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A note on receptiveness to loss in structured Investment☆

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ABSTRACT

The close to zero interest rates past the economic crisis open possibility to directly test for loss aversion in framed field structured investment tasks. We use a Web-survey platform to compare the willingness to invest in LOSS-GAIN deposits that pay positive return G in favorable market conditions, but bring a loss L in the complementary states, to the valuation of parallel GAIN-ONLY deposits that pay small positive return G-|L| in the favorable scenario but bring zero return in the opposite case. While common models of choice predict that investors should refrain from LOSS-GAIN designs but may strongly approve the GAIN-ONLY, the participants rank the LOSS-GAIN significantly higher and show similarly strong willingness to invest in both versions. The results suggest that loss aversion may attenuate in retail structured investment, when small losses come with increased compensating gain possibilities.

1. Introduction

While the contribution of Kahneman and Tversky's (1979) loss aversion to economics is indisputable (Camerer, 2004; Barberis, 2013), a growing body of research challenges the global loss aversion assumption, illustrating that decision makers may accommodate the possibility of loss in particular contexts and applications. This note reports the results of a brief Google Forms experiment, illustrating that loss aversion may diminish in retail structured investment, when the investors can increase their gain opportunities by accepting the possibility of a small loss.

The prospective investors of our incentivized survey reveal preference for structured deposits that may bring small loss or larger gain (LOSS-GAIN designs) over parallel deposits that provide full capital protection with a possibility of small gain (GAIN-ONLY). A deposit that pays 5% or −3% annual return depending on the 2017 performance of the S&P500 index, for example, is ranked as significantly more appealing than a deposit that similarly pays 2% or 0%. Participants' median predictions for the S&P500 2017 return are elicited first, to define deposits with 50-50 likelihoods for positive or non-positive return, and personal attitude to gain-domain risk is controlled using a choice problem between riskier and safer deposits. As Prospect Theory implies clear preference for GAIN-ONLY designs, our results strongly contradict the predictions of leading choice models. Since the preference for LOSS-GAIN also shows for risk averse respondents, we more specifically conclude that loss aversion locally mitigates, as 3% increase in gains appears to have stronger impact than 3% loss.

Our brief framed field experiment (Harrison and List, 2004) importantly exploits the close to zero deposit interest rates prevailing in September 2016. The risk free annual rates that commercial banks paid on large deposits did not exceed 0.15% around the experiment. If the risk free deposit rates were substantially higher, so that to compensate for 3% loss we should have offered the investor 12% return in the favorable market condition, then the GAIN-ONLY version paying 9% or 0% could still be preferred to the 12% or −3% LOSS-GAIN design (as a marginal increase in gains from 9% to 12% does not compensate for 3% loss). The very low interest rates however open a possibility for comparing the impact of 3% loss to almost parallel 3% increase in gain, from 2% to 5%. We intuitively suspect that loss aversion may fail in such close comparison.

The note proceeds as follows: the limited loss aversion literature is briefly surveyed in Section 2 and the methodology of the Web experiment is explained in Section 3. The sample is described in Section 4, while Section 5 presents the results. Section 6 concludes.

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2. Motivation and literature review

The lingering economic uncertainty and close to zero worldwide interest rates have increased the retail demand for structured investments in general, and structured instruments with capital protection in particular (Hens and Rieger, 2014; Entrop et al., 2016). Some structured notes and certificates offer 100% capital protection, with limited positive return possibilities. In other cases, the investor may lose given percentile of the investment, but the limited loss comes with compensating larger gain possibilities to keep the investment instrument attractive (see Web supplement A for recent field examples).[1] This note posits that loss aversion may decrease in retail structured investment context, to the extent that investors would prefer small loss designs to parallel, full capital protection instruments. The hypothesis links to 3 lines of findings in the emerging limited loss aversion literature:

Several papers propose that loss aversion may attenuate in deliberate or calculated choice. Sokol-Hessner et al. (2009) show that loss aversion almost disappears when subjects are requested to assume a trader's role. Vieider (2009) relatedly shows that loss aversion reduces when subjects have to explain their choices in post-experiment personal interviews. Klapper et al. (2005) find that consumers' loss aversion decreases with quality consciousness, while Ert and Erev (2008) illustrate that rejection of mixed loss-gain gambles is more frequent in hallway questionnaires compared to laboratory experiments.

