covering realized, expected, and delta-hedged returns allow me to rule out that conventional portfolio choice theory can explain my findings. For example, gross returns, at best, rise weakly with enhancement (+10 basis points per percentage point of enhancement).

The significant fees charged for enhancement completely swamp the modest rise in gross returns. Net of fees, enhancement yields losses of 45–60 basis points. In a portfolio choice model simulated to match the key moments in the data, rational investors with a conventional CRRA utility have zero willingness to pay for enhancement. The intuition is that the small increase in gross returns to enhancement is fully offset by higher volatility and covariance with the market portfolio. A framework allowing for subjective beliefs about underlying returns can yield a higher willingness to pay. However, better-priced and easily accessible exchange-listed options completely crowd out YEPs in the portfolio.

I next show that a form of salient thinking (Bordalo et al., 2022) whereby agents overweight the salient headline rates and underweight the additional conditions can explain my findings. The results are consistent with an average salience distortion—the difference between the objective and subjective valuation—of 5.6%, which aggregates to \$1.6 billion in excess fees over my ten-year sample period. Strictly speaking, these fees are transfers from investors to intermediaries and therefore do not affect total welfare. However, they directly speak to household welfare and to the behavioral frictions inhibiting welfare-improving financial innovations, which have been at the center of academic and policy debate (Campbell, 2006). The modeling framework I employ also allows me to recover an attention parameter m as modeled by Gabaix (2019). My baseline results are consistent with an attention parameter $m = 0.5$. Although the precise level of attention is likely context-specific, my estimate is comparable to several estimates discussed by Gabaix (2019). For example, attention to sales tax is 0.35 in Chetty, Looney, and Kroft (2009). In financial markets, the attention parameter to value innovation due to earnings announcements is 0.41–0.54 in DellaVigna and Pollet (2009).

The results likely generalize outside of the U.S. I complement my main results with evidence on almost 60,000 products issued globally. These data do not include information on product fees, which precludes a careful demand estimation. However, I show that the main stylized facts hold globally: (i) additional conditions significantly enhance headline rates, (ii) volume sold increases with enhancement, and (iii) realized returns decline with enhancement. I also note that the exotic design features similar to the ones explored in this paper are common in other categories of structured products[3], in the $1.5 trillion market for variable annuities (Koijen and Yogo, 2022), $32 billion market for defined outcome ETFs, and on fintech platforms offering custom security designs.[4]

The rest of the paper unfolds as follows: In Section 2, I describe my data, the measure of enhancement, and the key stylized facts about the extent and cost of enhancement. I estimate the demand model for YEPs in Section 3 and present my estimates of investors' willingness to pay for enhancement. In Section 4, I discuss potential rational explanations for enhancement effects. First, I analyze several measures of YEP returns. I then develop and simulate a simple portfolio choice model with YEPs and quantify the willingness to pay for enhancement by rational investors. In Section 5, I consider several behavioral explanations and formalize the role of salient thinking in security design. I conclude in Section 6.

Related literature. The article relates to several strands of literature. First, it contributes to the literature on behavioral biases, attention, and salience in economics and finance (see DellaVigna 2009; Barberis 2018; Beshears, Choi, Laibson, and Madrian 2018; and Bordalo, Gennaioli, and Shleifer 2022 for reviews). The firm behavior I document—the use of additional conditions to enhance headline rates—resembles a form of shrouding (Gabaix and Laibson, 2006). My paper joins a number of papers that find evidence of inattention to shrouded attributes: Brown, Hossain, and Morgan (2010); Anagol and Kim (2012); Stango and Zinman (2014). Most of this existing work exploits settings with a shrouded price component. In my setting, it is the quality of products, not add-on price, that is shrouded. While shrouding of quality or non-price attributes might be widespread in other markets, it often remains unobservable by the econometrician.[5] In this paper, I demonstrate how its unique setting—where all attributes and cost inputs are observable—enables a clean measurement. The substitution of shrouded to salient attributes—enhancement—which I show is normatively irrelevant, shares similarities

[3] Vokata (2019) documents a significant role of additional conditions in enhancing headline rates of capital protected products.

[4] Examples of fintech platforms offering custom designs include https://simon.io/, https://lumafintech.com/, or https://haloinvesting.com/.

[5] Examples of shrouded quality range from fraudulent activities, such as in the case of Theranos or the Volkswagen emissions scandal, to more subtle instances like misleading food labeling, where the nutritional content or ingredients of a product are obscured or misrepresented to appear healthier. In finance, greenwashing is a recent example of misleading labeling. In all of these examples, the extent of shrouded quality is difficult to measure.

with other salience modifications, such as framing (Kahneman and Tversky, 1979; Tversky and Kahneman, 1981). I am the first (to my knowledge) to document and quantitatively explore distortions due to such salience modification in a high-stakes field context. YEPs are sold to mass affluent investors with a median investment of $25,000, yet the magnitude of the salience distortion is large enough to wipe-out all or most of the equity premia, making YEPs inferior products. This suggests that salience distortions can be of first-order importance even beyond settings where unsophisticated consumers are making unconsidered decisions.

My paper also adds to the literature studying demand for financial assets. Barber, Odean, and Zheng (2005) argue that mutual fund flows are sensitive to salient front-load fees, and Barber, Huang, Odean, and Schwarz (2022) show that retail trading activity reacts to salient attention-grabbing events. Using search cost models, Egan (2019) studies the influence of brokers and Roussanov, Ruan, and Wei (2021) of marketing on retail demand. Drechsler, Savov, and Schnabl (2017) estimate relatively low elasticity of demand for deposits to bank spreads, and Koijen and Yogo (2019) estimate low price elasticity of demand for stocks. The estimates in this paper highlight the important role of behavioral frictions in lowering the price elasticity of household demand. The results also relate to the papers studying reaching for yield by households (Lian, Ma, and Wang, 2018; Gomes, Peng, Smirnova, and Zhu, 2022) and to the literature documenting various types of nominal distortions in equity markets (Birru and Wang, 2016; Hartzmark and Solomon, 2019; Shue and Townsend, 2021).

Finally, my work adds to the literature on retail structured products (Henderson and Pearson, 2011; Henderson, Pearson, and Wang, 2020, 2022; Vokata, 2021; Calvet, Célérier, Sodini, and Vallée, 2022)[6] and complexity in finance (Carlin, 2009; Ghent, Torous, and Valkanov, 2018). Célérier and Vallée (2017) also consider the role of salience and shrouding in the supply of structured products in Europe; however, their mechanism and empirical approach differ from this work. I defer the comparison of their mechanism to Section 5.1.[7] My results are also relevant

[6] See also Li, Subrahmanyam, and Yang (2018); Gao, Hu, Kelly, Peng, and Zhu (2022) for evidence from similar markets.

[7] Their empirical approach uses time-series and cross-country variation in headline returns and design complexity to study the supply side of the products. There are several key innovations in this paper that allow me to identify and quantify salience distortions in the market: (i) rich data, (ii) a novel measure of enhancement, and (iii) a demand estimation enable quantification, and (iv) comprehensive return data with (v) a portfolio-choice model allow to disentangle the salience mechanism from alternative explanations.

for theories explaining the motives for financial innovation and security design (Tufano, 2003; Grinblatt and Longstaff, 2000; Gennaioli, Shleifer, and Vishny, 2012; Bordalo, Gennaioli, and Shleifer, 2016; Pérignon and Vallée, 2017). In particular, my paper gives support to theories of behavioral financial innovation (Bordalo, Gennaioli, and Shleifer, 2016; Heidhues, Koszegi, and Murooka, 2016).

2 Data: Enhancement and Fees of Yield Enhancement Products

2.1 Structured Products Data

I combine detailed data on more than 28,000 yield enhancement products issued in the U.S., 59,000 products issued outside of the U.S., and standard data on pricing inputs. The combined dataset extends the data used in Vokata (2021). As far as I am aware, the resulting dataset is the most comprehensive dataset on retail structured products both in terms of the number of products (nearly 90,000) and variables covered.

I have the most detailed data on more than 28,000 products issued in the U.S. between 2006 and 2015. The data comes from Vokata (2021) and covers all product attributes: both headline rates, indicators for additional conditions (types of embedded exotic options), issue date, maturity, issuing bank, underlying asset, fair values, commissions paid to brokers, and several measures of returns. For the non-U.S. products, I observe the same variables except for the fair values. Both datasets cover only products categorized as retail and therefore exclude private placements targeted at institutional or accredited investors.

I merge the product data with data on pricing inputs. Implied volatility is from the volatility surface of OptionMetrics. Swap rates are from Bloomberg for the U.S. dollar and from Datastream for other currencies. The dividend yield is extrapolated from dividend payments and ex-dates coming from the Center for Research in Security Prices (CRSP) for U.S. stocks or from OptionMetrics for other underlyings.

2.2 Security Design of YEPs

YEPs are fully characterized by a small number of attributes. The two most prominently displayed attributes (see Internet Appendix Section A for examples) are the *headline return*, also called the coupon or interest rate, and the *protection level*, also called barrier or trigger price, which governs the downside risk. Generally, if the underlying price does not fall by more than the protection level, investors receive back their invested nominal amount at maturity on top of the coupon. However, the exact behavior of both headline rates is determined by a range of *additional conditions* which are embedded in the design with exotic options. Banks designing YEPs have considerable flexibility as the regulation does not heavily constrain the design of additional conditions. However, in practice, banks tend to use largely standardized designs, possibly due to the marketing cost (Ross, 1989) of explaining new designs to brokers and investors.[8] I define *security designs* as unique combinations of exotic embedded options. The headline rates and security design, together with the product *underlying asset*, and the schedule of *issuance*, payment, and *maturity* dates, fully define the product's cash flows, subject to the issuer's default risk.

One of the well-known examples of YEPs is reverse convertible, such as the one described in Internet Appendix Figure A.4. This product offers a 10% annual headline return and a 25% protection level. These two headline rates are prominent for two reasons. First, consistent with the use of the salient display to affect choice (Frydman and Wang, 2020), they are prominently advertised in the term sheet. Both are highlighted in bold and displayed early on the first page. The headline return is also mentioned in the header. Second, the headline rates are also the only two numbers related to the product return and risk profile ever mentioned in the term sheet or marketing materials. Other key factors, such as historical product returns, expected returns, fees, or probability of losses, are not disclosed.

The product embeds two additional exotic conditions on top of a plain-vanilla security design: knock-in and call feature. The role of these conditions is less obvious since one needs to use option pricing techniques to quantify their impact on risk and return. The conditions also tend

[8] The flexibility to modify headline rates and security design is somewhat analogous to the ability of firms to choose price formats to affect the ability of consumers to compare products as in Piccione and Spiegler (2012) and Carlin (2009).

to be less prominently displayed and are buried in more lengthy descriptions filled with technical jargon.

2.3 Measuring Enhancement

To quantify the impact of additional conditions, I introduce a measure of headline *enhancement*. I propose that a natural benchmark to each product is a plain-vanilla substitute stripped of all the additional conditions. I leverage the fact that I can accurately observe the input costs of products in the prices of listed options and construct such synthetic counterfactual product. The counterfactual product thus has a plain-vanilla design and inherits from the original product all other attributes other than the headline return: issue date, maturity, underlying asset, fair value, and protection level.

Because the payoff of a plain-vanilla product is equivalent to a bond and a short position in a plain-vanilla European put option, I can calculate its headline return with a closed-form formula building on the Black-Scholes-Merton framework. For product i with headline return hr_i, fair value FV and maturity T linked to the underlying stock s issued on day t with a protection level pl, I define *Enhancement (e_i)* as:

$$e_i = hr_i - hr_{vnl} = hr_i - \frac{(FV + OP_{pl,T}/S_0)(1+r)^T - 1}{T}, \tag{1}$$

where hr_{vnl} is the headline return of plain-vanilla counterfactual, r is an interpolated swap rate for product maturity T, $OP_{pl,T}$ is the price of a plain-vanilla put option with maturity T and a strike price corresponding to protection level pl, and S_0 is the initial price of the underlying. I calculate the option price using the Black-Scholes-Merton type formula for option prices of assets paying known dividend yield with implied volatility, σ, bilinearly interpolated from the volatility surface of OptionMetrics.

The formula in equation 1 follows from the fact that the plain-vanilla payoff is equivalent to writing a put option and investing the proceeds together with the fair value of the product at the risk-free rate. The investor in YEP pays an upfront embedded fee (the difference between the price and fair value) to the issuing bank and therefore only the fair value is effectively invested in the product. Table 1 shows details of the calculation for the example products in Figure 1.

I abstract from the role of discrete dividends, day-count conventions, coupon payment frequency, and issuer's credit risk when calculating enhancement because these factors have a minor impact. Both the fair values of YEPs and headline rates of counterfactual products are based on mid-quote prices consistent with the U.S. Securities and Exchange Commission (SEC) valuation guidelines.[9] Insofar as the effect of bid-ask spread is the same for the actual and the counterfactual product, the headline enhancement measure is unaffected by the bid-ask spreads. Internet Appendix Figure A.9 displays the distribution of enhancement and validates that for products with a plain-vanilla security design, the enhancement measure centers around zero.

Before turning to the stylized facts on enhancement, three comments about the novel measure are in order. First, I express the degree of enhancement in units of headline returns for expositional simplicity, but I show that banks use enhancement to increase both headline rates. The products in Figure 1 provide a concrete example: enhancement increases headline return by 90% and protection level by 75%. Internet Appendix Figure A.15 displays binned scatterplots of headline rates on enhancement in the full sample and shows that both rates are strongly increasing in enhancement.

Second, introducing enhancement is helpful in isolating just the role of additional conditions from other key determinants of the YEP's risk-return profile. For example, one may consider the risk-free rate as another natural benchmark (Célérier and Vallée, 2017). Relative to the risk-free rate, however, YEPs have significantly higher both expected returns and risk, which complicates comparison. Enhancement, on the other hand, as Section 4.1 documents, is largely irrelevant for expected returns.

Third, the definition in equation 1 requires data on fair values, which are missing in many datasets on structured products. Internet Appendix Section B shows how to adjust the measure when fair values are not available. On a security design level, the adjusted measure retains the rank ordering of the original measure, and I use it to extend the analysis to the 59,000 products issued outside of the U.S. where I do not observe fair values. The adjusted measure is conservative, i.e., it understates the extent of enhancement.

[9]The guidelines are expressed, for example, in the communication with Morgan Stanley, available at https://www.sec.gov/Archives/edgar/data/895421/000000000013009967/filename1.pdf.

2.4 Summary Statistics

Table 2 shows the mean value of enhancement together with other descriptive statistics for both the U.S. (Panel A) and non-U.S. (global) products (Panel B). The first salient fact that emerges from my analysis is the large magnitude of headline enhancement present in both samples. In the U.S. sample, additional conditions on average enhance headline returns by 11 percentage points. In the global sample, I conservatively estimate enhancement of 6 percentage points. Given the average headline return of 13 percentage points (and 9 percentage points globally), these results reveal additional conditions play a first-order role in the design of the securities.

The average U.S. product offers a protection level of 26%, while the average non-U.S. product offers protection of 35%. These nominally attractive rates may give investors the impression that breaching the protection level is unlikely. For instance, the annual return of the S&P 500 index, which may be the easiest to retrieve from memory, was lower than -26% only in four out of 96 years since 1926. Because the products are predominantly linked to single-name equities, which are riskier than the S&P 500 index, and because the downside protection is subject to additional conditions, the protection levels are regularly breached. In my sample, more than a quarter of the products breach the protection level. As a result, the average realized return is significantly lower than the headline return: -8.5% for the U.S. products and 0.3% for the non-U.S. products. These realized returns cover only products with fixed maturity, because annualized realized returns of autocallable products are significantly biased upward (Vokata, 2021). The average embedded fee—defined as the annualized markup, or the difference between the product price and fair value—is 7%.

The average sales volume in the U.S. is $2 million, and the average sales volume outside of the U.S. is $3.7 million. The sales volume represents the issuance size, i.e., the total volume issued at the end of the offering period over which investors can subscribe the products. The average maturity of the products in the U.S. is ten months, with an interquartile range of six months. In all analyses, the maturity fixed effects are rounded to quarters.

2.5 Engineering of Enhancement

Given the large magnitude of enhancement and its large dispersion—the standard deviation in the U.S. is 5 percentage points—a natural question is how exactly do banks engineer enhanced headline rates and what explains the variation in enhancement. In the data, the two factors that explain most of the variation in enhancement is the security design and the implied volatility of the underlying. These two variables combined explain two thirds of the variation in enhancement.

It is easy to see why security design affects enhancement. Compare for example the two most common security designs over my sample period. In the digital design (often called single-observation barrier reverse convertible), the breach of the protection level is evaluated only on the maturity date. In the barrier design, the breach of the protection is observed daily which by construction and all else equal increases the probability of participating in downside losses. In turn, for a product with the same protection level and fair value, the barrier design must enhance headline returns more than the digital design.

To see why the underlying volatility plays an important role, note that the probability of breaching the protection level on any date increases with the volatility of the underlying. Again, keeping fair value and protection level fixed, the difference between the headline return of the barrier and digital designs, therefore, must be higher for more volatile underlying assets.

2.5.1 Instrument for Enhancement

I use these insights to construct an instrument for enhancement which will prove useful in the empirical analyses. The intuition behind the instrument is similar to textbook cost based instruments: Fluctuations in the prices of options affect the headline rates that banks can engineer. When options are expensive, and therefore implied volatilities are high, the banks can offer more attractive headline rates, and even more so for high enhancement designs.

For product i with security design g linked to an underlying s, I define the product-specific instrument for enhancement derived from structuring costs as follows:

$$\phi_i = \nu_g \times \sigma_{s,t}, \tag{2}$$

where $\sigma_{s,t}$ is the underlying implied volatility on the valuation date t and ν_g is the security design sensitivity of enhancement to volatility ($\nu_g = \frac{\partial e_i}{\partial \sigma_s}$). I consider the sensitivity of headline enhancement to be constant at the security design level and estimate it with a regression:

$$e_i = \sum_{g=1}^{g=G} \nu_g \mathbf{1}_{i,f=g} \sigma_{s,t} + \lambda_T + \epsilon_i, \tag{3}$$

where e_i is enhancement, $\mathbf{1}_{i,f=g}$ is an indicator variable equal to one for products with security design g, and λ_T are maturity fixed effects. Identifying variation of the instrument comes from variation in underlying volatility over time and across underlying equities and from variation in ν_g across security designs. The F-statistic from the first stage is above 5,000 and therefore far above the conventional threshold for rejecting weak instruments (Stock and Yogo, 2005). Internet Appendix Figure A.16 presents the graphical representation of the instrument construction. It shows that (i) enhancement is positively related to implied volatility, and (ii) security designs vary in their sensitivity of enhancement to implied volatility.

2.6 Enhancement and Fees

I start my empirical analysis by examining how product fees vary with enhancement in the following regression specification:

$$p_i = \gamma e_i + \lambda_t + \epsilon_i, \tag{4}$$

where p_i is product fee and e_i is enhancement. Both fee and enhancement are expressed in annual percentage rates. In all specifications I include year-month fixed effects λ_t to control for the fee compression observed during my sample period (Vokata, 2021). In more saturated specifications, I also control for maturity, underlying, and issuer fixed effects.

A potential challenge with directly estimating equation 4 is that both fees and enhancement are calculated using product fair value which has to be estimated using option pricing. Any potential measurement error in fair values may cause γ to be biased upwards. To address this measurement error concern, I instrument for enhancement using the cost-based instrument described in Section 2.5. In addition, to understand the main drivers of fee dispersion, I also instrument for enhancement using the two instrument components separately.

Column 1, Table 3, presents the results. The coefficient implies that a one percentage point increase in enhancement is associated with a 50 basis points higher fee. Column 2 shows that this result is robust to the controlling for issuer, maturity, and underlying fixed effects. I next explore how fees vary with respect to the variation in enhancement on security design level alone. To that end, I replace the instrument with the vega, ν_g, of the security design. The results in Columns 3 and 4 indicate that security designs with higher enhancement charge 38–50 basis points higher fees for each additional percentage point of enhancement. In Columns 5 and 6, I instrument for enhancement using the underlying volatility only and find coefficients of similar magnitudes as in the previous specifications. Internet Appendix Section B shows that these results are robust to using markups disclosed by the issuers. Moreover, the same appendix section shows that enhancement is the primary determinant of fee dispersion in the data. I document that the partial R^2 for enhancement in regressions explaining fees is 23–46%.

Overall, I find evidence that variation in enhancement both across security design and across underlying volatility is associated with higher fees. These patterns are consistent with investors willing to pay higher fees for products with more attractive coupons and protection levels.[10] I will return to these stylized facts in Section 5.1 to underpin the formalization of salient thinking in investor demand.

3 Demand for Enhancement

I next estimate a model of investor demand for yield enhancement products which allows me to quantify how much are investors willing to pay for enhancement. I then consider rational and behavioral explanations for the willingness to pay for enhancement in Sections 4 and 5.

3.1 Estimation

I estimate investor demand for yield enhancement products with the following regression specification:

$$q_i = -\alpha p_i + \delta e_i + \lambda_{tTbs} + \lambda_g + \epsilon_i, \tag{5}$$

[10] I note that the sign of the coefficient is consistent with the small-sample ($N = 78$) evidence in Célérier and Vallée (2017) who find that products with higher headline rates charge higher fees and propose that the relation is driven by complexity of the security design.

where q_i is the sales volume of product i. The variable p_i measures product fees in annual percentage points and the associated parameter α reflects price sensitivity of demand. The variable e_i measures headline rate enhancement in annual percentage points and the associated parameter δ captures investor demand for enhancement. Since both fees and enhancement are expressed in the same units, the ratio of the two parameters, δ/α, measures investors willingness to pay for enhancement.

The fixed effects λ_{tTbs} absorb unobserved demand shocks for month t, maturity T, issuing bank b, and underlying stock s. In the most flexible specification, I control for the interaction of these fixed effects and therefore absorb unobserved month-by-maturity-by-issuer-by-underlying demand shocks. The security-design fixed effects λ_g capture unobserved security design characteristics such as design complexity. These unobserved demand shocks and characteristics therefore subsume any potential role of complexity aversion (Brown, Kapteyn, Luttmer, Mitchell, and Samek, 2017; Umar, 2022), or time-varying demand shocks for the underlying stocks due to extrapolation (Greenwood and Shleifer, 2014), familiarity (Keloharju, Knüpfer, and Linnainmaa, 2012), or various drivers of attention (Barber and Odean, 2008).