A complementary line of research suggests that loss aversion intensifies with emotion. Endowment effect studies show that the minimal price that owners demand for departing from a possession strongly increases with attachment (Ariely et al., 2005). Hartley and Phelps (2012) show that personal disposition to anxiety enhances loss aversion, while Inesi (2010) contrarily illustrates that power priming mitigates the aversion. Sokol-Hessner et al. (2012) find neuroimaging links between emotion regulation and the decreased loss aversion of subjects assuming the role of professional traders.

A third relevant stream in the restricted loss aversion literature deals with sociodemographic correlates, illustrating that loss aversion may reduce with education (Booij and Van de Kuilen, 2009; Gächter et al., 2007) and sophisticated financial literacy (Bateman et al., 2015). Dimmock and Kouwenberg (2010) find that direct investment in stocks associates with smaller loss aversion. Payne et al. (2015) expose negative correlation between loss aversion and personal life expectancy.[2]

Intuitively, these findings suggest that loss aversion may play smaller role in retail structured investment decision. The minimum investment in structured instruments frequently exceeds 1000 Euros (dollars), and the retail clientele that opt for these instruments are typically affluent, educated, and financially literate (cf., Chao-Hung, 2013). It is reasonable moreover to assume that structured investment decisions are non-emotional and calculated (Blümke, 2009). These characteristics match the contexts within which loss aversion shows smaller affect, motivating the current exploratory examination.

Moreover, in a related paper Sonsino et al. (2017) find evidence for limited loss aversion in the valuation of investment instruments with composite return structure. A composite is defined as a structured instrument with at least two underlying assets; e.g., an ETN (Exchange Trade Note) that tracks the S&P500 and COMEX GOLD contracts in equal weights (http://us.spindices.com/indices/strategy/sp-500-gold-hedged-index). The 2016 paper shows that prospective investors tend to value such composites "by tranche", weighting the values of underlying components, instead of valuating the reduced-form prospect.[3] Moreover, within valuation-by-tranche, loss aversion only emerges for losses exceeding thresholds around 5%. The investors of the composite-instruments experiments thus appear relatively receptive to losses, when these come with increased structured gain possibilities. These former results additionally motivate the current test of attitude to loss in the context of simple, non-composite, structured investment.

3. The 3-step design

We use a 3-step design to compare the valuation of framed field 2017 deposits with and without possible loss:

At the first step, the respondent was asked to provide a median prediction for the 2017 return of a leading U.S. stock market index such as the Standard & Poor's 500 (henceforth: SP500) or the Dow Jones Industrial Average (DJIA). The instructions (Appendix A.1) explained that a median prediction is a point forecast such that the predictor assigns equal 50-50 chances to larger or smaller return, and the realized return in each of the years 2013–2015 and at the first 8 months of 2016 were presented on screen to facilitate the forecasting. Ten participants were randomly selected for receiving a prize that decreases with their absolute prediction error. The potential prize was set at 200 NIS (about 54 $US) for prediction errors smaller than 1%, and decreased at slope of 10 NIS so that errors of 20% and higher canceled the payoff completely. As the median minimizes the expected absolute prediction error (e.g., Bloomfield and Steiger, 2012), the incentivization method matches the explicit call for predictions with equal 50-50 chances for lower or higher return.[4]

The median forecast was used at the next screen of the questionnaire (step 2), where the respondent was asked to evaluate a structured deposit that pays given positive return G if the underlying index return in 2017 exceeds (or is equal to) the previously submitted median prediction, but pays negative or zero return L if the 2017 index return falls below the previously submitted forecast. The $G = 5\%$ and $L = -3\%$ assignment is presented in Appendix A.2. The participant is asked to decide how much, of a free investment budget of 250,000 NIS she chooses to invest in the deposit, and also rank the deposit in 1–10 scale in terms of its general appeal to well-off investors.[5] Since the median prediction is defined as a prediction with equal chances for lower or higher return, the deposit actually represents a prospect with 50–50 chances for positive or negative return. The expected return is only 1%, which suits the close to zero risk-free deposit rates at the time of the experiment.

To compare the willingness to invest in such limited-loss deposits to the willingness to invest in parallel gain-only struc-

[1] Structured investment instruments typically consist of an underlying asset (or basket of assets) and a return function, deriving the structured return from the underlying's performance. A general typology of structured products is provided at http://www.svsp-verband.ch/en/. In examples A.1-A.2 of Web supplement A the investment capital is 100% protected (gain-only), while in examples A.3-A.4 the capital protection is 90% (maximal loss 10%). The industry uses terms such as "structured deposit note" or "structured certificate". We use "structured deposits" henceforth.

[2] Limited loss aversion also shows in choice from experience experiments; e.g., in Erev et al. (2008) subjects prefer a gamble paying +1000 or −1000 on a certain outcome of 0 in almost 50% of 100 trials. Another segment of literature argues that loss aversion does not show for money exchanged in routine no-risk transactions (Novemsky and Kahneman, 2005).

[3] Using V to denote the valuation functional, valuation by-tranche is based on 0.5*V(S&P500) +0.5*V(GOLD), contrarily to the rational model where V is applied to the reduced-form prospect: V(0.5*S&P500+0.5*GOLD).

[4] If the decision-maker holds subjective beliefs represented by some density f regarding the target return r, then the median solves the problem $\text{MIN}_P E_f(|P - r|)$.

[5] The US dollar was traded for 3.7 New Israeli Shekel around the experiment.

Table 1
The 4 versions of the questionnaire.

	GAIN-ONLY	LOSS-GAIN	Choice problem
SP500	[2%,0%] (N = 53)	[5%,−3%] (N = 66)	[5%,0%] or [3%,2%]
DJIA	[3%,0%] (N = 48)	[6%,−3%] (N = 50)	[6%,0%] or [3%]

tures, we use a modified version that pays only 2% return if the SP500 2017 return weakly exceeds the median prediction and 0% if the SP500 return falls behind the median prediction. The subjective expected return on the modified deposit is still 1%, but the LOSS-GAIN [5%,−3%] structure is replaced with GAIN-ONLY [2%,0%]. Intuitively, if investors are loss averse, we would expect a preference for [2%, 0%] over [5%, −3%], as the impact of 3% loss should exceed the impact of almost similar 3% increase in gain from 2% to 5%. More formally, if investors valuate deposits by their expected utility, where the utility function U complies with loss aversion and, in addition, exhibits diminishing sensitivity to gains (gain-domain concavity or risk aversion), then $-U(-3\%) > U(3\%) > U(5\%) - U(2\%)$, which implies that $0.5 * U(2\%) > 0.5 * U(5\%) + 0.5 * U(-3\%)$, so the GAIN-ONLY deposit should indeed appear more attractive. Web supplement B moreover shows that with one more standard assumption (pessimistic weighting of 0.5-likelihood win events), GAIN-ONLY is preferred to LOSS-GAIN when event-weighting is taken into account.[6]

We test the standard models' predictions by comparing the appeal rankings and the willingness to invest in such paired LOSS-GAIN and GAIN-ONLY deposits. Since subjects may directly respond to the presence or withdrawal of loss in evaluating paired LOSS-GAIN and GAIN-ONLY deposits, we choose a between-subject design where each participant confronts only one of the two versions. For robustness, we also test a pair of DJIA deposits that are slightly more attractive than the SP500 versions. The GAIN-ONLY DJIA deposit paid 3% or 0%, while the LOSS-GAIN paid 6% or −3%. All together we therefore distributed 4 distinct versions of the questionnaire. The structure of the 4 deposits is summarized in Table 1, together with the sample size for each version.