In additional to the baseline specification having sales volume as the dependent variable, I also estimate the demand using logged market share as the dependent variable, where market share is defined over all products issued in the same month $\mathcal{J}_t$ as:

$$S_i = \frac{q_i}{\sum_{j \in \mathcal{J}_t} q_j}. \tag{6}$$

This specification with market shares therefore allows to interpret the coefficients α and δ as semi-elasticities and is also analogous to the demand estimation in Baker et al. (2022) which adapts standard models in the industrial organization literature (Berry, 1994) to the discrete choice of financial products.

3.1.1 Identification: Instruments for Enhancements and Fees

The common challenge in estimating equation 5 is that product fees may be endogenous. For example, the issuing bank may increase product fees p_i when it anticipates higher demand, i.e., when the unobserved demand shocks ϵ_i, is higher. Such endogeneity of fees could then bias my estimate of α towards zero. In a similar fashion, if the bank changes product enhancement e_i in anticipation of demand shocks, the coefficient δ may be biased. To address the price endogeneity, I follow a standard approach and instrument for product fees using Hausman-type instruments (Hausman, 1996). Specifically, the instrument for the fee charged by product i with a maturity T issued by bank b in month t and belonging to enhancement quintile k is equal to the average fee charged by bank b on all other products issued in month t with maturity T and belonging to the same enhancement quintile k. To address the endogeneity of enhancement, I use the cost-based instrument defined in equation 2. The identifying assumption therefore requires that the demand shock for product i is orthogonal to the fees charged by the issuing bank b on other products in the same maturity-month-enhancement-quintile group, the underlying implied volatility, and the security design vega.

3.2 Results

Table 4 presents the results from estimating the demand equation 5. The OLS estimates are reported in columns 1 and 2, and the IV estimates are reported in columns 3 and 4. In Panel A, the dependent variable is the sales volume and in Panel B the dependent variable is logged market share. The specifications in columns 1 and 2 differ in the controls: in column 1 I include individual fixed effects, whereas in column 2 I include the interaction of month-by-maturity-by-bank-by-underlying fixed effect. As a result, the sample size in column 2 is significantly smaller. In column 3, I instrument for enhancement with the instrument based on structuring costs. In addition, in column 4 I instrument fees with the Hausman-type instrument.

Consistent with price elastic demand, I estimate a negative and statistically significant coefficient on product fees in all specifications. I calculate the corresponding demand elasticities measured at median sales volume and average fee at the bottom of panel A. The elasticities range from 0.8–1.5, indicating a relatively low price elasticity. This result is consistent with the interpretation that investors do not fully observe the product embedded fees, that YEPs are highly differentiated products, or that other factors, such as the role of broker recommendations (Egan, 2019), lower price elasticity.

The more interesting result is the coefficient on enhancement. Across the specifications, I estimate statistically and economically significant coefficient attached to the measure of enhancement. I calculate the corresponding willingness to pay for enhancement at the bottom of each panel. The willingness to pay ranges from 0.35–0.61 implying that investors are willing to pay 35–61 basis points for each percentage point of enhanced headline return. The magnitudes are close to the coefficients in fee regressions reported in Table 3 ranging from 0.38–0.56. This result suggests the market for YEPs is not sufficiently competitive allowing the banks to price the products close to investors' willingness to pay.[11]

The key question is why do investors demand enhancement. I defer a full discussion of the potential interpretations to Sections 4 and 5, but two observations about the size of the estimated coefficients are in order. Section 4 shows that rational investors with conventional preferences have zero willingness to pay for enhancement. In light of this result, the estimated willingness to pay for enhancement is surprisingly large. As another point of reference, Drechsler et al. (2017) document a semi-elasticity of deposits to bank spreads of 5.3. The enhancement semi-elasticities, comparable in scale and ranging from 2.9–4.5 (panel B, Table 4), imply that enhancement plays an economically important role in lowering the price elasticity of YEP demand.

I complement the tabulated results by exploring the shape of demand for enhancement in Figure 2. The figure plots a binned scatter plot corresponding to column 1 of panel B in Table 4. The figure shows the relation between volume and enhancement is concave, consistent with headline enhancement becoming less effective at high levels of headline rates. I find similar results when replacing the measure of enhancement with the two headline rates: headline return and protection level. Figure 3 plots the relation of volume with each of the headline rates individually and displays similar concave patterns. These results are consistent with investors deriving utility both from headline returns and protection levels, giving issuers incentives to enhance both headline rates with additional conditions.

[11] I note that the demand estimates are consistent with the OLS regressions in Egan (2019) who shows that the issuance size in his sample of reverse convertibles is more sensitive to the coupon rate than to the value of the embedded put option.

3.3 Instrument Validity: Falsification Test with Headline Rate Fixing

A useful feature of my setting is that the offering process of YEPs features separate periods of supply and demand timing. The products are designed before the start of the offering period. That is, the bank chooses the security design, the underlying equity, and the headline rates. These attributes remain fixed throughout the offering period, during which investors decide whether to subscribe to the product and, if so, how much to invest in it. At the end of the offering period, banks issue the total subscribed amount. I use this feature to design a falsification test of the identifying assumption. Specifically, if the relation between the instrument is driven by the impact of costs on headline rates, it should not be present for cost shocks that appear after the start of the offering period when headline rates are immune to cost shocks.

I observe the start of the offering period lasting at least one week for 5,414 products issued between 2006–2009. For other products, the offering period is either shorter than one week or the starting date of the offering period is missing in the data. For this sample of products, I measure weekly changes in the instrument $\Delta\phi_{i,h} = \nu_g \times \Delta\sigma_{s,h}$, where $\Delta\sigma_{s,h}$ is a weekly change in the underlying implied volatility. I consider four weeks before and two weeks after the start of the offering period, where the second week lasts only until the issue date and is therefore shorter for products with offering period shorter than two weeks. Internet Appendix Figure A.18 shows significant variation in these weekly instrument shocks that share similar distribution both before and after the start of the offering period.

I first validate that the cost shocks have a significant impact on headline rates before the start of the offering period but not after. Figure 4, panel A, plots γ_h coefficients from estimating regression:

$$\text{headline rate}_i = \sum_{\substack{h \in \{-1m, \\ -4w,..,2w\}}} \gamma_h \phi_{\mathbf{i,h}} + \lambda_{tTbsg} + \epsilon_i, \tag{7}$$

where $\phi_{\mathbf{i,h}}$ is a vector of cost shocks including the level of the instrument measured four weeks prior to the start of the offering period ($-1m$) and its six weekly changes, $\Delta\phi_{i,h}$. Consistent with the headline return being fixed over the offering period, I find that cost shocks affect headline returns before the start of the offering period, whereas the relation turns insignificant for the two weeks of the offering period. Panel B of Figure 4 shows similar patterns for protection levels.

The fact that the headline rates are fixed over the offering period implies that any changes to cost shocks over the offering period must translate to higher product fees. Panel C of Figure 4 validates this prediction. The figure plots the regression coefficients from equation 7, where the dependent variable is product fee.

In Figure 5, I explore how cost shocks affect demand with the following regression:

$$q_i = -\alpha p_i + \sum_{\substack{h \in \{-1m, \\ -4w \text{ to } -1w, \\ 1w \text{ to } 2w\}}} \delta_h \phi_{\mathbf{i,h}} + \lambda_{tTbsg} + \epsilon_i, \tag{8}$$

where $\phi_{\mathbf{i,h}}$ is a vector of cost shocks including the level of the instrument measured four weeks prior to the start of the offering period ($-1m$) and two changes, $\Delta\phi_{i,h}$, measured either before ($-4w$ to $-1w$) or during ($1w$ to $2w$) the offering period. The regression controls for fees (p_i), which are determined at the end of the offering period, and therefore accounts for the effect of cost shocks on demand arising from the disutility of paying higher fees. Prior to the start of the offering period and headline rate fixing, the instrument or its changes are positively and significantly related to demand. Consistent with the exclusion restriction of cost shocks affecting demand only through their impact on headline rates, the changes to the instrument have no significant impact on demand during the offering period. The difference between the coefficients attached to changes prior ($-4w$ to $-1w$) and after ($1w$ to $2w$) the start of the offering period is statistically significant (t-value $= -2.24$). Internet Appendix Tables A.3 and A.4 provide the tabulated results.

3.4 External Validity: Evidence from Global Markets

To assess the generalizability of the results, I next analyze data on 59,000 products issued outside of the U.S. I do not observe product fees in this sample and, therefore, cannot cleanly estimate demand as in the U.S. sample. Instead, I examine whether enhancement attracts higher sales volume with the following regression:

$$q_i = \delta e_g + \lambda_{tTbsc} + \epsilon_i, \tag{9}$$

where e_g is the security-design level measure of enhancement. λ_{tTbsc} are month, maturity, issuer, underlying, and country fixed effects. In the most saturated specification, I include the interaction of these fixed effects and, therefore, flexibly control for all attributes of the products other than the security design.

Table 5 presents the results. In column 1, I employ the full sample of more than 59,000 products. Because many of the products issued outside of the U.S. are linked to multiple underlying assets (baskets), I do not control for the underlying fixed effects in this baseline specification. In column 2, I restrict the sample only to the products that are linked to a single underlying and add underlying fixed effects. In the most saturated specification in column 3, I add the interaction of the fixed effects.

Across all the specifications, the coefficient attached to enhancement is highly statistically and economically significant. Internet Appendix Table A.5 shows that enhancement is also associated with lower returns in the global sample, consistent with high-enhancement designs charging higher fees and subsequently earning lower returns. These patterns are consistent with the interpretation that investors demand and are willing to pay higher fees for enhancement, corroborating the generalizability of my main results.

4 Rational Explanations for Enhancement Effects

In this section, I consider rational motives generating demand for enhancement within conventional portfolio choice theory. For example, it could be that enhancement increases expected returns or lowers volatility. I set the stage by exploring the relation between enhancement and several measures of YEP returns. I then set up a stylized model of portfolio choice to quantify the willingness to pay for YEPs under conventional preferences.

4.1 Returns to Enhancement

A natural explanation for why investors are willing to pay higher fees for enhancement are their potentially higher expected returns. It is clear that the enhanced coupon rates cannot, by design, fully translate into higher expected returns, because enhancement (as demonstrated in

Figure 1) also increases the magnitude and probability of downside losses. It is, however, possible that enhanced coupon rates yield at least partially higher expected returns if enhancement is associated with higher expected option returns, higher returns on the underlying assets, or higher abnormal returns due to mispricing.

I next provide novel evidence on the performance of the products with respect to enhancement using various measures of returns derived by Vokata (2021). Vokata (2021) shows that standard performance measures, such as average annualized returns, are biased for products with autocall features. I thus focus my analysis on 19,467 products with fixed maturity.

I start by studying the relation between enhancement and realized returns of YEPs. Realized returns are defined as the sum of all coupon payments plus the payment at maturity divided by the product price. Column 1 of Table 6 presents the result of a regression of realized returns on enhancement. To adjust for market returns, the regression controls for month and maturity fixed effects. I find that enhancement is strongly associated with worse performance. One percentage point higher enhancement translates into 62 basis points lower annual returns. Figure 6 presents the corresponding graphical evidence. Panel A plots the mean returns and 95-percent confidence intervals of portfolio sorts by enhancement, which I construct by sorting the products into enhancement quintiles within each month by maturity category. The figure shows that the relation between enhancement and returns is monotonic. The bottom enhancement quintile yields −6 percentage points return, whereas the top enhancement quintile yields −12 percentage points return.

By construction, the realized returns are net of fees as the product payoffs reflect all embedded fees. I next analyze gross returns to explore how much of the poor performance can be explained by the higher fees associated with enhancement. Column 2 of Table 6 shows that there is no economically and statistically significant relation between enhancement and gross returns. These patterns suggest that the poor net ex-post returns to enhancement are fully driven by the fees charged for enhancement

One potential concern with analyzing realized returns is that the results may be specific to the sample period. For example, the 2006–2015 sample period covers the financial crisis of 2007–2009, which exhibited otherwise infrequent "crashes" of trading strategies. To address the concern, I next examine measures of expected returns, which are immune to the performance of the underlying equities over my sample period. Specifically, I analyze the expected product returns derived under the physical (real-world) measure $\mathbb{P}$ assuming the risk premium on the underlying is given by the CAPM with a 6 percent market risk premium. The variation in these expected returns, therefore, captures the differences in underlying systematic risk as well as variation in embedded option returns due to leverage (Coval and Shumway, 2001) or underlying volatility (Hu and Jacobs, 2020).

Column 3 of Table 6 and panel C of Figure 6 show the relation between enhancement and net expected returns. The patterns copy the results with net realized returns while being more precisely estimated. In column 4 of Table 6 and panel D of Figure 6, I report the results for gross expected returns. As before, fees completely explain the negative association between enhancement and net returns; however, now the relation with gross returns is positive and statistically significant. A one percentage point enhancement translates into a ten basis-point increase in expected returns. Still, enhancement is predominantly artificial in the sense that 90 percent of the enhanced coupon rates do not translate into higher returns.

As a third driver of potentially higher expected returns to enhancement, I consider the role of option mispricing. Garleanu, Pedersen, and Poteshman (2008) show the pricing of options correlates with demand. The richness of option prices could affect the association between expected returns and enhancement since I estimate both fees and expected returns using implied volatilities from listed options. To assess any potential systematic differences between implied volatilities and realized volatilities, I examine ex-post returns from delta-hedging the product payoffs. Column 5 of Table 6 and panel E of Figure 6 report the relation between enhancement and abnormal returns, defined as the difference between the net realized return and delta-hedged return. Column 6 of Table 6 and panel F of Figure 6 report the results for the delta-hedged (benchmark) returns. The results copy the patterns of realized return measures. Benchmark returns, which are gross returns by construction, show, if anything, a negative relation with enhancement. Abnormal returns monotonically decrease with enhancement, consistent with higher fees ex-ante translating into lower abnormal returns ex-post.

Taken together, these results show a robust negative relation between net returns and enhancement and mixed evidence on the effect of enhancement on gross returns. The most optimistic evidence points to a weak positive effect, with a multiplier ($\mathbb{E}[R]/e_i$) of around 0.1.

4.1.1 Higher-Order Moments

Another potential explanation for the demand for enhancement could be their higher-order moments. Investors may be willing to pay higher fees for enhancement if it is associated with lower volatility. Similarly, for investors with preferences for positive skewness, a behavior widely observed in gambling and laboratory experiments, enhancement may be attractive if it is associated with higher skewness. Figure 7 shows that neither of these explanations can rationalize the demand for enhancement. The figure plots cross-sectional volatility (panel A) and skewness (panel B), measured within portfolios sorted by month, maturity, and enhancement quintiles. Volatility monotonically increases with enhancement. Skewness is negative, as the products have a high probability of a small positive return and a small probability of a large loss, and it declines with enhancement.

4.2 A Portfolio Choice Model with Yield Enhancement Products

To assess whether standard preferences can generate the high willingness to pay for enhancement documented in Section 3, I next set up a static portfolio choice model with conventional preferences in which investors can invest in a risk-free bond, an equity fund, and a YEP. For simplicity, I start with the case without labor income and then discuss the impact of background risk.

Financial assets. An investor considers allocating wealth w between a risk-free bond with returns r_f, a fund tracking the equity market with returns r_m, and a yield enhancement product. To be able to assess how willingness to pay varies with enhancement, I consider 15 versions of YEPs that display a range of enhancement from 0–20%. I construct these 15 products by combining three security designs with five underlying stocks with varying volatility. The security designs include a vanilla design (as in panel A of Figure 1), a digital design, and a barrier design (as in panel B of Figure 1). These designs are both tractable, as their prices can be approximated with Black-Scholes-Merton type formulas, and span the most common designs in the data. The volatilities of the underlying stocks reflect the variation in the data across the previously examined enhancement quintiles and are summarized together with other parameters used when calibrating the asset space in panel A of Table 7.

The length of the investment period and the maturity of YEPs is six months. All YEPs have a protection level of 25%. I model all products gross of fees and derive their headline return under fair pricing using Black-Scholes-Merton type formulas. I estimate the expected returns and covariance matrix of these financial assets by Monte Carlo simulations of the market and stock prices under the physical measure. The correlation between the market and the stocks corresponds to the stock betas. Panel B of Table 7 reports the expected returns of YEPs. The convenient property of the modeled YEP returns is that they increase with enhancement similarly as the gross expected returns in Table 6. That is, this stylized setting is designed to give the best chance of generating willingness to pay for enhancement. The expected YEP returns range from 2 percent for the lowest volatility (stock 1) vanilla design to 6 percent for the highest volatility (stock 5) barrier design.

Preferences. The investor chooses the optimal proportions of wealth allocated to the fund $\omega_m^* \in [0,1]$ and the YEP $\omega_y^* \in [0,1]$ to maximize expected utility:

$$(\omega_m^*, \omega_y^*) = \underset{\omega_m^*, \omega_y^* \in [0,1]}{\arg\max} \, \mathbb{E}u(w(1+r_p)), \tag{10}$$

where $r_p = r_f + \omega_m r_m + \omega_y r_y$ denote the portfolio returns. I assume the investor has a constant relative risk aversion (CRRA) utility defined over final wealth with risk aversion $\theta = 2$:

$$u(w) = \frac{w^{1-\theta}}{1-\theta} \tag{11}$$

Willingness to Pay for Enhancement. I use the portfolio choice model to solve for the willingness to pay for a yield enhancement product. Let $r_{y,p} = r_y - p$ denote the net expected YEP return after fee p and $\omega_{y,p}^*$ the optimal weight in YEP under fee p. I define the willingness to pay for YEP, $p_{\max}$, as the maximum fee that generates YEP adoption:

$$p_{\max} = \max\{0, p \mid \omega_{y,p}^* > 0\} \tag{12}$$

Numerical Solution. I solve for the optimal portfolio weights and willingness-to-pay numerically. For tractability, I approximate the expected utility with a second-order Taylor expansion. This approach is optimistic—it increases the optimal weight in a YEP—because the CRRA utility exhibits a preference for skewness while YEP returns are negatively skewed. The derived willingness to pay is, therefore, an upper bound. Appendix Section C provides the details of the numerical implementation of the model.

Results. In Figure 8, panel A, I plot the willingness to pay for YEPs as a function of product enhancement. The diamond markers illustrate the model predictions and the circle markers plot the corresponding values from my empirical analysis. Specifically, the circle markers plot an instrumented binned scatterplot of fees corresponding to column 2 of Table 3. As Figure 8 illustrates, conventional portfolio choice theory fails to explain both the slope and the level of willingness to pay for enhancement observed in the data. The main reason is that in the data, fees increase about five times faster than expected returns in relation to enhancement. Moreover, volatility increases with enhancement as well, which further diminishes investors' willingness to pay. As a result, the model yields a relationship between willingness to pay and enhancement that is nearly flat or slightly downward-sloping.

4.2.1 Background Risk

The analysis so far abstracts from the role of labor income or other sources of background risk more generally. In theory, bespoke nonlinear security designs might improve a household's ability to hedge against background risk. Consequently, a natural question arises: can the willingness to pay for enhancement be attributed to hedging motives?

I make three observations that cast doubt on the plausibility of this explanation. First, on aggregate YEPs perform particularly poorly during periods of market crashes and, therefore, do not serve as a natural hedge against downside risks. For example, the aggregate index of YEP performance constructed by Vokata (2021) lost more than 50% in 2008. As both the magnitude and timing of YEP losses coincide with market losses, YEPs do not help to diversify countercyclical labor income risk (Guvenen, Ozkan, and Song, 2014; Catherine, 2022).

Second, in the cross-section, the correlation of YEP returns with market returns increases with enhancement. High-enhancement products have the highest volatility, the lowest skewness and perform the worst during market crashes, making them the least attractive hedges of countercyclical labor income risk or skewness.

Third, hedging motives do not easily explain the sensitivity of demand to cost shocks to enhancement before headline rate fixing but no sensitivity after fixing (Section 3.3). For instance, if unobserved hedging needs were correlated with the cost shocks, one would expect demand to respond to the shocks that occur even after headline rate fixing.

5 Behavioral Mechanisms

In the previous two sections, I provide evidence that investors' willingness to pay increases with enhancement, an effect that cannot be easily explained by standard rational explanations and the conventional portfolio choice framework. In this section, I explore behavioral theories that predict demand for enhancement. I focus on salient thinking as the most parsimonious explanation. I then consider subjective beliefs about volatility and other alternative explanations and discuss the evidence in favor and against each of these explanations.

5.1 Salient Thinking

Salience has received significant attention in the psychology and economics literature and several recent papers formalize its role in various contexts. The modeling of salience is context dependent. It can operate across various properties of a stimulus: its prominence, contrast with surroundings, or surprising nature (see Bordalo et al. (2022) for a review), and can distort the role of various inputs in decision-making such as monetary payoffs (Bordalo, Gennaioli, and Shleifer, 2013a) or options' attributes (Bordalo, Gennaioli, and Shleifer, 2013b; Kőszegi and Szeidl, 2013; Bordalo et al., 2016).

Using data on various categories of structured products, Célérier and Vallée (2017) show that headline returns correlate with the complexity of security design and an indicator for exposure to complete losses. Although the authors do not present a formal model, they argue that the evidence is consistent with investors' salient thinking: investors overweight headline returns and neglect risk, which is shrouded by design complexity. A key challenge in quantitatively exploring Célérier and Vallée's (2017) conjecture is that it is not clear how to formalize investors' neglect of downside risk in the context of YEPs. First, virtually all YEPs expose investors to complete losses. Second, the evidence on protection levels—i.e., their attractive rates, enhancement by additional conditions, and correlation with sales volume—suggest that investors do pay attention to downside losses. These patterns point to a more nuanced mechanism than shrouding of a complete loss exposure. Third, security design is only one of the main drivers of fee dispersion in the data. Fees also increase with the underlying volatility keeping design complexity fixed.