The need for step 3 of the survey comes from the fact that preference for LOSS-GAIN type of structures over GAIN-ONLY may either follow from receptiveness to loss or from convexity of the gain-domain utility (gain-side risk preference). If the utility of increase in returns from 2% to 5% exceeds the utility of an initial 3% gain, for example, then the LOSS-GAIN version of the SP500 deposits may appear more appealing than the respective GAIN-ONLY, although a loss of 3% looms larger than respective 3% gain.

To control for gain-domain risk preference, we asked participants, at the next screen of the survey, to make binary choice between two gain-only structured deposits. In the SP500 questionnaires, the choice options included a riskier deposit that pays 5% or 0% and a relatively safe deposit that pays 3% or 2% (Appendix A.3). The DJIA questionnaires similarly asked respondents to choose between a [6%,0%] deposit and 3% risk-free return. If the risk-averse subjects show preference for LOSS-GAIN over GAIN-ONLY, the observed preference more clearly points at violation of loss aversion (at the 3% return level) as the convexity explanation is ruled out.

We chose not to incentivize the investment tasks of steps 2 and 3, since incentivization of these tasks could push manipulative subjects into providing false pessimistic predictions in step 1 (to increase the chances of obtaining the positive return in the two other tasks). The concern seems practically irrelevant when the investment tasks are non-incentivized. For additional precaution we have announced that page-turning is strictly forbidden and disobeying participants would be disqualified.[7]

The symbols FORECAST, INVESTMENT and APPEAL are henceforth used to represent the index predictions, the 0–250 K investments, and 1–10 appeal rankings. RISK AVERSION is an indicator for preferring the low risk deposit to the high risk deposit in the binary choice, and the variable FAMILIARITY denotes the proclaimed acquaintance with the local capital market in 1–10 discrete scale.

4. Method and sample

A major drawback of running incentivized Web-survey experiments is that inattentive (Savage and Waldman, 2008) or fraudulent (Teitcher et al., 2015) participation may damage the data. To decrease the hazards, we keep the questionnaire concise (only 6 pages including the brief welcome and thank you screens) and use the email lists of the four authors for distributing personal invitations. Faculty and research students were avoided, to decrease the risk that familiarity with Prospect theory and loss aversion would affect the results. Our convenience sample (Ferber, 1977) thus consists of coworkers and acquaintances of the authors, as well as students, alumni, and participants in preceding financial decision experiments. Each author distributed the 4 versions sequentially to randomly assign the participants to the 4 conditions, and precautions were employed to keep the sample dispersed (e.g., only one member of each nuclear family was approached). The final list of respondents was reexamined at the end of data collection to verify that at least one author identifies each participant.[8]

Another problematic feature of using Web surveys to collect framed field financial decisions, follows from the disperse data collection. If relevant economic indicators such as the prevailing stock market sentiment change along the survey period, these changes may generate trends that must be controlled in the analysis (Sonsino and Shavit, 2014). To avoid such complications, we collected the data in only 15 days, between September 3 and 18, 2016. We received 236 completed forms, but 19 were disqualified for missing or invalid responses.[9] The final sample thus consists of 217 legible questionnaires. Regressions of the main responses on submission DATE variables (controlling for version, where applicable) did not reveal significant trends.

The sample appears quite diverse, with 32% females and mean age about 37. The youngest participant is 23 years old and the oldest is 71. Most participants are highly educated: 39% hold a BA in economics or management; 24% hold a B.Sc. in engineering or computer sciences (with 1 physics major); 16.5% report no academic degree. About 43% of the participants held or were pursuing a second degree at the participation time; 36% held or currently pursued an MBA. The proclaimed FAMILIARITY with the local capital market averaged at 5.2, with 47% claiming FAMILIARITY > 5.

[6] If the 0.5 win-event is overweighted then the LOSS-GAIN deposit that pays 5% in the favorable state may be preferred to the GAIN-ONLY that pays only 2% in the respective state. Pessimistic weighting of 0.5-likelihood events was observed in most empirical studies; cf., Wakker (2010); Abdellaoui et al. (2011).

[7] It is currently impossible to block the page-back option in Google Forms, but it is possible to assign time stamps to each question or possibly use other auxiliary programming solutions to obtain a participation log. We did not implement these extras in practice. The forecasts that participants submitted were close to the annualized 2016 returns based on the January-August return presented on screen (mean SP500 forecast 8.5% compared to 11.4% annualized return; 9.2% vs. 9.1% for DJIA). In the analysis we show that the results are robust to removal of the subjects with most pessimistic index predictions.

[8] 211 of the 217 participants were successfully identified. The responses of the 6 unidentified were generally plausible and their APPEALs and INVESTMENTs did not differ significantly from others. We guess they received the link from participants in the main distribution lists.

[9] We used the "mandatory field" option of Google Forms to prohibit the submission of forms with missing data, but still received 16 forms with blank ids, FORECAST or INVESTMENT, pointing at some software problem. 3 forms were removed for extreme index forecasts, exceeding 50%, but the results are robust.

Table 2
Results*.

	Full samples			Paired-by-forecast samples		
	GAIN-ONLY	LOSS-GAIN	Pitman-test	GAIN-ONLY	LOSS-GAIN	Wilcoxon-test
SP500	**N = 53**	**N = 66**		**N = 48**	**N = 48**	
FORECAST	9.2%	8%	$p = 0.42$	9%	9%	$p = 0.17$
	10%	8%		10%	10%	
	(6.3%)	(9.2%)		(5.3%)	(5.1%)	
APPEAL	3.8	5.0	$p < 0.01$	3.7	5.0	$p < 0.01$
	3.0	5.0		3.0	5.0	
	(2.1)	(2.0)		(2.1)	(2.2)	
INVESTMENT	83	96	$p = 0.32$	83	91	$p = 0.50$
	60	100		55	100	
	(74)	(70)		(76)	(69)	
DJIA	**N = 48**	**N = 50**		**N = 43**	**N = 43**	
FORECAST	9.6%	8.8%	$p = 0.62$	8%	8.3%	$p = 0.26$
	8%	8%		8%	8%	
	(6.6%)	(9.3%)		(3.5%)	(3.9%)	
APPEAL	4.3	5.3	$p = 0.02$	4.3	5.3	$p < 0.03$
	4.5	6.0		5.0	6.0	
	(2.2)	(2.1)		(2.2)	(2.1)	
INVESTMENT	93	92	$p = 0.94$	95	94	$p = 0.95$
	100	100		100	100	
	(68)	(63)		(70)	(64)	

* The table presents the mean (upmost), median (intermediate), and standard deviation (smaller brackets at the bottom) of the FORECAST, APPEAL, and INVESTMENT in each condition. The left panel shows the result for the full samples, using the Pitman between-sample test to compare the results for LOSS-GAIN and GAIN-ONLY. The right panel presents the results for the paired-by-forecast samples, using the Wilcoxon signed-rank test to compare the paired observations.

About 24% of the participants held a financial industry job (including bank employees, CPAs, money managers, economists, investment consultants and insurance agents), but only 7% (N = 16) classified as professional traders, brokers or investment consultants. Web supplement C compares the 4 samples in terms of sociodemographics. Kruskal–Wallis tests could not reject equality across the 4 groups.

5. Results

Table 2 compares the responses to the GAIN-ONLY and LOSS-GAIN questionnaires. The upper panel deals with the SP500 deposits, while the lower panel addresses the DJIA conditions. The left panel shows the results for the full samples. The right panel deals with the restricted paired-by-forecast samples as explained below. The aparametric Pitman test is used for between-sample comparisons (left panel), while the Wilcoxon signed-rank test is utilized for the paired comparisons (right panel). The shading highlights cases where the differences are statistically significant at $p < 0.05$.