To make progress in formalizing and quantifying the role of salience in the market for YEPs, I lay out a simple version of the salience model in Bordalo, Gennaioli, and Shleifer (2022) motivated by the stylized facts. Specifically, I propose that investors' overweight the most salient attributes of the product—both the headlline return and the protection level. A product i is defined as a bundle of K attributes $(a_1, ..., a_K)$ and its objective intrinsic valuation equals:

$$V_i = \sum_k \pi_k a_{i,k}, \tag{13}$$

where π_k is the optimal decision weight attached to attribute k. Suppose that only a set of attributes P are prominently visible to the investor and the remaining attributes H are not observed. Investors are inattentive to hidden attributes and their subjectively perceived values are distorted towards typical values recalled from memory: $a^S_{i,k} = m_k a_{i,k} + (1 - m_k)a^n_k$, where $m_k \in [0, 1]$ is an attention parameter and a^n_k is a recalled norm. This formalization follows the formalization of partial inattention to hidden attributes in Gabaix (2019). The subjective intrinsic valuation is then given by:

$$V^S_i = \sum_{k \in P} \pi_k a_{i,k} + \sum_{k \in H} \pi_k [m_k a_{i,k} + (1 - m_k)a^n_k] \tag{14}$$

In the context of YEPs, one can consider the increase in expected return due to headline return, $a_1 = \mu_{hr}$, and the decrease in risk due to protection level, $a_2 = \sigma^2_{pl}$, as prominent attributes carrying positive weights $(\pi_k > 0)_{k=1,2}$. The negative impact of additional conditions on expected returns, $a_3 = \mu_c$, and positive impact on risk, $a_4 = \sigma^2_c$, are hidden attributes carrying negative weights: $\pi_3 = -\pi_1$ and $\pi_4 = -\pi_2$. Rational investors are fully attentive to the impact of additional conditions ($m_3 = m_4 = 1$) and their intrinsic valuation thus fully reflects the role of additional conditions: $V_i = \pi_1(\mu_{hr} - \mu_c) + \pi_2(\sigma^2_{pl} - \sigma^2_c)$. By contrast, salient thinkers in the model are inattentive to hidden attributes $(m_k < 1)_{k=3,4}$ and therefore overweight headline return and protection level in their valuations. When the recalled norm corresponds to no additional conditions ($a^n_k = 0$), their subjective valuation simplifies to: $V^S_i = \pi_1(\mu_{hr} - m_3\mu_c) + \pi_2(\sigma^2_{pl} - m_4\sigma^2_c)$.

To bring the model to the data, I quantify the willingness to pay for YEPs by salient thinkers using the portfolio choice framework laid out in Section 4.2. Specifically, I model the subjective expected return of product i with headline return hr as:

$$\mathbb{E}^S(R_{i,hr}) = \mathbb{E}R_{vnl,hr} - m(\underbrace{\mathbb{E}R_{vnl,hr} - \mathbb{E}R_{i,hr}}_{\mu_c}), \tag{15}$$

where $\mathbb{E}R_{vnl,hr}$ is the objective expected return of a substitute product with plain-vanilla design and headline return hr and $\mathbb{E}R_{i,hr}$ is the objective expected return of product i. The subjective covariance matrix is:

$$\sigma^{2,S}_{i,pl} = \sigma^2_{vnl,pl} - m(\underbrace{\sigma^2_{vnl,pl} - \sigma^2_{i,pl}}_{\sigma^2_c}), \tag{16}$$

where $\sigma_{vnl,pl}$ is the volatility of a product with plain-vanilla substitute linked to the same underlying stock and having the same protection level pl. Therefore, when investors are fully attentive ($m = 1$), the subjective expected returns and volatilities equal the objective ones. When investors are fully inattentive ($m = 0$), they completely neglect the impact of additional conditions and perceive the product as having plain-vanilla design.

Panel C of Table 7 shows the subjective expected returns under attention parameter, $m = 0.5$, and panel B of Figure 8 plots the corresponding willingness to pay. As the figure illustrates, this formalization of salient thinking explains well both the level of willingness to pay as well as its slope with respect to enhancement. Willingness to pay increases both with more enhancing security design as well as with the implied volatility of the underlying. These patterns are consistent with the variation in fees presented in Table 3.

How costly is the salience distortion in aggregate terms? Equation 17 quantifies the excess fees per product due to salient thinking as a function of enhancement:

$$p^S_{max,i} - p_{max,i} = \xi(1-m)e_i, \tag{17}$$

where $p^S_{max,i}$ is the willingness to pay under salient thinking. The parameter $\xi = \frac{d(p^S_{max,i} - p_{max,i})}{d((1-m)e_i)}$ measures the sensitivity of willingness to pay to enhancement. I use an OLS estimation equation corresponding to equation 17 to recover the parameter from the 15 YEPs considered in the portfolio choice model: $\hat{\xi} = 0.99$, S.E.=0.018. Intuitively, enhancement captures the role of additional conditions similarly as the terms μ_c and σ^2_c in equations 15 and 16. With $\hat{\xi}$ in hand, I estimate the aggregate dollar value of the distortion for the 28,383 products as $\sum_i \hat{\xi}(1-m)e_i\mathbb{E}_i[T]q_i = \$1.6$ billion.

This estimate is likely conservative, because the model yields relatively high willingness to pay even under full rationality ($p_{max,i}$). The average willingness to pay in Section 4.2 is 97 basis points. As a point of reference, even the very high indirect option trading costs estimated by Bryzgalova, Pavlova, and Sikorskaya (2023) would generate only 51 basis points average YEP fee in the model.[12]

5.2 Alternative mechanisms

5.2.1 Subjective Beliefs

One might object that the evidence is best explained by investors' subjective beliefs about the underlying returns. The payoff profile of YEPs may be attractive for investors who believe the underlying will be sideways trending over the lifetime of the product. Under such beliefs, the expected return on YEP will be higher than the risk-free rate or the return on the underlying. Some marketing materials include descriptions of such beliefs. For example, Internet Appendix Figures A.3 and A.8 express suitable investor beliefs as: "You believe the underlying stock will remain stable", "Would you also like to generate returns in stagnating markets?", "Guaranteed coupon for sideways-trending underlyings". To model such stable sideways-trending beliefs, I

[12] This estimate is calculated by multiplying the effective half-spread for put options in Table 1 of Bryzgalova et al. (2023) (6.9%/2) by the average value of option components for the 15 YEPs (7.4%) and by $1/T$ to convert the costs to annual fees.

set the subjective expected return of the underlying equal to zero and its volatility to 80% of the objective volatility. I then use these subjective beliefs to estimate the willingness to pay for YEPs the same way as in Section 4.2.

Internet Appendix Figure A.13, panel A, displays the results. While subjective beliefs can reconcile the level of fees observed in the data, the WTP curve is not as steeply sloping. The reason is that subjective beliefs do not easily yield a strong preference for more enhancing designs. A second and more important problem with this explanation is that YEPs would be easily dominated by simple combinations of listed options. To see this, note that short strangle strategies are better suited for stable market views as they generate an additional income from selling upside volatility. Internet Appendix Figure A.12, panel B, shows that the expected returns from simple strangle strategies are significantly higher than YEP returns and Internet Appendix Figure A.13, panel B, shows that strangles completely crowd out YEPs in the portfolio choice problem leading to zero willingness-to-pay. I refer the reader to Internet Appendix Section C.E for the details of this estimation.

5.2.2 Reference-Dependent Preferences

Another mechanism that can explain the adoption of yield enhancement products are reference-dependent preferences. This explanation is motivated by the observation that investors may form reference points of investment returns and may be attracted by the high headline returns of YEPs particularly in periods of low interest rates. A standard way to model reference-dependent utility uses the prospect theory value function proposed by Tversky and Kahneman (1992):

$$u[w(1+r_p)] = \begin{cases} [w(r_p - r_r)]^{\alpha} & \text{if } r_p \geq r_r \\ -\lambda[w(r_r - r_p)]^{\alpha} & \text{if } r_p < r_r \end{cases} \tag{18}$$

where r_r is the reference point. Using the parameters estimated by Tversky and Kahneman (1992), $\lambda = 2.25$ and $\alpha = 0.88$, an investor with a reference point $r_r = 1.05$[13] will prefer a fairly

[13]This choice of reference point is motivated by investors anchoring to levels of risk-free rate of returns experienced in the past (Barberis, Huang, and Santos, 2001; Malmendier and Nagel, 2011; Bordalo, Gennaioli, and Shleifer, 2020).

priced YEP over the combination of the market and the risk-free rate as modeled in Section 4.2. The intuition is that the nonlinear YEP payoff increases the probability of states where the YEP return is equal to or higher than the reference point.

The key challenge of this mechanism is that it does not generate the high willingness to pay for YEPs observed in the data. Specifically, Internet Appendix Section C.F shows that even with a moderate fee of 3%, an investor will prefer the combination of the market and the risk-free rate over the YEP. The reason is that even a moderate level of fees is enough for the additional utility in states when the YEP return is above the market and above the reference point to be outweighed by the disutility coming from the capped YEP returns and from states when the YEP loses money. This result holds for all YEPs modeled in Section 4.2 as well as for high levels of reference points (e.g., $r_r = 1.15$). Moreover, the crowding-out effect of better-priced listed options applies here as well. An investor selling put options to generate returns above a reference point is better off selling a put spread using exchange-listed options than buying a YEP.

I note that similar reasoning applies to mechanisms featuring reaching for income (Daniel, Garlappi, and Xiao, 2021) or preferences for frequently outperforming assets (Ungeheuer and Weber, 2023). While such mechanisms may be able to generate the adoption of YEPs when considered in isolation, they do not easily reconcile a preference for YEPs when statewise dominating exchange-listed options are easily available (Vokata, 2021).

5.2.3 Conflicted Advice

I also consider whether the results can be explained by conflicted interests of brokers selling YEPs. YEPs are sold by brokers who are compensated for the sale with a kick-back/commission paid by the issuing bank. The advantage of the setting is that the commission is disclosed in the pricing supplement. Egan (2019) uses the data on commissions (broker's fees) and shows that the issuance size of the products in his sample correlates with the broker's commission. These results are consistent with brokers acting in their own conflicted interest and steering investors to inferior investments.

In Internet Appendix Table A.7 I show that I obtain quantitatively similar results to Table 4 when controlling for the broker's commission. Moreover, in Internet Appendix Table A.2 I document that enhancement explains 5–10 times more variation in fees than commissions. These results imply that the monetary interests of brokers do not explain investors' high willingness to pay for enhancement. It is, however, possible that brokers themselves overweight the salient attributes of YEPs and steer investors to high-enhancement products due to own misguided beliefs (Linnainmaa, Melzer, and Previtero, 2021). Internet Appendix Figure A.7 provides anecdotal evidence consistent with this conjecture.

6 Conclusion

This paper develops a framework for studying salience distortions in markets with complex security designs. It shows that the most salient information provided by issuers of yield enhancement products does not help to select products with the highest intrinsic value and expected returns. Quite the opposite: investors selecting the products solely on the most salient headline rates would fare worse, as these rates are associated with higher fees and lower returns. The crucial piece of information that issuers do not provide is the quantitative role of complex additional conditions.

I develop an intuitive measure—enhancement—that quantifies the role of these conditions. My empirical strategy involves comparing products to simple counterfactuals that share the same attributes and fair values, but are stripped off the additional conditions. The virtue of the measure is that it can be easily calculated even for complex products and it lends itself well to cost-based instruments. My analysis demonstrates that enhancement is largely irrelevant for expected returns, not priced in a conventional portfolio choice model, yet powerful in boosting salient headline rates, explaining price dispersion in the market, and in shaping investor demand. In the spirit of Bordalo et al. (2022) and Gabaix (2019), I provide a simple intuitive model of salient thinking in security design as a useful way for organizing the evidence.

The empirical evidence in the paper provides a strong case for salience distortions in the market for yield enhancement products. Without a model of salient thinking, it would be hard to make sense of even the most basic stylized facts of the market—its high fees, poor returns, and high degree of enhancement. I quantify that the magnitude of the total salience distortion exceeds $1.6 billion in my data alone. I anticipate that this number is likely just the tip of the iceberg. I focus on the U.S. market for YEPs because its characteristics make it easier to estimate fair values and demand for the products. There is, however, little reason to believe that similar salience distortions are absent in other multi-trillion markets for complex security designs. Examples might include capital protected products or variable annuities. In another important market, the market for collateralized debt obligations, the evidence in Coval, Jurek, and Stafford (2009) is consistent with distortions due to salient AAA ratings.

References

Anagol, Santosh, and Hugh Hoikwang Kim, 2012, The Impact of Shrouded Fees: Evidence from a Natural Experiment in the Indian Mutual Funds Market, *American Economic Review* 102, 576–593.

Baker, Malcolm, Mark L. Egan, and Suproteem K. Sarkar, 2022, How do investors value ESG? NBER Working Paper.

Barber, Brad M, Xing Huang, Terrance Odean, and Christopher Schwarz, 2022, Attention-induced trading and returns: Evidence from Robinhood users, *Journal of Finance* 77, 3141–3190.

Barber, Brad M., and Terrance Odean, 2008, All That Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors, *Review of Financial Studies* 21, 785–818.

Barber, Brad M, Terrance Odean, and Lu Zheng, 2005, Out of Sight, Out of Mind: The Effects of Expenses on Mutual Fund Flows, *Journal of Business* 78, 2095–2120.

Barberis, Nicholas, 2018, Psychology-Based Models of Asset Prices and Trading Volume, in B. Douglas Bernheim, Stefano DellaVigna, and David Laibson, eds., *Handbook of Behavioral Economics: Applications and Foundations 1*, volume 1, 79–175 (North-Holland).

Barberis, Nicholas, Ming Huang, and Tano Santos, 2001, Prospect theory and asset prices, *Quarterly Journal of Economics* 116, 1–53.

Berry, Steven T, 1994, Estimating discrete-choice models of product differentiation, *RAND Journal of Economics* 242–262.

Beshears, John, James J. Choi, David Laibson, and Brigitte C. Madrian, 2018, Behavioral Household Finance, in B. Douglas Bernheim, Stefano DellaVigna, and David Laibson, eds., *Handbook of Behavioral Economics: Applications and Foundations 1*, volume 1, 177–276 (North-Holland).

Birru, Justin, and Baolian Wang, 2016, Nominal price illusion, *Journal of Financial Economics* 119, 578–598.

Bordalo, Pedro, Nicola Gennaioli, and Andrei Shleifer, 2013a, Salience and Asset Prices, *American Economic Review* 103, 623–628.

Bordalo, Pedro, Nicola Gennaioli, and Andrei Shleifer, 2013b, Salience and Consumer Choice, *Journal of Political Economy* 121, 803–843.

Bordalo, Pedro, Nicola Gennaioli, and Andrei Shleifer, 2016, Competition for Attention, *Review of Economic Studies* 83, 481–513.

Bordalo, Pedro, Nicola Gennaioli, and Andrei Shleifer, 2020, Memory, Attention, and Choice, *Quarterly Journal of Economics* 135, 1399–1442.

Bordalo, Pedro, Nicola Gennaioli, and Andrei Shleifer, 2022, Salience, *Annual Review of Economics* 14, 521–544.

Brown, Jeffrey, Arie Kapteyn, Erzo F.P. Luttmer, Olivia Mitchell, and Anya Samek, 2017, Behavioral Impediments to Valuing Annuities: Evidence on the Effects of Complexity and Choice Bracketing, *NBER Working Paper* 24101.

Brown, Jennifer, Tanjim Hossain, and John Morgan, 2010, Shrouded attributes and information suppression: Evidence from the field, *Quarterly Journal of Economics* 125, 859–876.

Bryzgalova, Svetlana, Anna Pavlova, and Taisiya Sikorskaya, 2023, Retail trading in options and the rise of the big three wholesalers, *Journal of Finance* 78, 3465–3514.

Calvet, Laurent E., Claire Célérier, Paolo Sodini, and Boris Vallée, 2022, Can Security Design Foster Household Risk-Taking?, *Journal of Finance* Forthcoming.

Campbell, John Y, 2006, Household finance, *Journal of Finance* 61, 1553–1604.

Carlin, Bruce I., 2009, Strategic Price Complexity in Retail Financial Markets, *Journal of Financial Economics* 91, 278–287.

Catherine, Sylvain, 2022, Countercyclical labor income risk and portfolio choices over the life cycle, *Review of Financial Studies* 35, 4016–4054.

Chetty, Raj, Adam Looney, and Kory Kroft, 2009, Salience and taxation: Theory and evidence, *American Economic Review* 99, 1145–1177.

Coval, Joshua D, Jakub W Jurek, and Erik Stafford, 2009, Economic Catastrophe Bonds, *American Economic Review* 99, 628–666.

Coval, Joshua D, and Tyler Shumway, 2001, Expected option returns, *Journal of Finance* 56, 983–1009.

Célérier, Claire, and Boris Vallée, 2017, Catering To Investors Through Security Design: Headline Rate and Complexity, *Quarterly Journal of Economics* 1469–1508.

Daniel, Kent, Lorenzo Garlappi, and Kairong Xiao, 2021, Monetary Policy and Reaching for Income, *Journal of Finance* 76, 1145–1193.

DellaVigna, Stefano, 2009, Psychology and Economics: Evidence from the Field, *Journal of Economic Literature* 47, 315–372.

DellaVigna, Stefano, and Joshua M Pollet, 2009, Investor inattention and Friday earnings announcements, *Journal of Finance* 64, 709–749.

Drechsler, Itamar, Alexi Savov, and Philipp Schnabl, 2017, The deposits channel of monetary policy, *Quarterly Journal of Economics* 132, 1819–1876.

Egan, Mark, 2019, Brokers vs. Retail Investors: Conflicting Interests and Dominated Products, *Journal of Finance* 74, 1217–1260.

Frydman, Cary, and Baolian Wang, 2020, The Impact of Salience on Investor Behavior: Evidence from a Natural Experiment, *Journal of Finance* 75, 229–276.

Gabaix, Xavier, 2019, Behavioral inattention, in B. Douglas Bernheim, Stefano DellaVigna, and David Laibson, eds., *Handbook of Behavioral Economics: Applications and Foundations 1*, volume 2, 261–343 (North-Holland).

Gabaix, Xavier, and David Laibson, 2006, Shrouded Attributes, Consumer Myopia, and Information Suppression in Competitive Markets, *Quarterly Journal of Economics* 121, 505–541.

Gao, Pengjie, Allen Hu, Peter Kelly, Cameron Peng, and Ning Zhu, 2022, Asset Complexity and the Return Gap, *Review of Finance* Forthcoming.

Garleanu, Nicolae, Lasse Heje Pedersen, and Allen M Poteshman, 2008, Demand-based option pricing, *Review of Financial Studies* 22, 4259–4299.

Gennaioli, Nicola, Andrei Shleifer, and Robert Vishny, 2012, Neglected Risks, Financial Innovation, and Financial Fragility, *Journal of Financial Economics* 104, 452–468.

Ghent, Andra C., Walter N. Torous, and Rossen I. Valkanov, 2018, Complexity in Structured Finance, *Review of Economic Studies* 86, 694–722.

Gomes, Francisco, Cameron Peng, Oksana Smirnova, and Ning Zhu, 2022, Reaching for yield: Evidence from households, *Financial Markets Group Discussion Paper* No 887.

Greenwood, Robin, and Andrei Shleifer, 2014, Expectations of returns and expected returns, *Review of Financial Studies* 27, 714–746.

Grinblatt, Mark, and Francis A. Longstaff, 2000, Financial Innovation and the Role of Derivative Securities: An Empirical Analysis of the Treasury STRIPS Program, *Journal of Finance* 55, 1415–1436.

Guvenen, Fatih, Serdar Ozkan, and Jae Song, 2014, The nature of countercyclical income risk, *Journal of Political Economy* 122, 621–660.

Hartzmark, Samuel M, and David H Solomon, 2019, The dividend disconnect, *Journal of Finance* 74, 2153–2199.

Hausman, Jerry A, 1996, Valuation of new goods under perfect and imperfect competition, in *The economics of new goods*, 207–248 (University of Chicago Press).

Heidhues, Paul, Botond Koszegi, and Takeshi Murooka, 2016, Exploitative Innovation, *American Economic Journal: Microeconomics* 8, 1–23.

Henderson, Brian J., and Neil D. Pearson, 2011, The Dark Side of Financial Innovation: A Case Study of the Pricing of a Retail Financial Product, *Journal of Financial Economics* 100, 227–247.

Henderson, Brian J., Neil D. Pearson, and Li Wang, 2020, Pre-Trade Hedging: Evidence from the issuance of retail structured products, *Journal of Financial Economics* 137.

Henderson, Brian Joseph, Neil D. Pearson, and Li Wang, 2022, Retail Derivatives and Sentiment: A Sentiment Measure Constructed from Issuances of Retail Structured Equity Products, *Journal of Finance* Forthcoming.

Hu, Guanglian, and Kris Jacobs, 2020, Volatility and expected option returns, *Journal of Financial and Quantitative Analysis* 55, 1025–1060.

Kahneman, Daniel, and Amos Tversky, 1979, Prospect Theory: An Analysis of Decision under Risk, *Econometrica* 47, 263–291.

Keloharju, Matti, Samuli Knüpfer, and Juhani Linnainmaa, 2012, Do investors buy what they know? Product market choices and investment decisions, *Review of Financial Studies* 25, 2921–2958.

Koijen, Ralph SJ, and Motohiro Yogo, 2019, A demand system approach to asset pricing, *Journal of Political Economy* 127, 1475–1515.

Koijen, Ralph S.J., and Motohiro Yogo, 2022, The Fragility of Market Risk Insurance, *Journal of Finance* 77, 815–862.

Kőszegi, Botond, and Adam Szeidl, 2013, A Model of Focusing in Economic Choice, *Quarterly Journal of Economics* 128, 53–104.

Li, Xindan, Avanidhar Subrahmanyam, and Xuewei Yang, 2018, Can financial innovation succeed by catering to behavioral preferences? Evidence from a callable options market, *Journal of Financial Economics* 128, 38–65.

Lian, Chen, Yueran Ma, and Carmen Wang, 2018, Low Interest Rates and Risk Taking: Evidence from Individual Investment Decisions, *Review of Financial Studies* 32, 2107–2148.

Linnainmaa, Juhani T, Brian T Melzer, and Alessandro Previtero, 2021, The misguided beliefs of financial advisors, *Journal of Finance* 76, 587–621.