The FORECAST rows of the left panel first verify that the index forecasts that were elicited at the first step were similar for GAIN-ONLY and LOSS-GAIN. Indeed, Pitman tests could not reject equality of the SP500 predictions ($p = 0.42$) and the DJIA forecasts ($p = 0.62$). The LOSS-GAIN forecasts appear more volatile than the GAIN-ONLY forecasts in both conditions, but again statistical tests could not reject equality (Leven's test for the equality of independent variances; $p = 0.36$ for SP500 and $p = 0.35$ for DJIA), and closer look revealed that the differences in standard deviations diminish when few extreme observations are removed.

To control the index forecasts more tightly (in the APPEAL and INVESTMENT comparisons), we constructed paired-by-forecast samples that consist of paired LOSS-GAIN and GAIN-ONLY questionnaires with close index forecasts. We chose to select 48 pairs of SP500 questionnaires and 43 pairs of DJIA questionnaires for the matched comparisons (sample sizes that are N = 5 smaller than GAIN-ONLY samples), and used linear programming to identify the 48 (43) pairs that minimize the average distance between paired forecasts.[10] The right panel of Table 2 shows that the (insignificant) differences between the forecasts of GAIN-ONLY and LOSS-GAIN subjects completely diminish in the paired comparisons.

The APPEAL rows of the table however clearly show that the LOSS-GAIN deposits were perceived as more appealing than the respective GAIN-ONLY. The median APPEAL of the SP500 GAIN-ONLY deposit was 3 compared to median 5 for the respective LOSS-GAIN deposit ($p < 0.01$ by Pitman test). The median APPEALs of the two DJIA deposits were 4.5 and 6 respectively ($p = 0.02$). The equality of APPEALs is similarly rejected in the matched comparisons ($p < 0.01$ for SP500; $p = 0.026$ for DJIA). Recall that formal choice models, with loss aversion and gain-domain risk-aversion, predict clear preference for GAIN-ONLY over LOSS-GAIN. Our results for APPEAL therefore strongly contradict the standard models, suggesting that investors may perceive LOSS-GAIN designs as relatively more attractive in simple structured investment context.

The INVESTMENT rows of the table, however, show that the differences diminished when the respondents decided on the amount they choose to invest in the respective deposits. The willingness to invest in the GAIN-ONLY SP500 deposit is still considerably smaller than the willingness to invest in the respective LOSS-GAIN (median investments: 60 compared to 100), but the variation in individual investments is large (standard deviations: 74 and 70), and statistical tests could not reject the hypothesis that the willingness to invest in the LOSS-GAIN and GAIN-ONLY versions is similar ($p = 0.32$ by Pitman). Moreover, the median investments in the GAIN-ONLY and LOSS-GAIN versions of the DJIA deposits were identical: 100 K, and the difference in means was negligible (see table; $p = 0.94$). Again, the same patterns reflect in comparisons of the full samples and the paired-by-forecast subsamples.

[10] We use the absolute difference $|FORECAST_i - FORECAST_j|$ to measure the DISTANCE between the forecasts of subjects i and j. The linear programming is used to find the 48 (43) disjoint pairs with minimal mean DISTANCE. In the case of SP500 for example, with N=66 subjects in LOSS-GAIN and N = 53 subjects in GAIN-ONLY, the problem selects 48 of the 66·53=3498 slots in the FORECAST distance matrix, so that each row and column can be selected only once and the mean DISTANCE between the 48 paired forecasts is minimal. Web supplement D provides more details.

Closer examination revealed that the smaller differences in willingness to invest, compared to the respective differences in appeal rankings, mostly follow from a discrepancy between the high ranking of the LOSS-GAIN deposits relatively to smaller willingness to invest in these deposits. When the APPEAL and INVESTMENT variables are normalized to 0-100 scales, using the suffix $_N$ for the normalized variables, the median difference ($APPEAL_N$ - $INVESTMENT_N$) is 10.1 for the SP500 LOSS-GAIN, and even larger 11.8 for the DJIA LOSS-GAIN deposit. Equality to 0 is easily rejected in various one-sample tests ($p < 0.03$ and $p < 0.01$ by Wilcoxon signed-rank tests). The differences are still positive but much smaller and statistically insignificant for the two GAIN-ONLY deposits (medians 2.2 $p = 0.77$ for SP500 and 3.3 $p = 0.68$ for DJIA). The survey participants therefore appear relatively enthusiastic when ranking the LOSS-GAIN designs in terms of general appeal to well-off investors, but show significantly smaller appetite when asked about the possibility of personal investment. The discrepancy diminishes for GAIN-ONLY.