Malmendier, Ulrike, and Stefan Nagel, 2011, Depression babies: Do macroeconomic experiences affect risk taking?, *Quarterly Journal of Economics* 126, 373–416.

Piccione, Michele, and Ran Spiegler, 2012, Price Competition Under Limited Comparability, *Quarterly Journal of Economics* 127, 97–135.

Pérignon, Christophe, and Boris Vallée, 2017, The Political Economy of Financial Innovation: Evidence from Local Governments, *Review of Financial Studies* 30, 1903–1934.

Ross, Stephen A, 1989, Institutional markets, financial marketing, and financial innovation, *Journal of Finance* 44, 541–556.

Roussanov, Nikolai, Hongxun Ruan, and Yanhao Wei, 2021, Marketing mutual funds, *Review of Financial Studies* 34, 3045–3094.

Shue, Kelly, and Richard R. Townsend, 2021, Can the Market Multiply and Divide? Non-Proportional Thinking in Financial Markets, *Journal of Finance* 76, 2307–2357.

Stango, Victor, and Jonathan Zinman, 2014, Limited and Varying Consumer Attention: Evidence from Shocks to the Salience of Bank Overdraft Fees, *Review of Financial Studies* 27, 990–1030.

Stock, James H., and Motohiro Yogo, 2005, Testing for Weak Instruments in Linear IV Regression, in James H. Stock, and Donald Andrews, eds., *Identification and Inference for Econometric Models: Essays in Honor of Thomas J. Rothenberg* (Cambridge University Press).

Tufano, Peter, 2003, Financial Innovation, in G. Constantinides, M. Harris, and R. Stulz, eds., *Handbook of the Economics of Finance*.

Tversky, Amos, and Daniel Kahneman, 1981, The framing of decisions and the psychology of choice, *Science* 211, 453–458.

Tversky, Amos, and Daniel Kahneman, 1992, Advances in prospect theory: Cumulative representation of uncertainty, *Journal of Risk and Uncertainty* 5, 297–323.

Umar, Tarik, 2022, Complexity aversion when Seeking Alpha, *Journal of Accounting and Economics* 73, 101477.

Ungeheuer, Michael, and Martin Weber, 2023, The frequency of outperformance and investment decisions, *Working Paper,* Aalto University.

Vokata, Petra, 2019, Essays on Financial Innovation, *Aalto University* Doctoral Dissertation.

Vokata, Petra, 2021, Engineering lemons, *Journal of Financial Economics* 142, 737–755.

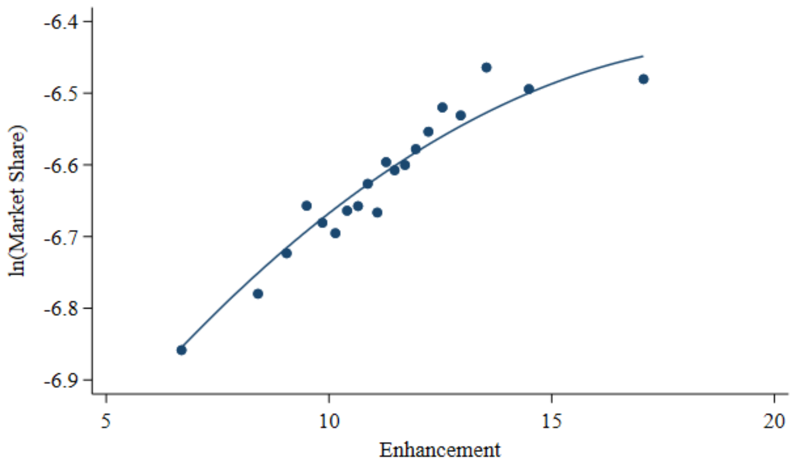
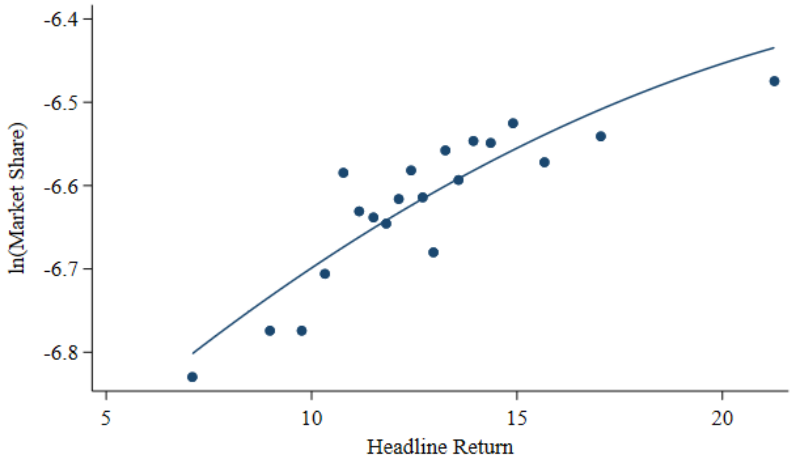


Figure 2. Market Share and Enhancement

The figure displays a binned scatter plot with a quadratic fit line of the logged market share and enhancement as defined in Section 2.3. Market share is defined over all YEPs issued in the same month. The controls include fees and fixed effects for year-month, issuer, maturity, underlying, and security design. The sample consists of 28,383 products issued in the U.S. between January 2006 and September 2015.

Panel A: Headline Return



Panel B: Protection Level

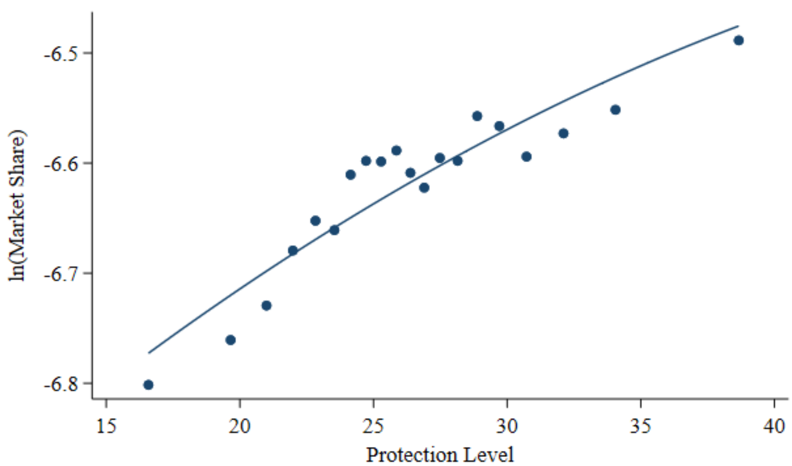


Figure 3. Market Share and Headline Rates

The figures display binned scatter plots with quadratic fit lines of the logged market share and the two headline rates: headline return and protection level. Each plot controls for fees, the other headline rate, and fixed effects for year-month, issuer, maturity, underlying, and security design. The sample consists of 28,383 products issued in the U.S. between January 2006 and September 2015.

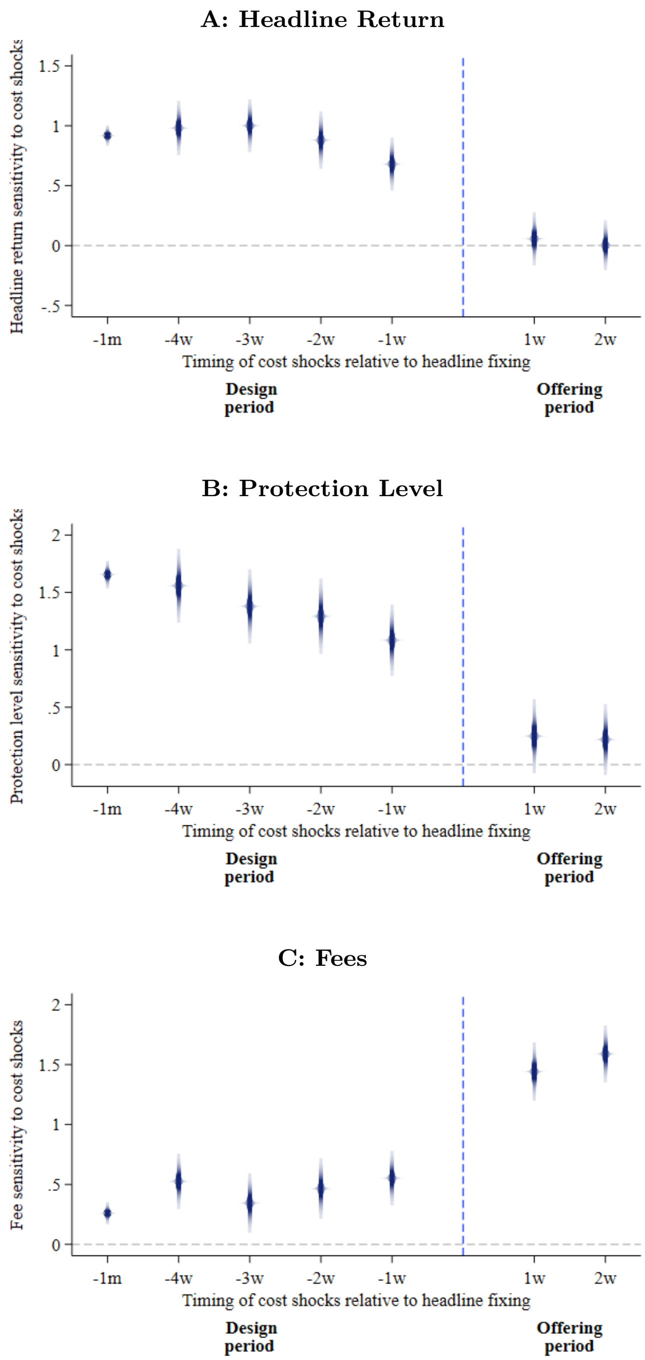


Figure 4. Headline Rates and Fee Sensitivities to Cost Shocks at Different Horizons

The figures plot coefficients γ_h and the associated robust confidence intervals from estimating regressions corresponding to equation 7. Cost shocks follow the definition in Section 2.5 and are measured either as a level four weeks before the start of the offering period ($-1m$) or weekly changes for four weeks prior to the offering period ($-4w, -3w, -2w, -1w$) or the first two weeks of the offering period ($1w, 2w$). The dependent variable is the headline return in Panel A, protection level in Panel B, and fee in Panel C. The sample covers 5,414 products issued between 2006–2009 with offering period lasting at least one week. The vertical blue dashed line depicts the beginning of the offering period when headline rates remain fixed and are therefore immune to cost shocks.

B: Volume

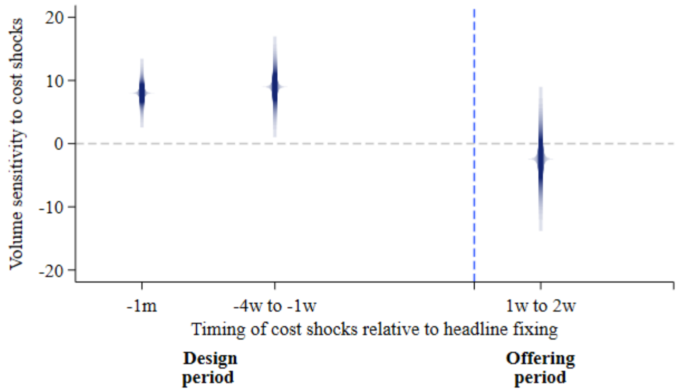


Figure 5. Demand Sensitivity to Cost Shocks at Different Horizons
The figure plots coefficients δ_h and the associated robust confidence intervals from estimating regression 8. Cost shocks are defined in Section 2.5 and are measured either as a level four weeks before the start of the offering period ($-1m$) or the changes over four weeks prior to the offering period ($-4w$ to $-1w$) or the first two weeks of the offering period ($1w$ to $2w$). The dependent variable is the product sales volume. The sample covers 5,414 products issued between 2006–2009 with offering period lasting at least one week. The vertical blue dashed line depicts the beginning of the offering period when headline rates remain fixed and are therefore immune to cost shocks.

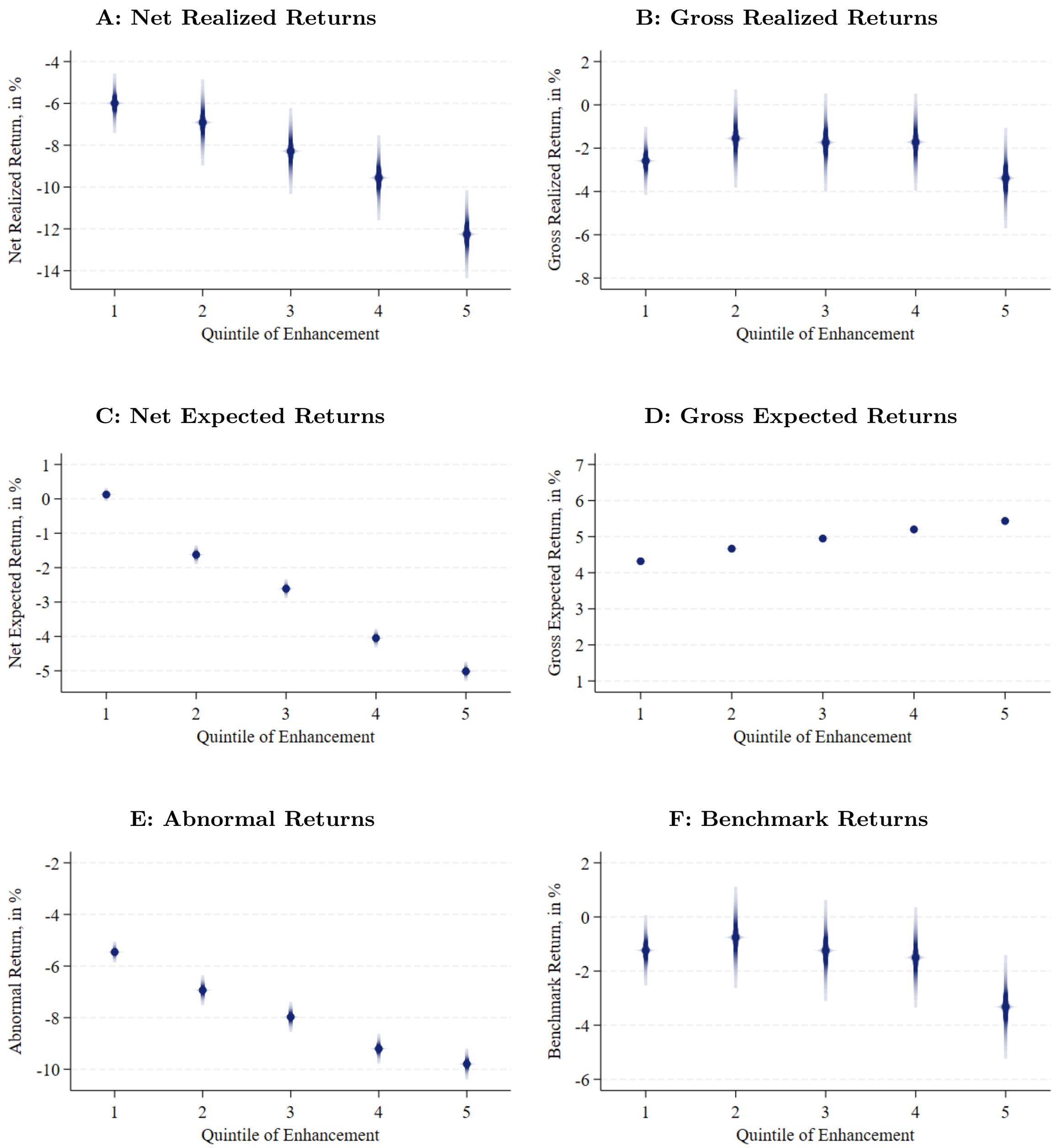


Figure 6. Returns to Enhancement

The figures display mean returns and their 95-percent confidence intervals across enhancement quintiles defined within month by maturity group. Net Realized Return in Panel A is the sum of coupon payments and any payment at maturity divided by product price. Net Expected Return in Panel C is estimated under the physical measure and assuming the excess return on the underlying is equal to $\beta \times 6\%$. Gross Realized Return and Gross Expected Return in Panels B and D are adjusted for embedded fees. Abnormal Return in Panel E is the difference between the net realized return and benchmark return. Benchmark return in Panel F is the cumulative return from daily-adjusted delta-equivalent positions in the underlying and a risk-free bond. All returns are annualized. The sample consists of 19,467 U.S. products.

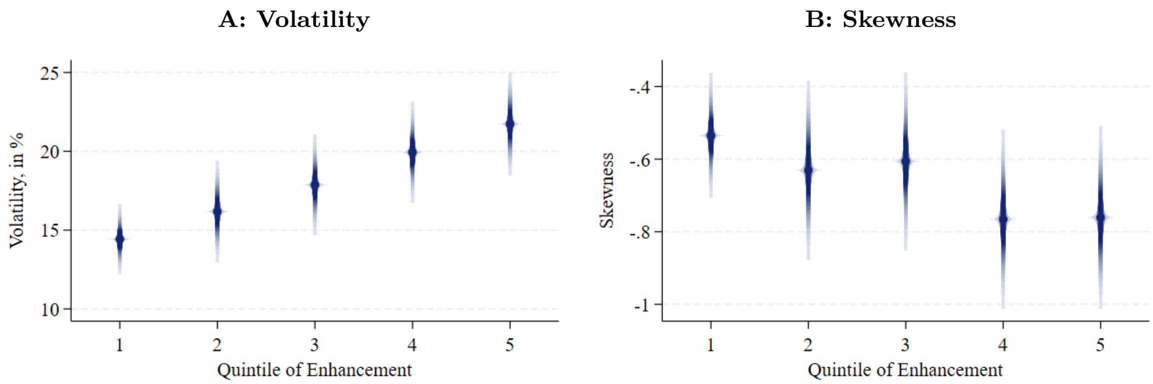


Figure 7. Returns to Enhancement: Second and Third Moments
The figures display cross-sectional volatility (Panel A) and skewness (Panel B) of net realized returns across enhancement quintiles. Volatility and skewness are estimated in each month by maturity by enhancement quintile groups. The figures plot the averages of the estimates and corresponding 95-percent confidence intervals for each enhancement quintile.

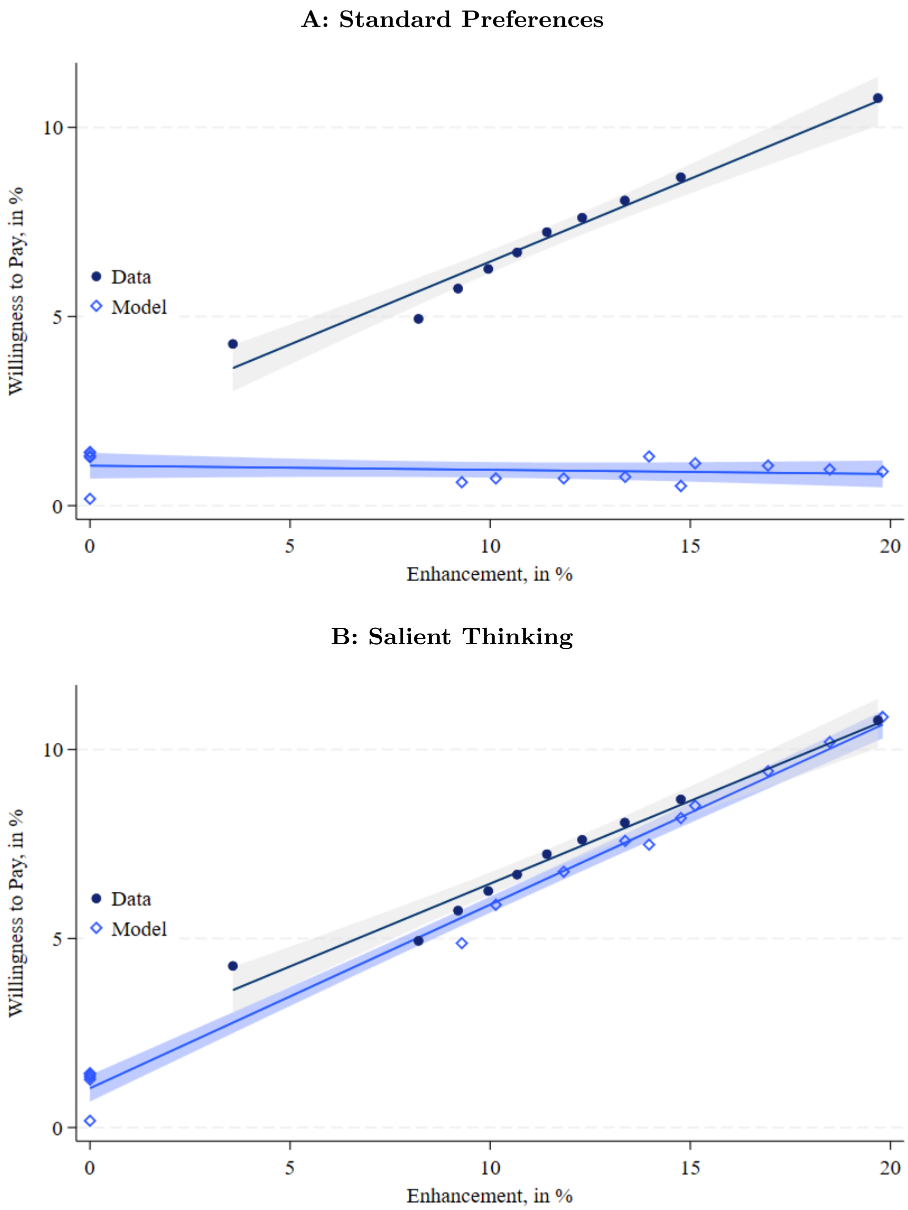


Figure 8. Willingness-to-Pay: Portfolio-Choice Model versus Data
The figures illustrate the relationship between enhancement and willingness to pay for a YEP. In each panel, the blue diamonds plot the willingness to pay for YEP estimated from the portfolio choice model described in Section 4.2. Each diamond corresponds to one YEP described in Panel B of Table 7. The navy circles plot the binned scatter plot of product fees against enhancement controlling for year-month and maturity and instrumenting enhancement with structuring costs ($\nu \times \sigma$). In Panel A, the willingness to pay for YEP in the model is estimated using the objective expected returns and covariance matrix. In Panel B, the willingness to pay for YEP is estimated using subjective measures distorted by salience as formalized in Section 5.1. All scatter plots are accompanied by linear fitted lines with 95-percent confidence intervals.

Table 1
Measuring Enhancement

The table presents calculations of headline enhancement for the example products described in Figure 1. The enhancement measure captures the impact of additional conditions in security design on product headline rates and is defined as the spread in headline return between the product and its plain-vanilla synthetic counterfactual. This counterfactual product inherits from the original product all attributes except for additional conditions and headline return and has a plain-vanilla design, as depicted in Panel A of Figure 1. See Section 2.3 for details.

Panel A: Plain-vanilla product

	Product		Plain-vanilla synthetic counterfactual
Fair value	——	95.5%	——
Initial valuation date	——	March 26, 2009	——
Term	——	6 months	——
Underlying	——	Deere & Company	——
Protection level	——	20%	——
Additional conditions	none		none
Headline return	9.5%		9.5%
Enhancement = 9.5% − 9.5% = 0%			

Panel B: Product with additional conditions

	Product		Plain-vanilla synthetic counterfactual
Fair value	——	95.2%	——
Initial valuation date	——	March 26, 2009	——
Term	——	6 months	——
Underlying	——	Deere & Company	——
Protection level	——	35%	——
Additional conditions	knock-in barrier		none
Headline return	18%		1.4%
Enhancement = 18% − 1.4% = 16.6%			

Table 2
Summary Statistics

The table reports summary statistics for 28,383 products issued in the U.S. between January 2006 and September 2015 (Panel A) and 59,120 products issued outside of the U.S. between January 2002 and September 2015 (Panel B). *Enhancement* in the U.S. sample is measured on product level and is adjusted for fees. *Enhancement* in the global sample is measured on the security design level and is not adjusted for fees. Both variables measure the spread of product headline return to plain-vanilla counterfactual securities as described in Section 2.3. *Headline return* is the product annual return if the underlying price does not fall by more than the *Protection level*, subject to additional conditions. *Fee* is the product markup annualized using the expected product maturity. *Volume* is sales volume in million $. *Return* is the net realized return and is reported only for products without early termination conditions. *Maturity* (in years) is the maximum term of a product.

Panel A: U.S. Sample

	Mean	Std. Dev.	p1	p25	p75	p99	Observations
Ehancement	11.3	5.4	2.7	7.4	14.2	25.8	28,383
Headline return	12.8	4.7	5.8	9.6	15.0	28.7	28,383
Protection level	26.4	7.6	10.0	20.0	30.0	50.0	28,383
Fee	7.0	4.2	1.0	3.8	9.1	17.3	28,383
Volume	2.0	5.3	0.0	0.2	2.0	20.2	28,383
Return	−8.5	35.7	−96.7	−21.9	13.1	19.1	19.467
Maturity	0.8	0.7	0.2	0.5	1.0	5.0	28,383

Panel B: Global Sample

	Mean	Std. Dev.	p1	p25	p75	p99	Observations
Enhancement	6.3	2.9	2.2	4.3	7.3	13.9	59,120
Headline return	8.9	5.3	2.0	5.5	10.5	30.0	59,120
Protection level	34.6	10.2	15.0	25.0	41.0	55.0	59,120
Volume	3.7	7.3	0.0	0.9	4.0	27.8	59,120
Return	0.3	15.7	−62.8	−0.1	9.1	20.6	9,619
Maturity	2.0	1.5	0.2	1.0	3.0	6.0	59,120

Table 3
Fees and Enhancement

The table presents the regression described in equation 4. The dependent variable is the product annualized fee. The explanatory variable is the previously defined measure of enhancement (Section 2.3). The instruments for enhancement are based on the structuring costs of enhancement. In the first two columns, the instrumental variable for enhancement is the security design sensitivity to underlying volatility (ν) multiplied by the underlying implied volatility (σ). In columns 3 and 4, enhancement is instrumented with the design sensitivity only, and in columns 5 and 6 with the underlying volatility only. The sample consists of 28,383 U.S. products. Standard errors clustered at the issuer level are in parentheses. *, *, and *** represent statistical significance at the 10%, 5%, and 1%, respectively.

	Dependent variable: Fee					
	(1)	(2)	(3)	(4)	(5)	(6)
Enhancement	0.501***	0.481***	0.380***	0.509***	0.562***	0.483***
	(0.0244)	(0.0130)	(0.0800)	(0.0242)	(0.0358)	(0.0919)
IV	$\nu \times \sigma$	$\nu \times \sigma$	ν	ν	σ	σ
Controls						
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Issuer FE	No	Yes	No	Yes	No	Yes
Maturity FE	No	Yes	No	Yes	No	Yes
Underlying FE	No	Yes	No	Yes	No	Yes
Observations	28,383	28,177	28,383	28,177	28,383	28,177
R^2	0.338	0.544	0.167	0.521	0.325	0.480

Table 4
Demand for Enhancement

The table presents the regressions corresponding to the demand estimation equation 5. The dependent variable is the product sales volume (in million $) in Panel A and logged market share in Panel B. The explanatory variables are the previously defined (Section 2.3) measure of enhancement and fee. The sample consists of 28,383 U.S. products. Controls in Panel B are identical to controls in Panel A for each column, respectively, and are omitted for brevity. Robust standard errors are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1%, respectively. The elasticity of demand is calculated using the average fee in the data and median sales volume of $0.62 million. Willingness to pay for enhancement is expressed in percentages.

	Panel A, Dependent variable: Volume			
	(1)	(2)	(3)	(4)
Fee	-10.75***	-7.358***	-10.10***	-13.45***
	(0.738)	(1.291)	(0.973)	(2.095)
Enhancement	6.563***	2.721**	5.436***	5.966***
	(0.758)	(1.208)	(1.397)	(1.734)
IV			$\nu \times \sigma$	$\nu \times \sigma$, Fee
Controls				
Month FE	Yes	Interacted	Yes	Yes
Issuer FE	Yes	Interacted	Yes	Yes
Maturity FE	Yes	Interacted	Yes	Yes
Underlying FE	Yes	Interacted	Yes	Yes
Design FE	Yes	Yes	Yes	Yes
Observations	28,177	10,124	28,177	25,612
R^2	0.454	0.652	0.452	0.421
Elasticity of demand	1.2	0.8	1.1	1.5
Willingness to pay	0.61	0.37	0.54	0.44

	Panel B, Dependent variable: ln(Market Share)			
	(1)	(2)	(3)	(4)
Fee	-8.762***	-7.934***	-8.246***	-8.296***
	(0.286)	(0.584)	(0.390)	(0.947)
Enhancement	3.894***	4.541***	2.996***	2.877***
	(0.293)	(0.596)	(0.553)	(0.768)
IV			$\nu \times \sigma$	$\nu \times \sigma$, Fee
Observations	28,177	10,124	28,177	25,612
R^2	0.510	0.725	0.507	0.484
Willingness to pay	0.44	0.57	0.36	0.35

Table 5
Demand for Enhancement: Global Sample

This table displays the coefficients corresponding to the OLS regressions in equation 9. The dependent variable is the product sales volume. The explanatory variable is the previously defined (Section 2.3) security design-level measure of *Enhancement*. The sample consists of 59,120 products issued outside of the U.S. In Columns 2 and 3, I exclude products with multiple underlying assets. Robust standard errors are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1%, respectively.

	Dependent variable: Volume		
	(1)	(2)	(3)
Enhancement	14.77***	19.29***	10.11***
	(1.381)	(1.937)	(1.748)
Controls			
Month FE	Yes	Yes	Interacted
Country FE	Yes	Yes	Interacted
Issuer FE	Yes	Yes	Interacted
Maturity FE	Yes	Yes	Interacted
Underlying FE	No	Yes	Interacted
Sample:	Full	Single underlying	Single underlying
Observations	59,062	32,924	16,107
R^2	0.390	0.416	0.676

Table 6
Returns to Enhancement

This table displays the coefficients from OLS regressions in which the dependent variables are different measures of product returns and the explanatory variable is the measure of enhancement defined in Section 2.3. Net Realized Return in column 1 is the sum of coupon payments and any payment at maturity divided by the product price. Net Expected Return in column 3 is estimated under the physical measure and assuming the excess return on the underlying is equal to $\beta \times 6\%$. Gross Realized Return and Gross Expected Return in columns 2 and 4 are adjusted for embedded fees. Abnormal Return in column 5 is the difference between the net realized return and benchmark return. Benchmark return in column 6 is the cumulative return from daily-adjusted delta-equivalent positions in the underlying and a risk-free bond. All returns are annualized. The sample consists of 19,467 U.S. products. Robust standard errors are in parentheses. *, *, and *** represent statistical significance at the 10%, 5%, and 1%, respectively.

Dep. var.:	Net Realized Return	Gross Realized Return	Net Expected Return	Gross Expected Return	Abnormal Return	Benchmark Return
	(1)	(2)	(3)	(4)	(5)	(6)
Enhancement	-0.622***	-0.0531	-0.584***	0.0963***	-0.446***	-0.227***
	(0.0613)	(0.0690)	(0.00748)	(0.00338)	(0.0174)	(0.0593)
Controls						
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Maturity FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,466	19,466	19,466	19,466	19,466	19,466
R^2	0.331	0.325	0.607	0.468	0.270	0.241

Table 7
Portfolio Choice Model: Calibration Parameters and Expected Returns

Panel A reports the parameters used to simulate the joint distribution of equity market returns and five underlying stocks of yield enhancement products. Panel B reports the estimated expected returns of YEPs linked to these underlying stocks. For each underlying stock, I estimate returns for three different security designs: vanilla, digital, and barrier. All YEPs have a maturity of six months and a protection level of 25%. Their headline returns are derived using Black-Scholes-Merton type formulas. Panel C reports the subjective expected returns of these YEPs under salient thinking formalized in Section 5.1 using attention parameter $m_k = 0.5$.

Panel A: Return Simulation

Asset	$\mathbb{E}R$	σ	β
Risk-free bond	1.0		
Equity market	7.0	20	
Underlying stock			
1	8.8	40	1.3
2	9.7	45	1.45
3	10.6	50	1.6
4	11.5	55	1.75
5	12.4	60	1.9

Panel B: Expected Returns of YEPs

	Security Design		
	Vanilla	Digital	Barrier
Underlying stock			
1	1.9	3.8	4.8
2	3.2	4.3	5.1
3	3.5	4.7	5.4
4	3.8	5.1	5.7
5	4.1	5.3	6.0

Panel C: Subjective Returns of YEPs under Salient Thinking

	Security Design		
	Vanilla	Digital	Barrier
Underlying stock			
1	1.9	7.5	10.3
2	3.2	8.8	11.7
3	3.5	10.0	12.9
4	3.8	11.2	14.0
5	4.1	12.1	14.9

Internet Appendix to
Salient Attributes and Household Demand for Security Designs

Petra Vokata

January 1, 2024

Table of Contents

Additional Figures

Additional Tables

A Marketing of YEPs

Figure A.1 shows an example of a YEP marketing brochure. The first page portrays an ice climber on an extremely steep slope. The second page portrays the climber's hand holding a rope with a carabiner engraved with the name of the product. These images are consistent with marketing catering to associative thinking (Mullainathan, Schwartzstein, and Shleifer, 2008): namely that the first image is used to trigger association with a high-risk high-return environment, whereas the second image is used to trigger an association with safety provided by the product. The marketing text on the next pages further reinforces the metaphor that with the right tools, one can succeed in precarious conditions, i.e., with structuring solutions, one can mitigate risk and maximize return. The material then describes the primary feature of the product as its "potential for enhanced yield," and the second main feature its protection against the decline in the performance of the underlying asset.

Figure A.4 shows an example of a prospectus with prominently displayed headline rates. Figure A.5 shows a prominent display of the headline rates in online advertising where investors can sort products by the two headline rates: coupon and barrier. In contrast, Figure A.6 shows that the typical display of exchange traded options does not contain the implied rates of returns in the best-case scenario or protection levels against the drop in price of the underlying.

Figure A.7 shows an excerpt from a communication with a financial advisor. The advisor asked for advice on whether the described product has merit for his clients. The communication reveals that the selection of products focuses on the two headline rates (coupon and barrier) and, to some extent, on the frequency of positive and negative performance. The advisor acknowledges that his firm does not have information on the product fees or performance (historical or expected returns).

Figure A.8 shows an example of the investor suitability section with a description of beliefs suitable with the investment. Similar description of stable market views is also present in the marketing brochure in Figure A.3.

Anecdotes from regulatory filings and investor lawsuits suggest that the marketing of YEPs sometimes involves high-pressure sales techniques such as free-lunch seminars for elderly investors, which have been criticized by financial regulators.[1] Data on investor characteristics in the U.S. are not available. Using comprehensive data on Swedish investors in structured products, Calvet et al. (2022) find that the probability of buying a product is a hump-shaped function of cognitive abilities. Knüpfer, Rantala, Vihriälä, and Vokata (2023) shows a similar pattern for investors in a Ponzi scheme, suggesting that declining propensity to invest with IQ above median may be an indicator of inferior investments.

[1]See the Securities and Exchange Commission (SEC) allert available at https://www.sec.gov/spotlight/seniors/nofreelunch.pdf and description of investor lawsuit at https://www.dossfirm.com/blog/the-doss-firm-llc-sues-ameriprise-over-unsuitable-sales-of-reverse-convertible-notes-to-elderly-couple/.

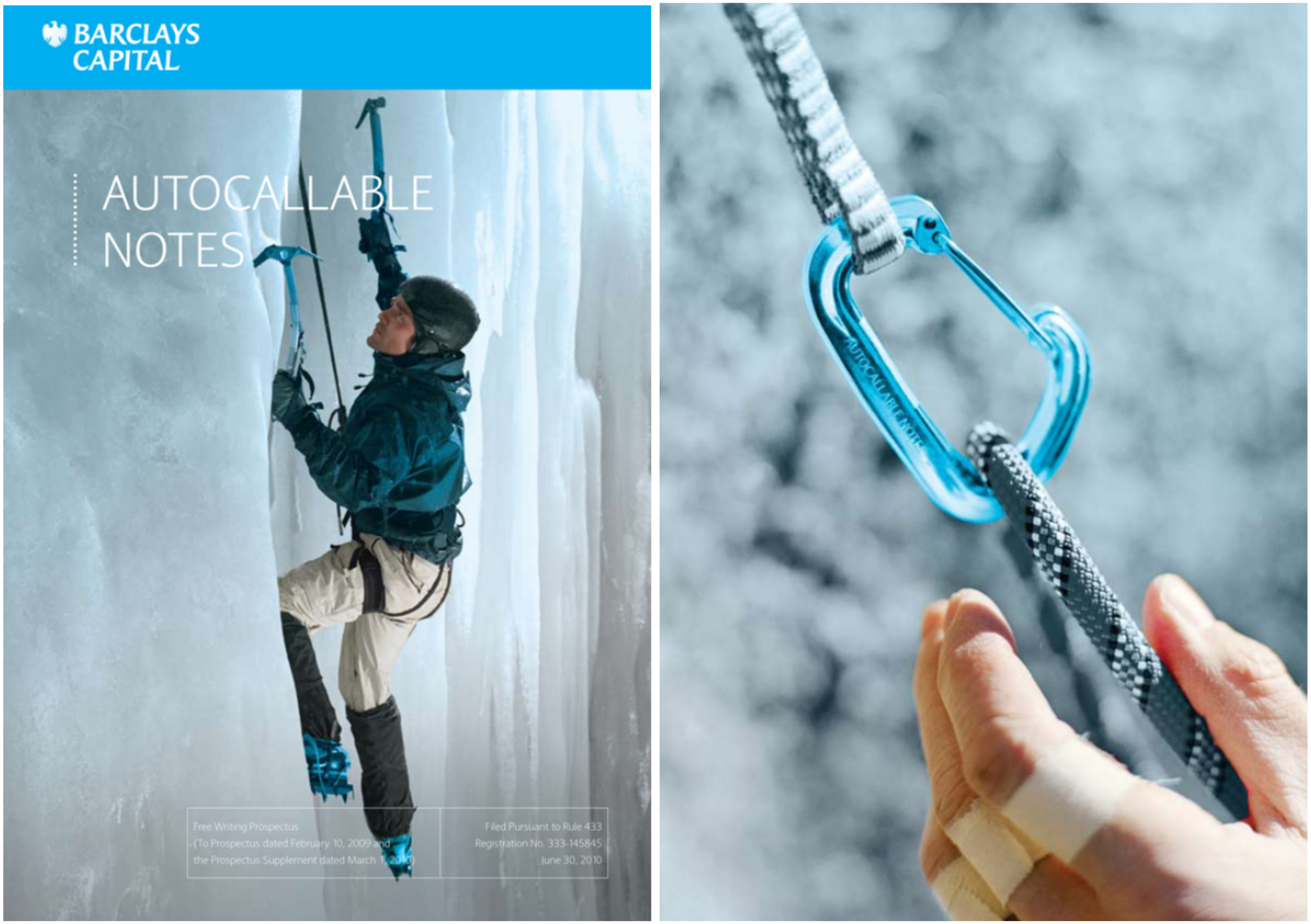


Figure A.1. Marketing Brochure

The figure shows the first two pages of the marketing brochure available at https://www.sec.gov/Archives/edgar/data/312070/000119312510151530/dfwp.htm.

The highly dynamic environment of today's financial markets creates new opportunities and challenges for investors. As a result, investors are looking for new ideas and creative solutions that seek to mitigate risk and maximize return on their portfolios. A growing number of investors are seeking different strategies that could help them meet their financial goals. There is an increasing need for efficient financial products that may allow investors to realize higher yields, reduce their risk exposure and achieve access to a wider range of asset classes, such as international equities, commodities, foreign currencies and various market indices. Due to this growing need, structured investments have become a key driver in today's global markets. Please see "Certain Risk Considerations" in this presentation.

Structured Investments may help investors meet their specific financial goals and provide greater diversification* to their investment portfolios. Structured investments encompass a variety of structures and terms. The most typical are structured notes which consist of a debt security linked to the performance of a reference asset (equity, basket of equities, equity index, commodity, commodity index or foreign currency). Among the variety of structures available, most aim to help investors to achieve the following primary objectives: minimize the loss of principal (e.g. principal protected notes)**, generate higher yields (e.g. reverse convertible and Autocallable Notes) or participate in enhanced returns (e.g. SuperTrack℠ Notes).

* Diversification does not protect against loss.

** Any payment on a Structured Investment, including any principal protection feature, is subject to the creditworthiness of the issuer. Structured Investments are not, either directly or indirectly, an obligation of any third party.

AUTOCALLABLE NOTES

What is an Autocallable Note and how does it work?

An Autocallable Note is a structured investment that aims to provide exposure to the performance of a specific reference asset or a basket of reference assets, with a contingent coupon feature. An Autocallable Note would be called prior to maturity if the reference asset is at or above its initial level on a specified observation date. The investor would receive the principal amount of their investment plus the pre-determined coupon and the Autocallable Note would be redeemed early.

Autocallable Notes issued by Barclays Bank PLC are subject to the creditworthiness of the issuer. In addition, Autocallable Notes are not, either directly or indirectly, an obligation of any third party. Autocallable Notes may be linked to common stocks, American Depositary Shares (ADSs), baskets of stocks, stock market indices, commodities or other asset classes.

The primary feature of an Autocallable Note is its potential for enhanced yield. Autocallable Notes are designed to pay a coupon that may be higher than the coupon an investor would generally receive on a fixed income security with a comparable maturity. However, the reference asset must close at or above a pre-determined level on the relevant specified observation date in order for the Autocallable Note to pay a coupon.

In addition to potentially higher yields, an Autocallable Note may be structured to include a buffer feature called a "buffer percentage" where the principal amount of the Notes would be contingently protected against a decline in the performance of the reference asset. The level of the "buffer percentage" can typically range from 10% to 30% of the initial level of the reference asset depending on the terms of the specific Autocallable Note. As a result, if the performance of the reference asset, as of the final valuation date, has declined below the specified "buffer percentage", investors in Autocallable Notes with contingent protection can lose a portion of or all of their original investment in the Autocallable Notes.

Unlike a direct investment in the reference asset, the appreciation potential in Autocallable Notes is limited to the coupon amount. The investor will not participate in the gains of the reference asset, if any.

Hypothetical Examples of Autocallable Notes

The payout structure of Autocallable Notes may vary and can be designed to satisfy specific investment goals. Hypothetical examples of two typical payout structures – Accumulating Coupon Autocallable Notes and Constant Coupon Autocallable Notes – are provided below:

Autocallable Notes are designed for investors with a moderately "bullish" view of the market for the relevant underlying reference asset.

3

Figure A.2. Marketing Brochure—Cont.

The figure shows pages 3 and 4 of the marketing brochure available at https://www.sec.gov/Archives/edgar/data/312070/000119312510151530/dfwp.htm (highlights added).

For marketing purposes only

Barrier Reverse Convertibles (BRC)

The coupon makes the difference

BRCs: guaranteed coupon for sideways-trending underlyings

Are you looking for an investment that offers you attractive coupon payments?

If so, then Barrier Reverse Convertibles – BRCs for short – could be exactly the right choice for you. This is because these yield enhancement products will provide you with a coupon that is sometimes significantly higher than the interest rate of bonds. The coupon is fixed in advance and is paid out without any other conditions having to be met. This means that returns are distributed regardless of how the underlying on which the product is based performs.

Would you also like to generate returns in stagnating markets?

Barrier Reverse Convertibles have conditional partial protection in the form of a barrier. The barrier is fixed at a certain level below the price of the underlying when the BRC is issued. If the barrier is never touched or breached during the term of the product, the nominal will be repaid. This means that in addition to the fixed coupon payment, you will also be paid back your invested capital in full at the end of the term. You therefore have the opportunity to achieve an attractive return on underlyings with a stable or moderately negative performance.

Would you like an investment that caters to your wishes?

There are BRCs based on numerous underlyings, with each BRC having very different features. Due to the fine adjustment of the various parameters, investors can to some degree control the level of opportunity and risk to which they are exposed with BRCs. You can choose between products with very low barriers if you value having a high safety buffer. Alternatively, you can make do with a smaller barrier distance and in return enjoy a correspondingly higher coupon. Additional features ensure further room for maneuver, e.g. the opportunity to double the coupon. Higher returns are also generated with BRCs that are based on multiple underlyings – these are referred to as Multi Barrier Reverse Convertibles.