Intuitively, the inconsistent results for APPEAL and INVESTMENT connect to the literature on risk-taking for oneself and others. Some papers (e.g., Pollmann et al., 2014; Chakravarty et al., 2011) find that subjects take more risk in decisions for others compared to personal decisions. Andersson et al. (2014) suggest that the difference mostly follows from decreased loss aversion in decision for others.[11] The current survey participants similarly appear enthusiastic when judging the appeal of LOSS-GAIN deposits for hypothetical well-off investors, but their interest decreases, and the gap between LOSS-GAIN and GAIN-ONLY becomes insignificant, when the task deals with personal investment.

The higher ranking of the LOSS-GAIN deposits with inability to reject the equality of investments shows for males and females, and appears robust to educational background, occupation, and proclaimed familiarity with the local market. When the subjects with BA in economics or an MBA are removed, the APPEAL rankings of the GAIN-LOSS deposits still significantly exceed the rankings of the GAIN-ONLY deposits (means 4 vs. 5.2 for S&P 500; 4.3 vs. 5.5 for DJIA; $p \leq 0.04$ in both comparisons), while the equality of INVESTMENTs cannot be rejected (100 vs. 95; $p = 0.8$; 99 vs. 101; $p = 0.9$). Web supplement E provides more details, also showing that the same patterns emerge when the subjects with most pessimistic or optimistic predictions are ignored.[12]

The results are clearly inconsistent with the predictions of standard choice models that take loss aversion into account. When Tversky and Kahneman's (1992) estimated Cumulative Prospect Theory parameters are used to calculate the expected value of each deposit, the value of the LOSS-GAIN versions is negative, while the value of the GAIN-ONLY deposits exceeds the value of risk-free investment at the interest rates prevailing at the time of the experiment (see Web supplement F.1 for detailed calculations). Similar results emerge using the more recent CPT under uncertainty parameters of Abdellaoui et al. (2016).[13] Moreover, when the 4 optimal allocation problems of a Tversky and Kahneman (1992) decision-maker or an Abdellaoui et al. (2016) decision-maker that must divide a given budget between the structured deposit and risk-free investment in annual rate of 0.15% (an upper bound on the deposit rates around the experiment) are analyzed, the LOSS-GAIN deposits receive less than 5% of the budget, while the GAIN-ONLY deposits receive 100% at the corner optimum (Web supplement F.2). By common formal benchmarks, the participants should strongly approve the GAIN-ONLY deposits, while almost refraining from the LOSS-GAIN structures. This hypothesis is clearly rejected.

Table 3
Results for risk-averse respondents.

	GAIN–ONLY	LOSS-GAIN	Pitman test
S&P500	**N = 38**	**N = 44**	
Forecast	9.0%	7.5%	$p = 0.43$
	10.0%	7.2%	
	(6.1%)	(10.9%)	
Appeal	3.6	4.9	$p < 0.01$
	3.0	5.0	
	(2.1)	(1.9)	
Investment	79.1	99.2	$p = 0.22$
	66.0	100	
	(73)	(74)	
DJIA	**N = 31**	**N = 30**	
Forecast	8.2%	7.7%	$p = 0.66$
	8.0%	8.0%	
	(4.1%)	(5.5%)	
Appeal	4.3	4.9	$p = 0.30$
	5.0	5.5	
	(2.3)	(2.0)	
Investment	89.8	86.0	$p = 0.82$
	100	100	
	(70)	(66)	

Table 3 finally presents the results for the risk-averse subjects that preferred the safer deposit to the riskier deposit in step 3 of the survey. The upper panel shows that the SP500 LOSS-GAIN is ranked significantly higher and attracts large investments than the GAIN-ONLY even when the comparison is restricted to the N = 82 (69%) risk-averse SP500 participants. The lower panel shows that equality could not be rejected for the N = 61 (62%) risk-averse DJIA participants. The large investments of risk-averse participants in LOSS-GAIN deposits, however, clearly contradicts the formal benchmarks, proposing more closely that loss-aversion mitigates in the valuation of limited capital protection deposits of the type explored in this note.