Be aware: you cannot generate attractive returns without taking risks.

Despite the conditional partial protection, Barrier Reverse Convertibles come with some risks. If the barrier is breached, the partial protection lapses and your loss risk reverts to that of a direct investment in the underlying – however, losses are reduced by the coupons received. Something else to keep in mind is that BRCs do not participate in the positive performance of the underlying. The maximum return opportunity is limited to the coupon payment.

Want to know more?

Read through the following pages for a detailed explanation of how these investment instruments work, the market phases in which the instruments demonstrate their advantages and the different types of products available.

4

Figure A.3. Marketing Brochure 2

Pricing supplement no. 1196
To prospectus dated November 21, 2008,
prospectus supplement dated November 21, 2008 and
product supplement no. 108-A-III dated February 7, 2011

Registration Statement No. 333-155535
Dated March 24, 2011
Rule 424(b)(2)

JPMORGAN CHASE & CO.

Structured Investments

JPMorgan Chase & Co.
$1,050,000
5.00% (equivalent to 10.00% per annum) Upside Auto Callable Reverse Exchangeable Notes due September 29, 2011 Linked to the Common Stock of Ford Motor Company

General

- The notes are designed for investors who seek a higher interest rate than either the current dividend yield on the Reference Stock or the yield on a conventional debt security with the same maturity issued by us or an issuer with a comparable credit rating. Investors should be willing to forgo the potential to participate in the appreciation in the Reference Stock, to accept the risks of owning equities in general and the common stock of Ford Motor Company, in particular, to assume the risk that the notes will be automatically called and the investors will receive less interest than if the notes are not automatically called and, if the notes are not automatically called, to lose some or all of their principal at maturity.
- If the notes are not automatically called, the notes will pay 5.00% (equivalent to 10.00% per annum) interest over the term of the notes. **However, the notes do not guarantee any return of principal at maturity. Instead, if the notes are not automatically called, the payment at maturity will be based on the Final Share Price of the Reference Stock and whether the closing price of the Reference Stock is less than the Initial Share Price by more than the Protection Amount ($3.76 initially) on any day during the Monitoring Period, as described below. If the notes are automatically called, you will receive, for each $1,000 principal amount note, $1,000 plus accrued and unpaid interest. Any payment on the notes is subject to the credit risk of JPMorgan Chase & Co.**
- Senior unsecured obligations of JPMorgan Chase & Co. maturing September 29, 2011*
- If the notes are not automatically called, payment at maturity for each $1,000 principal amount note will be either a cash payment of $1,000 or delivery of shares of the Reference Stock (or, at our election, the Cash Value thereof), in each case, together with any accrued and unpaid interest, as described below.
- Minimum denominations of $1,000 and integral multiples thereof

Key Terms

Reference Stock:	The common stock, par value $0.01 per share, of Ford Motor Company (New York Stock Exchange symbol "F"). We refer to Ford Motor Company as "Ford Motor."
Interest Rate:	• **5.00% if the notes are not automatically called; or** • **2.50% if the notes are automatically called** **(in each case equivalent to 10.00% per annum),** paid monthly and calculated on a 30/360 basis
Automatic Call:	If on the Call Date, the closing price of the Reference Stock is greater than the Initial Share Price, the notes will be automatically called.
Payment if Called:	If the notes are automatically called, on the Call Settlement Date, for each $1,000 principal amount note, you will receive $1,000 plus any accrued and unpaid interest to but excluding the Call Settlement Date.
Protection Amount:	**$3.76, which is equal to 25.00% of the Initial Share Price, subject to adjustments**
Pricing Date:	March 24, 2011
Settlement Date:	On or about March 29, 2011
Call Date*:	June 24, 2011
Call Settlement Date*:	June 29, 2011, which is the third business day after the Call Date
Observation Date*:	September 26, 2011
Maturity Date*:	September 29, 2011
CUSIP:	48125XKK1
Interest Payment Dates:	Interest on the notes will be payable monthly in arrears on the 29th calendar day of each month (each such day, an "Interest Payment Date"), commencing April 29, 2011, to and including the Maturity Date, unless the notes are automatically called. If the notes are automatically called, interest will accrue to but excluding the Call Settlement Date, and will be payable on each Interest Payment Date occurring before the Call Settlement Date and on the Call Settlement Date. See "Selected Purchase Considerations — Monthly Interest Payments" in this pricing supplement for more information.
Payment at Maturity:	If the notes are not automatically called, the payment at maturity, in excess of any accrued and unpaid interest, will be based on the performance of the Reference Stock. If the notes are not automatically called, for each $1,000 principal amount note, you will receive $1,000 plus any accrued and unpaid interest at maturity, unless: (1) the Final Share Price is less than the Initial Share Price; and (2) on any day during the Monitoring Period, the closing price of the Reference Stock is less than the Initial Share Price by more than the Protection Amount. If the notes are not automatically called and the conditions described in both (1) and (2) are satisfied, at maturity you will receive, in addition to any accrued and unpaid interest, instead of the principal amount of your notes, the number of shares of the Reference Stock equal to the Physical Delivery Amount (or, at our election, the Cash Value thereof). Fractional shares will be paid in cash. **The market value of the Physical Delivery Amount or the Cash Value thereof will most likely be substantially less than the principal amount of your notes, and may be zero.**
Monitoring Period:	The period from the Pricing Date to and including the Observation Date
Physical Delivery Amount:	66.4894 shares of the Reference Stock, per $1,000 principal amount note, which is the number of shares equal to $1,000 divided by the Initial Share Price, subject to adjustments
Cash Value:	The product of (1) $1,000 divided by the Initial Share Price and (2) the Final Share Price, subject to adjustments
Initial Share Price:	$15.04, the closing price of the Reference Stock on the Pricing Date. The Initial Share Price is subject to adjustments in certain circumstances. See "Description of Notes – Payment at Maturity" and "General Terms of Notes – Anti-Dilution Adjustments" in the accompanying product supplement no. 108-A-III for further information about these adjustments.
Final Share Price:	The closing price of the Reference Stock on the Observation Date

Figure A.4. Display of Headline Rates and Additional Conditions

The figure shows the beginning of the product pricing supplement available at https://sec.report/Document/0000891092-11-001958/e42822_424b2.pdf. The product offers a 10% headline return (advertised in the header and under Interest Rate) and protection against up to 25% drop in the underlying price (defined under Protection Amount). Additional conditions affecting the product payoff are described, e.g., under Payment at Maturity, Automatic Call, and Payment if Called.

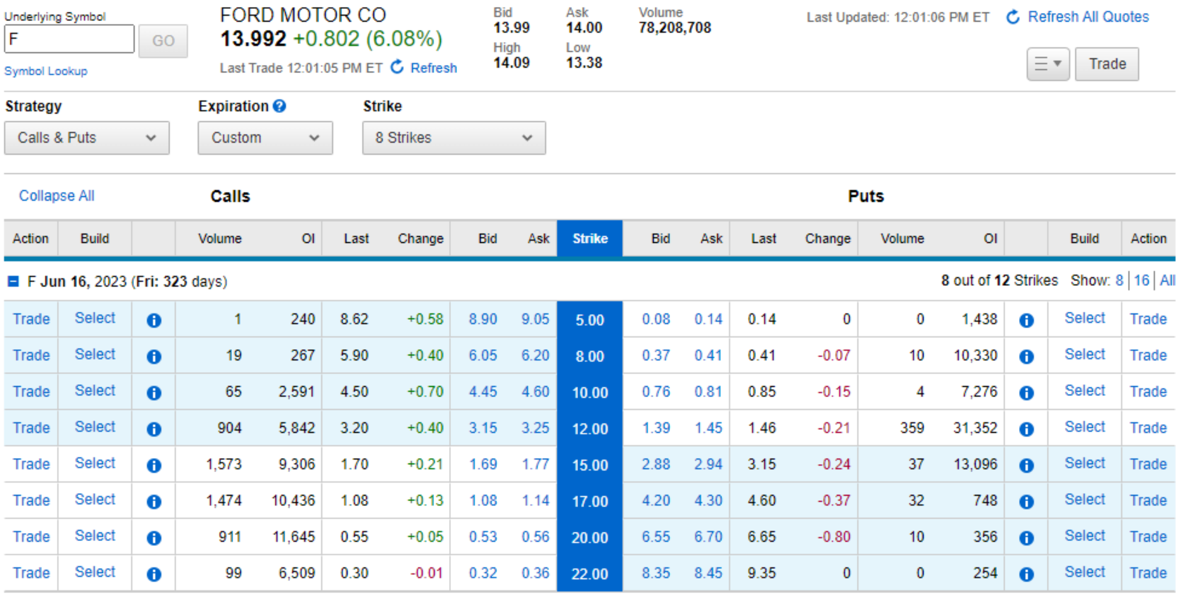
Yield enhancement

Autocallable BRC

Valor SIX symbol	Underlying(s)	Coupon p.a.	Barrier	Expiry date Settlement	Currency	End of subscription Remaining time	Termsheet at issue date
130517717 KPGQDU	Hermes Intl Inditex adidas	10.25% p.a.	55.00%	06.12.2024 in cash / physical	EUR	06.12.2023 1 day remaining	
130518664 KPHPDU	Bayer SAP SE Siemens	9.50% p.a.	50.00%	13.06.2025 in cash / physical	EUR	13.12.2023 8 days remaining	
130517716 KPGPDU	Barrick Gold Freeport McMoRan Newmont Mining Corp	11.50% p.a.	55.00%	06.12.2024 in cash / physical	USD	06.12.2023 1 day remaining	
130518808 KPIDDU	Coca-Cola Company McDonald's	6.75% p.a.	65.00%	15.12.2025 in cash / physical	USD	13.12.2023 8 days remaining	

Figure A.5. Online Display of YEPs

The figure shows a screenshot of online YEP offerings.



Underlying Symbol
F
GO
Symbol Lookup

FORD MOTOR CO
13.992 +0.802 (6.08%)
Last Trade 12:01:05 PM ET Refresh

Bid	Ask	Volume
13.99	14.00	78,208,708
High	Low	
14.09	13.38	

Last Updated: 12:01:06 PM ET Refresh All Quotes
Trade

Strategy: Calls & Puts
Expiration: Custom
Strike: 8 Strikes

Collapse All

F Jun 16, 2023 (Fri: 323 days) — 8 out of 12 Strikes Show: 8 | 16 | All

Calls: Action	Build		Volume	OI	Last	Change	Bid	Ask	Strike	Puts: Bid	Ask	Last	Change	Volume	OI		Build	Action
Trade	Select	i	1	240	8.62	+0.58	8.90	9.05	5.00	0.08	0.14	0.14	0	0	1,438	i	Select	Trade
Trade	Select	i	19	267	5.90	+0.40	6.05	6.20	8.00	0.37	0.41	0.41	-0.07	10	10,330	i	Select	Trade
Trade	Select	i	65	2,591	4.50	+0.70	4.45	4.60	10.00	0.76	0.81	0.85	-0.15	4	7,276	i	Select	Trade
Trade	Select	i	904	5,842	3.20	+0.40	3.15	3.25	12.00	1.39	1.45	1.46	-0.21	359	31,352	i	Select	Trade
Trade	Select	i	1,573	9,306	1.70	+0.21	1.69	1.77	15.00	2.88	2.94	3.15	-0.24	37	13,096	i	Select	Trade
Trade	Select	i	1,474	10,436	1.08	+0.13	1.08	1.14	17.00	4.20	4.30	4.60	-0.37	32	748	i	Select	Trade
Trade	Select	i	911	11,645	0.55	+0.05	0.53	0.56	20.00	6.55	6.70	6.65	-0.80	10	356	i	Select	Trade
Trade	Select	i	99	6,509	0.30	-0.01	0.32	0.36	22.00	8.35	8.45	9.35	0	0	254	i	Select	Trade

Figure A.6. Display of Option Prices in Online Brokerage Account

Terms:	
Structure:	ACYN
Tenor:	21 month
Call Restrictions :	Non Callable – 3months
Call Frequency :	Monthly
Underliers (Worst of:)	IWN(Russell Small Value)/ NDX(Nasdaq 100)/ RTY(Russell 2000)
Principal Barrier of initial:	60.00%
Coupon Structure :	Contingent
Coupon Payment Frequency :	Monthly
Coupon Barrier of initial level :	70.00%
Coupon Rate p.a.	12.75%

If an investor bought this autocallable note and it was called after 3 months, they could reinvest those proceeds into a new note. Since the market goes up more frequently than it declines, on average, these notes will be called.

An long term investor in this asset class could continue to collect high interest payments and more often than not, will have their note called. When we look at the historical drawdowns for the underlying indexes, they have only breached a 40% barrier during extreme market events and in less than 10% of rolling periods. We acknowledge that an investor could lose principal if they have the misfortune of bad timing, but in most periods, an investor will receive the high interest payments and be able to roll the proceeds into a new note.

We are trying to take a prudent approach and only buy structured notes with at least a 70% barrier for income payments and a 60-70% barrier on principal.

We have been told that competition between banks keeps their fees lower than they may have been in the past, though it is not always clear what their profit is.

Figure A.7. Communication with Financial Advisor

The figure shows an excerpt from e-mail communication with a financial advisor soliciting advice about YEPs (highlights added).

Investor Suitability

The Securities may be suitable for you if:

- You believe the underlying stock will not close below the Trigger Price, which is 80% of the Initial Price, on the Final Valuation Date.
- You believe the underlying stock will close at or above the Initial Price on any one of the specified Observation Dates, including the Final Valuation Date.
- You are willing to hold securities that will be called on any Observation Date on which the underlying stock closes at or above the Initial Price, or you are otherwise willing to hold such securities to maturity.
- You believe the underlying stock will remain stable for the term of the Securities and will close at or above the Initial Price on the Final Valuation Date.
- You are willing to make an investment whose return is limited to the specified Call Return of 16.01% per annum, regardless of the appreciation of the underlying stock, which may be significant.
- You are willing to hold the Securities to maturity, a term of approximately 12 months, and are aware that there may be little or no secondary market for the Securities.
- You do not seek current income from this investment.
- You are comfortable with the creditworthiness of Barclays Bank PLC, as Issuer of the Securities.
- You are willing to make an investment where you could lose some or all of your principal.
- You seek exposure to the issuer of the underlying stock.

The Securities may not be suitable for you if:

- You believe the underlying stock will close below the Trigger Price, which is 80% of the Initial Price, on the Final Valuation Date.
- You do not believe the underlying stock will close at or above the Initial Price on any one of the specified Observation Dates, including the Final Valuation Date.
- You seek an investment that is fully principal protected.
- You are not willing to make an investment in which you could lose up to 100% of your principal.
- You seek an investment whose return is not limited to the specified Call Return of 16.01% per annum, regardless of the appreciation of the underlying stock, which may be significant.
- You seek an investment for which there will be an active secondary market.
- You are unable or unwilling to hold securities that will be called on any Observation Date on which the underlying stock closes at or above the Initial Price, or you are otherwise unable or unwilling to hold such securities to maturity, a term of approximately 12 months.
- You prefer the lower risk, and therefore accept the potentially lower returns, of fixed income investments with comparable maturities and credit ratings.
- You seek current income from your investment.
- You are not willing or are unable to assume the credit risk associated with Barclays Bank PLC, as Issuer of the Securities.
- You do not seek exposure to the issuer of the underlying stock.

Figure A.8. Investor Beliefs Suitability

The figure shows the investor suitability section from a pricing supplement available at https://www.sec.gov/Archives/edgar/data/312070/000119312510291226/d424b2.htm

B Data Appendix

This section provides details on the construction and validation of the variables used in the paper.

Fair value. Fair values, estimated using a local volatility diffusion model, are taken from Vokata (2021). I assume the following diffusion for the price of the underlying asset:

$$dS_t = r_t S_t dt + \sigma(t, S_t) S_t dW_t + dAt, \tag{A.1}$$

where r_t is the continuous-time risk-free rate, $\sigma(t, S_t)$ is the local volatility calculated with Dupire's formula, W_t is a Brownian motion, and A_t models discrete dividends for ex-dividend dates $0 < t_1 < t_2 < t_{n_D}$ and dividend amounts c_i as follows:

$$A_t = \sum_{i=1}^{n_D} c_i 1_{t \leq t_i} \tag{A.2}$$

Enhancement. The Black-Scholes-Merton type formula for plain-vanilla option price used in equation 1 is:

$$OP_{pl,T} = Ke^{-rT} N(-d_2) - S_0 e^{-qT} N(-d_1),$$

where strike price K matches the protection level ($K = S_0(1-pl)$), and q is the continuous dividend yield. d_1 and d_2 are defined as in the Black-Scholes-Merton formulas: $d_1 = \frac{\ln(S_0/K)+(r-q+\sigma^2/2)T}{\sigma\sqrt{T}}$ and $d_2 = d_1 - \sigma\sqrt{T}$.

Figure A.9 plots histograms of headline returns and enhancement. The figures show that both variables are positively skewed. The red bars in the histogram of enhancement mark products with a plain-vanilla security design. The plot validates that the enhancement measure is approximately zero for products with no additional conditions (mean of 0.4, t-stat 1.2) and also highlights that such designs are rare in the data. I winsorize enhancement at the 2.5% and 97.5% level to minimize the impact of extreme observations.

Enhancement outside of the U.S. For products issued outside of the U.S., I do not observe fair values and therefore cannot use the same measure of enhancement as defined in Section 2.3. Instead, I define enhancement on the security design level as the average enhancement not-adjusted for fees as follows:

$$e_g = \frac{\sum_g e_{i,FV=1}}{N_G} = \frac{\sum_g hr_i - \frac{(1+OP_{pl,T})(1+r)^T - 1}{T}}{N_G}, \tag{A.3}$$

where N_G is the number of products having security design g. The idea behind the measure is motivated by the observation that on a security-design level, the impact of enhancement on coupons is stronger than the impact of fees. As a result, on the design level, average enhancement not adjusted for fees retains the rank-ordering of the original enhancement measure defined in

Section 2.3.

Fees. I define the embedded fee as the annualized markup:

$$p_i = \frac{1 - FV_i}{\mathbb{E}[T]}, \tag{A.4}$$

where $\mathbb{E}[T]$ is the expected product maturity under the risk-neutral measure. Effectively, the markup is a front-load fee which includes the compensation to brokers. If held until maturity, the products charge no additional ongoing fees. If sold prior to maturity, issuers often charge additional markdowns, which I abstract from.

Commissions. I calculate annualized commissions similar to fees:

$$\text{commission}_i = \frac{\text{Total commission}}{\mathbb{E}[T]}, \tag{A.5}$$

where Total commission is the dollar fee paid to the broker divided by the product price.

Validations. In addition to the estimated fees, I also use the markups/fees disclosed by issuers which are available for a subsample of products. I use the sample to validate the role of enhancement in fees documented in Table 3. Specifically, in Table A.1, I report results from regressions corresponding to equation 4. In the first column, I employ the full sample and use the enhancement measure without instrumenting. In the second column, I employ the sample of products with disclosed fees and with fixed maturity. In the third column, I employ all products with disclosed markups which I annualize using expected maturity using equation A.4. The results in the table show that the relation between enhancement and fees is robust across samples and different estimates of fees.

Determinants of fee dispersion. I examine the primary drivers of fee dispersion in Table A.2. The table plots the partial R^2 from regressions of fees on previously documented drivers of fees. Vokata (2021) documents significant fee compression over my sample period and finds that the product maturity is inversely related to product fees. Egan (2019) explores the impact of brokers' commissions on product fair value. I explore the role of these factors and of enhancement in the following regression:

$$p_i = \gamma x_i + \lambda_t + \lambda_T + \epsilon_i, \tag{A.6}$$

where the explanatory variable (x_i) is either enhancement as defined in Section 2.3, instrument for enhancement (ϕ) as defined in Section 2.5.1, or broker's commissions introduced in Section 5.2.3. The table shows that enhancement is the primary determinant of fee dispersion in the data. Its partial R^2 is 46% (23% for the instrument), which is, for example, 5–10 times larger than the partial R^2 of broker's commissions.

Realized returns. Realized returns are calculated from the product payoff formula as follows. I evaluate the formula to calculate the payment at maturity and the coupon payments

(CP) on coupon observation dates $ct = 1, ..., CT$:

$$\text{Total return} = \frac{\text{Payment at maturity} + \sum_{ct=1}^{CT} CP_{ct}}{\text{Price}} \tag{A.7}$$

The calculation uses prices of the underlying correctly adjusted for splits. Because the payoff formula reflects the product embedded fees, the realized returns are net of fees. I calculate the annual net realized return as:

$$\text{Net realized return} = \frac{\text{Total return}}{T} \tag{A.8}$$

Note that the sample of products includes only products with a fixed maturity, and therefore the maximum maturity (T) is equal to expected maturity $(\mathbb{E}[T])$.

Gross returns. I calculate gross annualized returns as follows:

$$\text{Gross return} = \frac{\frac{\text{Net total return}}{\text{Fair value}} - 1}{T}. \tag{A.9}$$

Expected returns. I use total expected returns under $\mathbb{P}$ from Vokata (2021) estimated under the assumption the excess return on the underlying is equal to $\beta \times 6\%$. I calculate the annual expected return as follows:

$$\text{Net expected return} = \frac{\mathbb{E}[R]}{T} \tag{A.10}$$

Benchmark returns. Total benchmark returns are the cumulative returns from a daily-adjusted delta-equivalent position in the underlying and the risk-free bond, where daily deltas are estimated from the same local volatility diffusion model as product fair values (see Vokata (2021) for details). Annual benchmark returns are equal to Total benchmark returns divided by maturity. By construction, the benchmark returns are gross of fees. I calculate the ex-post annual abnormal return as:

$$\text{Abnormal return} = \frac{\text{Total return} - \text{Benchmark return}}{T} \tag{A.11}$$

Compounding. As described above, I use simple compounding to construct the annualized return, fee, and enhancement variables. The use of simple compounding is consistent with the bond coupon rate formulas and appropriate given the short-term maturity of the products in my sample. A downside of simple compounding is that it can yield extreme returns for short-dated products. For example, a 3-month product with a total return of -90% would have an annualized return of -360%. To limit the impact of such extreme observations, I winsorize return measures at the 5% and 95% level. The sample of products in analyses of returns is restricted to products with fixed maturity and available factor loadings and delta-hedged returns.

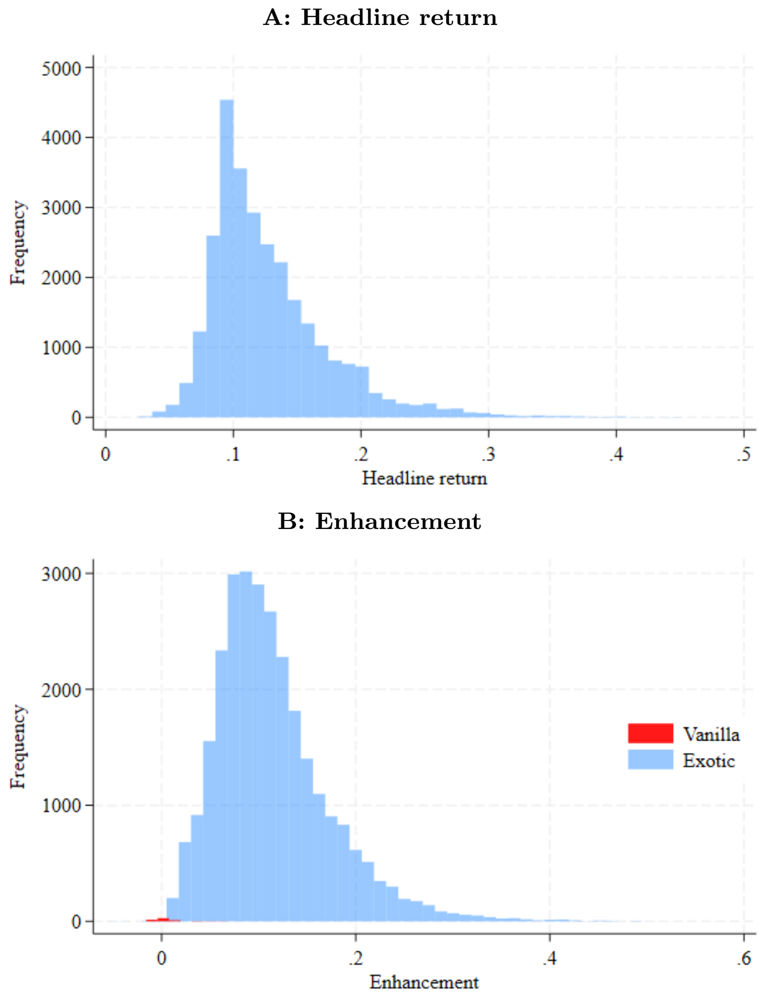


Figure A.9. Distribution of Headline Returns and Enhancement

The figures plot histograms of headline returns (Panel A) and Enhancement (Panel B). Red bars in Panel B mark products with a plain-vanilla security design with no additional conditions. Blue bars mark all other products.

Table A.1
Fees and Enhancement: Validations

The table presents the regression described in equation 4. The dependent variable is the product annualized fee. The explanatory variable is the previously defined measure of enhancement (Section 2.3). In Columns 2 and 3, the fee is calculated from disclosed markups by the issuers. Standard errors clustered at the issuer level are in parentheses. *, *, and *** represent statistical significance at the 10%, 5%, and 1%, respectively.

	Dependent variable: Fee		
	(1)	(2)	(3)
Enhancement	0.530***	0.519***	0.353***
	(0.0236)	(0.0373)	(0.0775)
Controls			
Month FE	Yes	Yes	Yes
Sample:	Full	Disclosed Markups, Fixed Maturity	Disclosed All
Observations	28,383	3,089	8,137
R^2	0.607	0.562	0.463

Table A.2
Fees and Enhancement: Partial R^2

The table presents partial R^2 for three explanatory variables from the following regression:

$$p_i = \gamma x_i + \lambda_t + \lambda_T + \epsilon_i,$$

where the explanatory variable (x_i) is either enhancement as defined in Section 2.3, instrument for enhancement (ϕ) as defined in Section 2.5.1, or broker's commissions introduced in Section 5.2.3. The sample consists of 25,241 products with available commission.

Explanatory variable (x_i)	Partial R^2
Enhancement	0.457
ϕ	0.229
Commission	0.047

C Portfolio Choice Model

C.A Simulation Methodology

I quantify the expected returns of YEPs and their covariance matrix with market returns under the (real-world) physical measure $\mathbb{P}$. To that end, I draw Monte Carlo simulations for prices of the market and five possible underlying stocks of YEPs. For simplicity, I abstract from the role of dividends ($q = 0$). I assume that the market M_t follows a geometric Brownian motion with a constant drift and volatility:

$$dM_t = \mu_M M_t dt + \sigma_M M_t dW_{1,t}, \tag{A.12}$$

where μ_M is the continuous-time market expected return and σ_M denotes market volatility. Let $M_0 = 1$. I use the following equation to construct the paths for M:

$$M(t + \Delta t) = M(t) \exp\left[\left(\mu_M - \frac{\sigma_M^2}{2}\right)\Delta t + \sigma_M \epsilon_M \sqrt{\Delta t}\right], \tag{A.13}$$

where ϵ_M is a random sample from a normal distribution with mean zero and standard deviation of one.

To simulate paths for the underlying stocks, I assume their correlation with the market is $\rho_S = \beta_S \frac{\sigma_M}{\sigma_S}$. Let $S_0 = 1$. I then construct the path for each underlying stock as:

$$S(t + \Delta t) = S(t) \exp\left[\left(\mu_S - \frac{\sigma_S^2}{2}\right)\Delta t + \sigma_S \epsilon_S \sqrt{\Delta t}\right], \tag{A.14}$$

where μ_S is the continuous-time expected return of the stock, $\epsilon_S = \rho_S \epsilon_M + \sqrt{1 - \rho_S^2} v$, and v is a random sample from standard normal distribution independent of ϵ_M. For each of the five stocks, I derive their expected returns $\mathbb{E}R_S$ from the Capital Asset Pricing Model: $\mathbb{E}R_S = r_f + \beta(r_M - r_f)$. The assumptions about β_S, σ_S and $\mathbb{E}R_S$ are listed in Table 7, Panel A.

For each simulated path z, I use the final prices of the market $M_{z,T}$, the final prices of a stock $S_{z,T}$ and the minimum prices of the stock during the path $S_{z,min}$ to derive the YEP returns.

C.B Modeling YEPs

I model 15 versions of YEPs using three security designs (vanilla, digital, barrier) combined with five underlying stocks. The variation in security design and underlying volatility approximates the variation in enhancement observed in the data. I derive the headline returns of YEPs under the risk-neutral measure $\mathbb{Q}$ and assuming fair pricing: $FV = 1$, $p = 0$. For each security design I calculate the price of the embedded put option using Black-Scholes-Merton type formulas for stocks with no dividends. I refer the reader to Hull (1993) for details on these formulas. The vanilla embedded option price is:

$$OP_{pl,T,vanilla} = Ke^{-rT}N(-d_2) - S_0N(-d_1), \tag{A.15}$$

where $K = 1 - pl = 0.75$, $d_1 = \frac{ln(S_0/K)+(r+\sigma^2/2)T}{\sigma\sqrt{T}}$, and $d_2 = d_1 - \sigma\sqrt{T}$. The digital payoff embeds the vanilla option plus a cash-or-nothing put option:

$$OP_{pl,T,digital} = ple^{-rT}N(-d_2), \tag{A.16}$$

where the cash payment is equal to the protection level: $pl = 0.25$. The price of the down-and-in embedded barrier option is:

$$\begin{aligned} OP_{pl,T,barrier} = &-S_0N(-x_1) + Ke^{-rT}N(-x_1 + \sigma\sqrt{T}) + S_0(H/S_0)^{2\lambda}[N(y) - N(y_1)] \\ &- Ke^{-rT}(H/S_0)^{2\lambda-2}[N(y - \sigma\sqrt{T}) - N(y_1 - \sigma\sqrt{T})], \end{aligned} \tag{A.17}$$

where $K = 1$, $H = 1 - pl = 0.75$, and

$$\lambda = \frac{r + \sigma^2/2}{\sigma^2},$$

$$x_1 = \frac{ln(S_0/H)}{\sigma\sqrt{T}} + \lambda\sigma\sqrt{T},$$

$$y = \frac{ln(H^2/(S_0K))}{\sigma\sqrt{T}} + \lambda\sigma\sqrt{T},$$

$$y_1 = \frac{ln(H/S_0)}{\sigma\sqrt{T}} + \lambda\sigma\sqrt{T}.$$

For all YEPs, $T = 0.5$. Volatility ranges from $\sigma = 0.4$–0.6 depending on the underlying stock. I convert the option prices to headline returns as:

$$hr = \frac{(1 + OP_{pl,T})(1 + r)^T - 1}{T}. \tag{A.18}$$

With the headline return in hand, I calculate the YEP returns depending on the design. For vanilla design:

$$R_{vanilla} = \begin{cases} 1 + hr \times T & \text{if } S_T \geq 0.75 \\ 1 + hr \times T - (0.75 - S_T) & \text{if } S_T < 0.75, \end{cases} \tag{A.19}$$

for digital design:

$$R_{digital} = \begin{cases} 1 + hr \times T & \text{if } S_T \geq 0.75 \\ 1 + hr \times T - (1 - S_T) & \text{if } S_T < 0.75, \end{cases} \tag{A.20}$$

and for barrier design:

$$R_{barrier} = \begin{cases} 1 + hr \times T & \text{if } S_{min} \geq 0.75 \\ 1 + hr \times T - (1 - S_T) & \text{if } S_{min} < 0.75 \text{ and } S_T < 1. \end{cases} \tag{A.21}$$

The gross expected return of YEP is the average return over all simulations:

$$\mathbb{E}R_{YEP} = \frac{\sum_z R}{N_Z}, \tag{A.22}$$

where N_Z is the number of simulations set to 10,000.

Figure A.10 plots the objective expected returns for 15 YEPs considered in the portfolio choice model and the gross expected returns observed in the data against enhancement. The figure shows that the YEPs are modeled to match the observed variation in the data and match the positive slope of gross expected returns against enhancement.

C.C Portfolio Choice

To simplify the portfolio choice problem, in most applications I approximate the expected utility with a second-order Taylor expansion around expected portfolio value, $\mathbb{E}w$:

$$\mathbb{E}u(w) \approx u(\mathbb{E}w) + \frac{1}{2}u''(\mathbb{E}w)\sigma_w^2, \tag{A.23}$$

where σ_w^2 is portfolio variance.[2] I then use an optimization algorithm to solve for the maximum fee as defined in equation 12.

C.D Salience

Figure A.11 plots the gross expected returns under salient thinking (eq. 15) against enhancement. The figure highlights that the distortion in perceived expected returns due to salient thinking increases both with the implied volatility of the underlying as well as with the vega of the security design. The barrier design (marked with squares) which has the highest vega and therefore enhances headline returns the most, displays the most distorted returns. Within barrier design, the highest volatility underlying (the rightmost square) displays the largest return distortion.

C.E Subjective Beliefs

I simulate underlying returns under subjective beliefs to assess whether belief distortions can explain the results presented in Section 3. YEPs may appear attractive to investors who

[2] The exception is expected utility under reference-dependent preferences which I estimate by taking the average of $u(w(1 + r_{z,p}))$ over all simulated paths $z \in Z$.

believe the underlying volatility will decline and who believe that the underlying price will trend sideways. If the price of the underlying does not decline by more than the protection level and does not increase by more than the headline return, a YEP will yield a higher return than investing in the underlying (abstracting from the impact of potential dividend payments). Such beliefs are often mentioned by marketing brochures of YEPs (see, e.g., figure A.3).

To model such subjective beliefs, for each of the stocks considered in Section 4.2, I set the subjective volatility of underlying returns to 80% of the objective volatility and both the expected return and beta to zero. That is, stock 1 with the lowest volatility of 40% has a subjective volatility 32% and stock 5 with the highest volatility of 60% has a subjective volatility of 48%. Together, the low volatility and zero underlying return capture the beliefs in stagnating or sideway-trending underlyings. I then follow the steps described in Section C and simulate 10,000 paths for each underlying stock to generate the distribution of YEP returns. Panel A of Figure A.12 plots the gross expected returns under these subjective beliefs. As expected, the gross expected returns are significantly higher than the objective returns.

With the subjective expected returns, volatilities, and covariances with the market in hand, I then solve for the willingness-to-pay using the same numerical solution as described in Section C. Panel A of Figure A.13 displays the results. I find that the subjective beliefs can generate the high willingness-to-pay observed in the data, but the relation with enhancement is weaker. The reason for the weak slope is that the willingness-to-pay for YEPs does not increase dramatically with more enhanced security designs. The intuition is that simple formalizations of beliefs in sideways moving underlying do not easily generate a preference for more complex designs—investors would be willing to pay high fees even for simple and vanilla designs. To make this point even stronger, I next expand the set of available financial assets.

Strangles. Specifically, I design a simple short strangle strategy corresponding to each of the 15 YEP products. The strategy has the same underlying stock and the same maturity. It consists of a short position in a put option at strike $K = 0.75$ and a short position in a call option at strike $K = 1+$ headline return. This strategy highlights the incentive of an investor with the subjective beliefs in a sideways trending underlying to also short upside volatility. I calculate the prices of both options using the Black-Scholes-Merton type formulas and calculate the expected returns, volatilities, and covariances from the same simulated stock price paths as for the YEPs above. Panel B of Figure A.12 plots the expected strangle returns and shows that the difference to YEP returns is dramatic. For example, the highest enhancement YEP (barrier design with underlying volatility of 60%) has an expected gross return of 9.1% p.a., whereas the strangle strategy has an expected return of 11.9%.

Panel B of Figure A.13 displays the willingness to pay for YEP when the investor can choose between a YEP or a strangle. That is the maximum fee such that an investor would prefer a combination of the market, the risk-free rate and a YEP over a combination of the market portfolio, the risk-free rate and a strangle. The strangles completely crowd out YEPs.

C.F Reference-Dependent Preferences

Figure A.14 plots the optimal weights in a YEP for an investor with reference-dependent preferences as in equation 18. I plot the portfolio choice for a YEP with barrier design and underlying volatility of 50%. The results are qualitatively similar for other YEPs modeled in Section 4. The put spread approximates the YEP payoff and is formed by selling 8.5 put options with a relative strike price $K = 0.75$ and buying 7.5 put options with a relative strike price $K = 0.7$. The prices of both options are calculated using Black-Scholes-Merton type formulas.

The figure shows that reference-dependent preferences can generate YEP adoption under moderate levels of fees but not under the fees observed in the data. Panel B shows that YEPs are completely crowded out by the PUT spread.

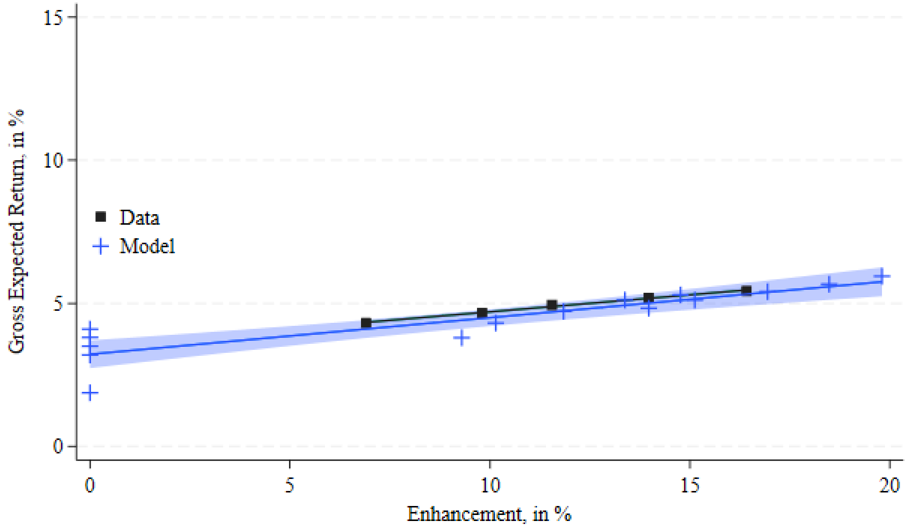


Figure A.10. Expected Returns: Portfolio-Choice Model vs Data

The figure plots the gross expected returns for the 15 YEPs considered in the portfolio-choice model and the gross expected returns observed in the data against enhancement. Blue plus symbols represent objective gross expected returns for 15 YEPs in the model. Black squares mark the average gross expected returns for five enhancement quintiles analyzed in Section 4.1.

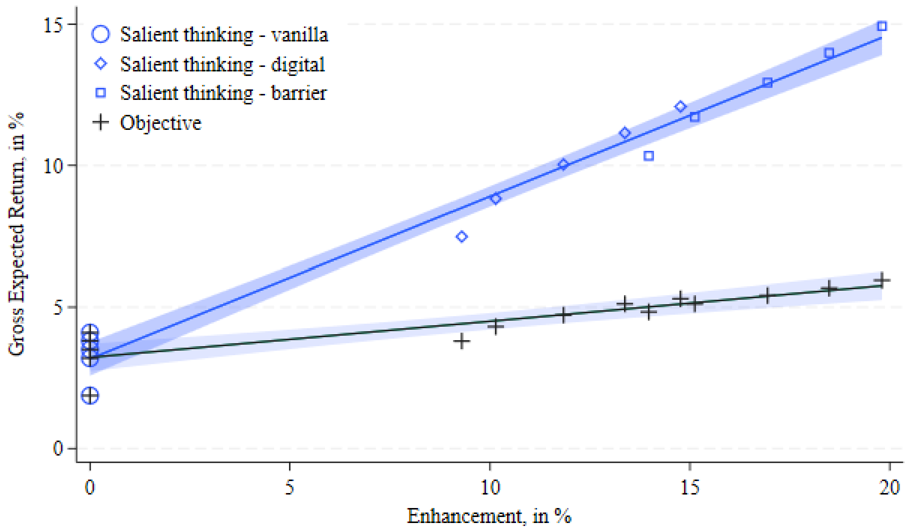
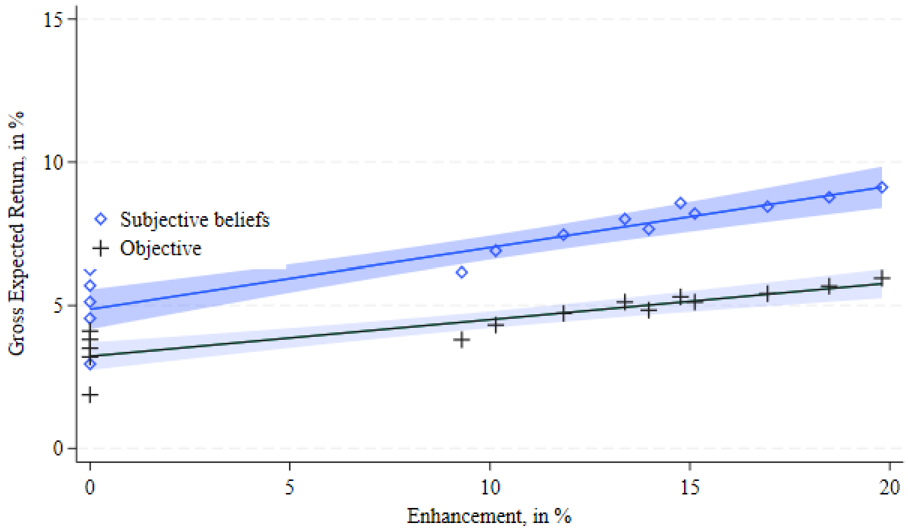


Figure A.11. Expected Returns under Salient Thinking

The figure plots the gross expected returns for the 15 YEPs considered in the portfolio-choice model distorted by salient thinking against enhancement. Blue markers plot gross expected returns under salient thinking as modeled in equation 15. Black plus symbols mark the objective gross expected returns.

A: YEPs



B: Strangles

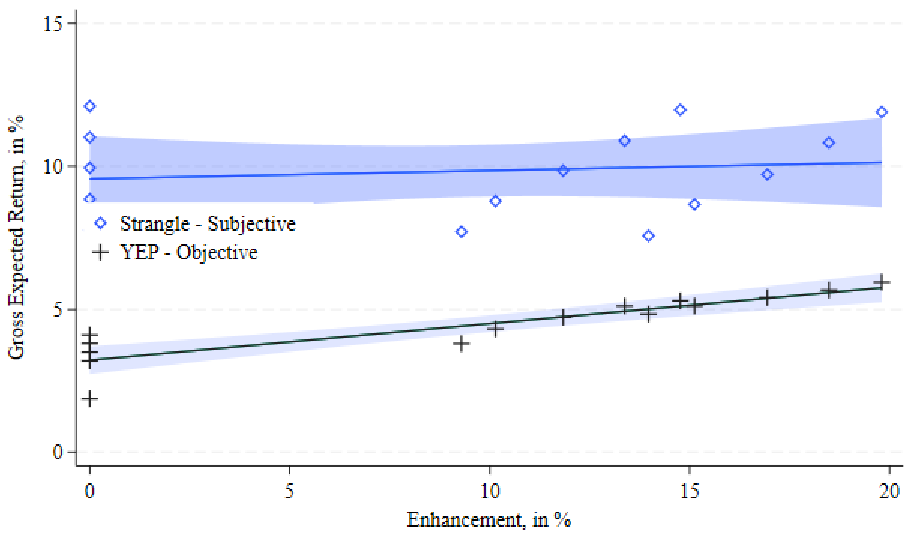
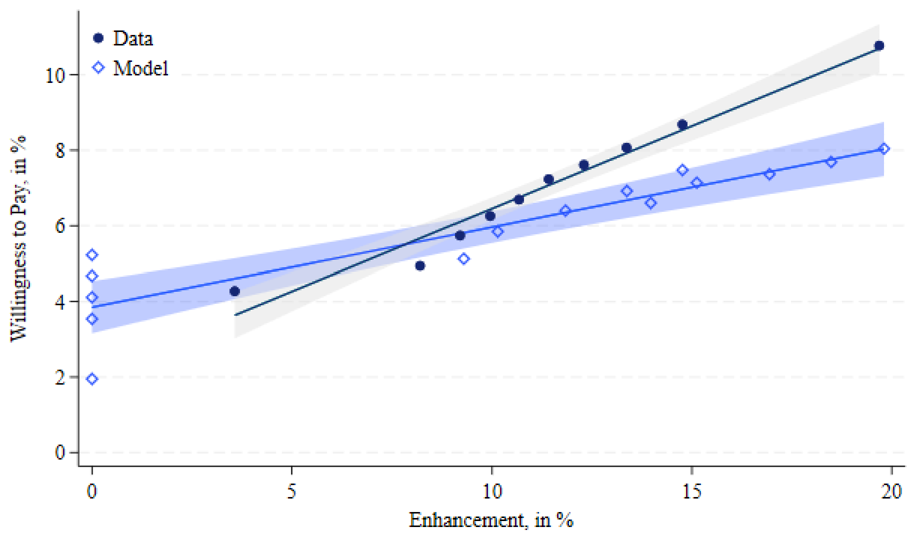


Figure A.12. Expected Returns under Subjective Beliefs

Panel A plots the gross expected returns for the 15 YEPs considered in the portfolio-choice model under subjective beliefs about the underlying return. For each YEP, the subjective underlying volatility is equal to 80% of the objective volatility. The underlying expected return and beta are zero. Panel B plots the gross expected returns for the corresponding strangles created from exchange-listed options as described in Section C.E.

A: Baseline Asset Space



B: Asset Space Augmented with Exchange-Listed Options

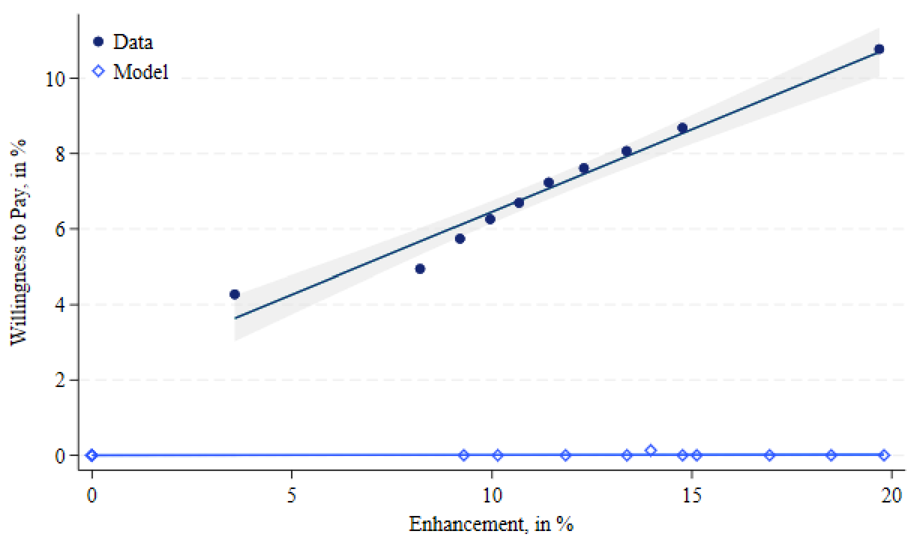


Figure A.13. Willingness-to-Pay: Portfolio-Choice Model with Subjective Beliefs
The figures display the willingness to pay from the portfolio choice model described in Section 4.2 when investors hold subjective beliefs about the underlying return. For each YEP, the subjective underlying volatility is equal to 80% of the objective volatility. The underlying expected return and beta are zero. Panel A plots willingness to pay under these subjective beliefs when investors choose from a YEP, market and risk-free rate. Panel B plots the willingness to pay when investors can also choose a strangle created from exchange-listed options as described in Section C.E.

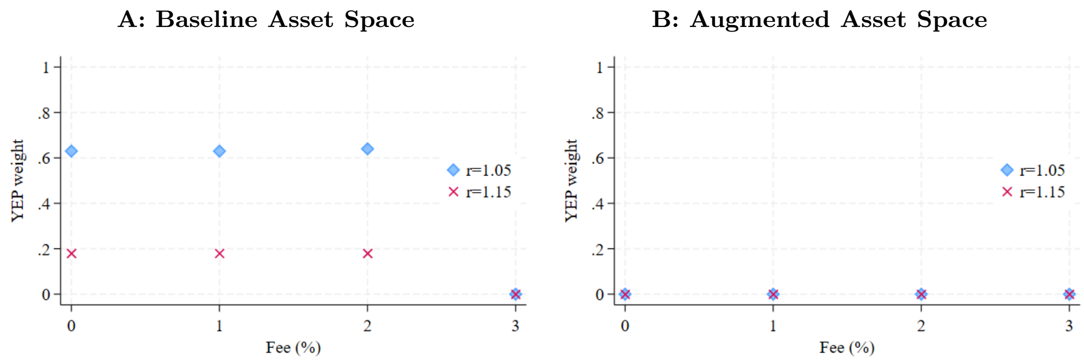
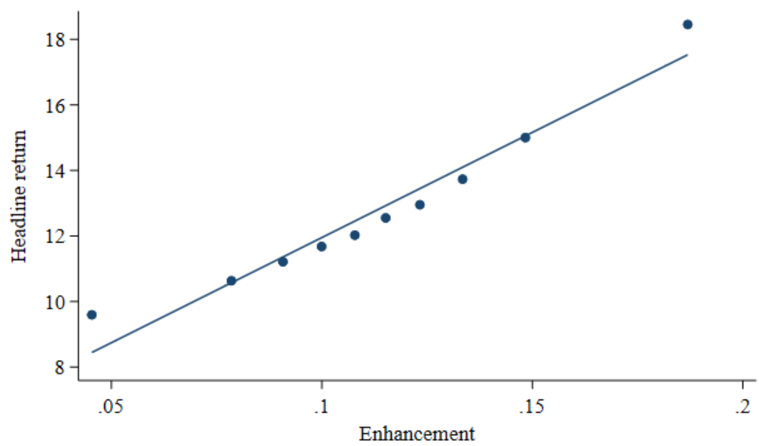


Figure A.14. Portfolio Choice Under Reference-Dependent Preferences
The figures plot the optimal weight in a YEP against YEP fees for an investor with reference-dependent preferences modeled in equation 18. In Panel A, the investor chooses from the equity market, risk-free rate and a YEP. In Panel B, the investor can also choose from a put spread constructed from exchange-listed options. Both figures plot optimal weights for two values of the reference point: 1.05 and 1.15.

D Additional Figures and Tables

A: Headline return



B: Protection level

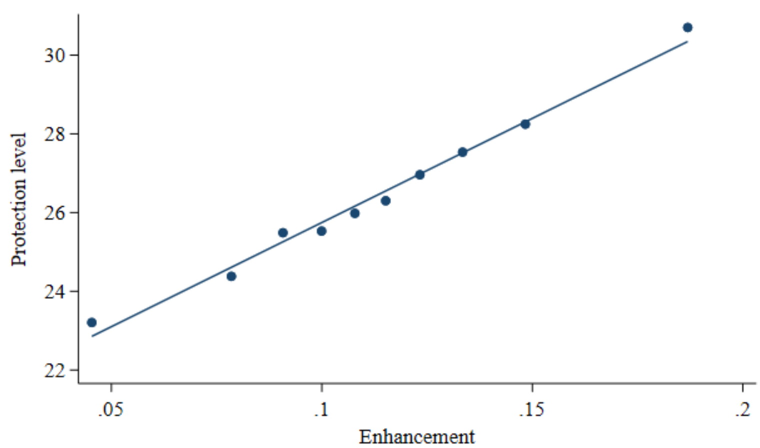


Figure A.15. Headline Rates and Enhancement

The figures plot binned scatterplots of the two headline rates on the measure of enhancement defined in Section 2.3.

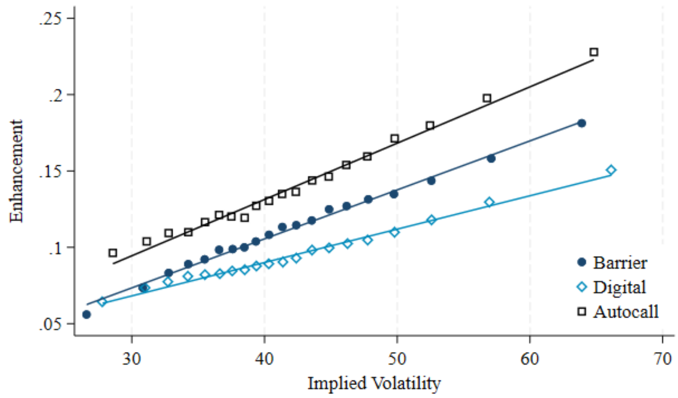


Figure A.16. Security-Design Vega

The figure displays a binned scatter plot of *Enhancement*, as previously defined in Section 2.3, against the underlying implied volatility for three security designs. The plot controls for maturity fixed effects.

FWP 1 e45836fwp.htm TERM SHEET

Term sheet
To prospectus dated November 21, 2008,
prospectus supplement dated November 21, 2008 and
product supplement no. 34-A-II dated February 7, 2011

Term Sheet to
Product Supplement No. 34-A-II
Registration Statement No. 333-155535
Dated October 17, 2011; Rule 433

JPMORGAN CHASE & CO.

Structured Investments

$ 13.50% per annum Reverse Exchangeable Notes due October 24, 2012 Linked to the Common Stock of Caterpillar Inc.

General

- The notes are designed for investors who seek a higher interest rate than the current dividend yield on the Reference Stock or the yield on a conventional debt security with the same maturity issued by us or an issuer with a comparable credit rating. Investors should be willing to forgo the potential to participate in appreciation in the Reference Stock, be willing to accept the risks of owning equities in general and the common stock of Caterpillar Inc., in particular, and be willing to lose some or all of their principal at maturity.
- The notes will pay 13.50% per annum interest over the term of the notes. **However, the notes do not guarantee any return of principal at maturity. Instead, the payment at maturity will be based on the Final Share Price of the Reference Stock and whether the closing price of the Reference Stock is less than the Initial Share Price by more than the Protection Amount on any day during the Monitoring Period, as described below.**
- Senior unsecured obligations of JPMorgan Chase & Co. maturing October 24, 2012*.
- Payment at maturity for each $1,000 principal amount note will be either a cash payment of $1,000 or delivery of shares of the Reference Stock (or, at our election, the Cash Value thereof), in each case, together with any accrued and unpaid interest, as described below.
- Any payment on the notes is subject to the credit risk of JPMorgan Chase & Co.
- Minimum denominations of $1,000 and integral multiples thereof.

Key Terms

Reference Stock:	The common stock, par value $1.00 per share, of Caterpillar Inc. (New York Stock Exchange symbol "CAT"). We refer to Caterpillar Inc. as "Caterpillar."
Interest Rate:	**13.50% per annum**, paid monthly and calculated on a 30/360 basis.
Protection Amount:	An amount that represents at least **25.00% of the Initial Share Price, subject to adjustments.**
Pricing Date:	On or about October 19, 2011
Settlement Date:	On or about October 24, 2011
Observation Date:	October 19, 2012*
Maturity Date:	October 24, 2012*
CUSIP:	48125X6S0
Interest Payment Dates:	Interest on the notes will be payable monthly in arrears on the 24th calendar day of each month, up to and including the final monthly interest payment, which will be payable on the Maturity Date (each such date, an "Interest Payment Date"), commencing November 24, 2011. See "Selected Purchase Considerations — Monthly Interest Payments" in this term sheet for more information.
Payment at Maturity:	The payment at maturity, in excess of any accrued and unpaid interest, is based on the performance of the Reference Stock. You will receive $1,000 for each $1,000 principal amount note, plus any accrued and unpaid interest at maturity, unless: (1) the Final Share Price is less than the Initial Share Price; and

Figure A.17. Term Sheet with Headline Rate Fixing
The figure shows the beginning of the product term sheet available at https://www.sec.gov/Archives/edgar/data/19617/000089109211007004/e45836fwp.htm. The headline return (13.5%) and the minimum level of protection (25%) are fixed prior to the start of offering period.

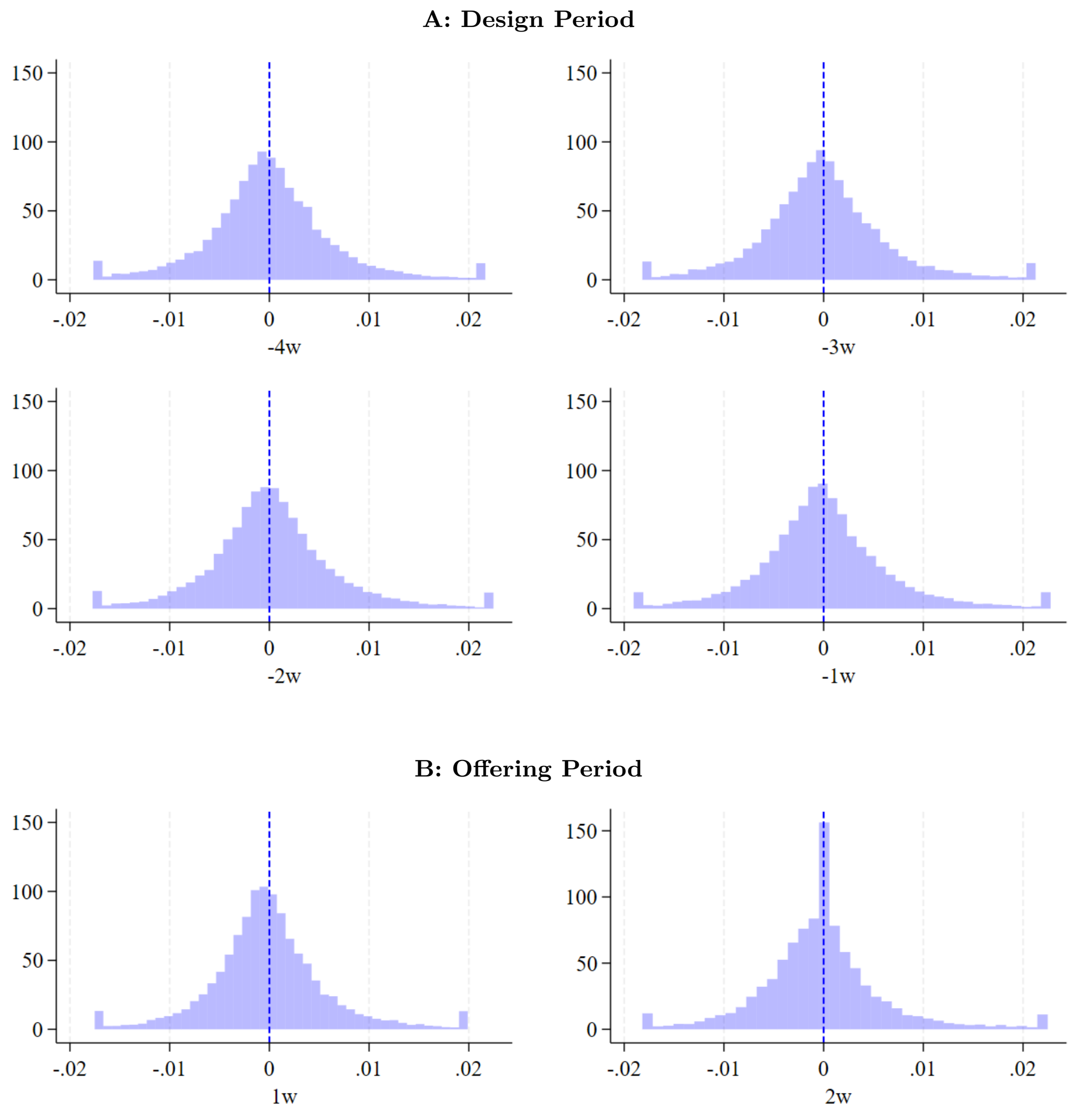


Figure A.18. Distribution of Cost Shocks over Design and Offering Period
The figures plot histograms of weekly changes in structuring costs, $\Delta\phi_i$, as defined in Section 2.5.1, with vertical blue dashed lines at 0.

Table A.3
Sensitivity of Headline Rates to Cost Shocks at Different Horizons

The table reports coefficients from the regression corresponding to equation 7. The dependent variables are the two headline rates: headline returns and protection levels. The explanatory variables are the cost-based instrument (as defined in Section 2.5.1) measured at different horizons: four weeks before the start of the offering period ($-1m$), change between four weeks and the start of the offering period ($-4w - 1w$), and change over the first two weeks of offering period ($1w - 2w$). The sample consists of 5,414 products issued between January 2006 and December 2009 with offering period of at least one week. Robust standard errors are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1%, respectively.

Dep. var.:	Headline return	Protection
	(1)	(2)
ϕ_{-1m}	0.933***	1.670***
	(0.0332)	(0.0474)
$\Delta\phi_{-1m-1w}$	0.915***	1.368***
	(0.0563)	(0.0819)
$\Delta\phi_{1w-2w}$	0.107	0.202**
	(0.0674)	(0.101)
Controls		
Month FE	Yes	Yes
Issuer FE	Yes	Yes
Maturity FE	Yes	Yes
Underlying FE	Yes	Yes
Design FE	Yes	Yes
Observations	5,414	5,414
R^2	0.711	0.746

Table A.4
Falsification Test: Effect of Cost Shocks Before and After Headline Fixing

The table reports coefficients from the regression corresponding to equation 8. The dependent variable is the sales volume and the main explanatory variables are the cost-based instruments (as defined in Section 2.5.1) measured at different horizons: four weeks before the start of the offering period ($-1m$), change between four weeks and the start of the offering period ($-4w - 1w$), and change over the first two weeks of offering period ($1w - 2w$). The regression also controls for fees. The sample consists of 5,414 products issued between January 2006 and December 2009 with offering period of at least one week. Robust standard errors are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1%, respectively.

	Dependent variable: ln(Volume)
	(1)
ϕ_{-1m}	7.998***
	(2.107)
$\Delta\phi_{-4w-1w}$	8.993***
	(3.090)
$\Delta\phi_{1w-2w}$	-2.425
	(4.424)
Controls	
Month FE	Yes
Issuer FE	Yes
Maturity FE	Yes
Underlying FE	Yes
Design FE	Yes
Observations	5,414
R^2	0.577

Table A.5
Returns to Enhancement: Global Sample

This table displays the coefficients from OLS regressions in which the dependent variables are different measures of product returns and the explanatory variable is the measure of enhancement defined in Section 2.3 on the security-design level. Net Realized Return in columns 1 and 4 is equivalent to Net Realized Return in Table 6. The return is calculated by annualizing the net total return of the product using simple compounding. Net Realized $Return_c$ in columns 2 and 5 is annualized using geometric compounding and Total return in columns 3 and 6 is not annualized. The sample consists of 9,619 products issued outside the U.S. with fixed maturity and available return data. Robust standard errors are in parentheses. *, *, and *** represent statistical significance at the 10%, 5%, and 1%, respectively.

Dep. var.:	Net Realized Return	Net Realized $Return_c$	Total Return	Net Realized Return	Net Realized $Return_c$	Total Return
	(1)	(2)	(3)	(4)	(5)	(6)
Enhancement	-0.431***	-0.371**	-0.385***	-0.465***	-0.425***	-0.472***
	(0.140)	(0.140)	(0.132)	(0.133)	(0.130)	(0.124)
Controls						
Month FE	Yes	Yes	Yes	Interacted	Interacted	Interacted
Country FE	Yes	Yes	Yes	Interacted	Interacted	Interacted
Maturity FE	Yes	Yes	Yes	Interacted	Interacted	Interacted
Observations	9,603	9,603	9,603	9,295	9,295	9,295
R^2	0.230	0.227	0.239	0.346	0.328	0.319

Table A.6
Returns to Enhancement: Fama-MacBeth Regressions

This table displays the coefficients from Fama Mac-Beth regressions corresponding to the OLS regressions in Table 6. The regressions are estimated on monthly level. The sample consists of U.S. products. Newey–West *t*-statistics using 4 lags are reported in parentheses. *, *, and *** represent statistical significance at the 10%, 5%, and 1%, respectively.

Dep. var.:	Net Realized Return	Gross Realized Return	Net Expected Return	Gross Expected Return	Abnormal Return	Benchmark Return
	(1)	(2)	(3)	(4)	(5)	(6)
Enhancement	-0.439***	0.142	-0.525***	0.0970***	-0.378***	-0.0875
	(0.126)	(0.149)	(0.0268)	(0.00968)	(0.0382)	(0.119)

Table A.7
Demand for Enhancement: Controlling for Broker's Commission

The table presents the regressions equivalent to Panel A of Table 4 which in addition control for broker's commission. Robust standard errors are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1%, respectively.

	Dependent variable: Volume			
	(1)	(2)	(3)	(4)
Fee	-10.56***	-9.340***	-9.740***	-12.85***
	(0.808)	(1.304)	(1.039)	(2.202)
Enhancement	7.140***	3.215***	5.723***	5.774***
	(0.811)	(1.049)	(1.455)	(1.735)
IV			$\nu \times \sigma$	$\nu \times \sigma$, Fee
Controls				
Month FE	Yes	Interacted	Yes	Yes
Issuer FE	Yes	Interacted	Yes	Yes
Maturity FE	Yes	Interacted	Yes	Yes
Underlying FE	Yes	Interacted	Yes	Yes
Design FE	Yes	Yes	Yes	Yes
Commission	Yes	Yes	Yes	Yes
Observations	25,033	9,321	25,033	22,881
R^2	0.471	0.667	0.469	0.437

Appendix References

Calvet, Laurent E., Claire Célérier, Paolo Sodini, and Boris Vallée, 2022, Can Security Design Foster Household Risk-Taking?, *Journal of Finance* Forthcoming.

Egan, Mark, 2019, Brokers vs. Retail Investors: Conflicting Interests and Dominated Products, *Journal of Finance* 74, 1217–1260.

Hull, John, 1993, *Options, futures, and other derivative securities*, volume 7 (Prentice Hall Englewood Cliffs, NJ).

Knüpfer, Samuli, Ville Rantala, Erkki Vihriälä, and Petra Vokata, 2023, Household responses to phantom riches, *Working paper* Ohio State University.

Mullainathan, Sendhil, Joshua Schwartzstein, and Andrei Shleifer, 2008, Coarse thinking and persuasion, *Quarterly Journal of Economics* 123, 577–619.

Vokata, Petra, 2021, Engineering lemons, *Journal of Financial Economics* 142, 737–755.