6. Discussion

We have used the instant Google Form survey platform to illustrate that loss aversion may diminish in retail structured investment context, where losses come up with increased gain opportunities to keep the instrument appealing. Context effects on preferences have been intensely explored in the psychology judgment literature (cf., Payne et al., 1993; Tversky and Simonson, 1993; Rieskamp et al., 2006). Erb et al. (2002) illustrate that context may alter individual risk preference subconsciously, and recent neuroimaging studies (Engelmann and Hein, 2013) find physiological regularities in context dependence. In the early loudness perception experiments of Garner (1954), for example, the level of loudness that subjects assigned to given sounds strongly varied with the spectrum of sound-stimuli that was presented. Based on the indirect evidence in Sonsino et al. (2017) and the results of the current exploratory study, we likewise posit that the disutility brought by a given loss may diminish in a structured investment context where negative returns show with increased positive return opportunities.

[11] The findings of the risk-taking for others literature are generally mixed. Smaller loss aversion in decision for others was also documented in Mengarelli et al. (2014), Trump et al. (2015) and Vieider et al. (2015), but some papers suggest that risk or loss aversion may increase in decisions involving others (e.g., Eriksen and Kevaloy, 2010; Füllbrunn and Luhan, 2015). It seems that the framing of the task may affect results considerably. The APPEAL-INVESTMENT difference also remotely relates to discussions of intention-behavior gaps (Sheeran, 2002; Döbeli and Vanini, 2010).

[12] A referee expressed concern regarding the possibility that our results are driven by experimenter demand. Robustness to the removal of subjects with economics or business education decreases the plausibility of experimenter bias. More importantly, the fact that we find significant differences in the APPEAL rankings but marginal differences in the selected INVESTMENTs, in two disjoint comparisons, make the experimenter demand explanation very unlikely.

[13] The Abdellaoui et al. (2016) CPT elicitation methodology bypasses event weighting. We therefore assume the Tversky and Kahneman (1992) event-weighting functions when applying the Abdellaoui et al. estimates, but the results are robust.

A decrease in loss aversion in retail structured investment decision may have interesting market level implications. Empirical finance studies continually argue that structured products are overpriced relatively to the underlying assets, bringing substantial losses to the investors (cf., Wilkens and Stoimenov, 2007; Henderson and Pearson, 2011; Entrop et al., 2016). Our results propose an explanation to the inefficiency. If loss aversion shows full force in the valuation of stocks (Benartzi and Thaler, 1995; Barberis et al., 2016) but diminishes in more stylized structured investment decision, the discrepancy may explain the consistent gaps in pricing.

The results of the current exploratory study should be taken with caution. Since we have only incentivized the forecasting task, used a convenience sample, and briefly explored 50-50 likelihood events and 3% losses, we cannot vouch that similar results would emerge in more comprehensive experiments. Still, the fact that similar results emerge in two disjoint comparisons (the SP500 and DJIA conditions), showing for subjects with and without an economics degree, and sustaining after removal of the participants with extreme forecasts, suggests that our motivating intuition is valid. Increase in structured gains from 2% to 5% may loom larger than 3% loss, locally contradicting benchmark theories such as CPT. The 3-step methodology of the current experiment would be expanded to characterize investors' response to structured losses more extensively in computerized laboratory experiments.

Appendix A. Script of the SP500 LOSS-GAIN main tasks[14]

A.1. The prediction task

Assignment 1: predicting the S&P500 return in 2017

In this assignment we ask for your median prediction for the S&P500 return in 2017 (recall that S&P500 is the 500 leading US stocks index)

You are requested to provide a median prediction so that you assign equal probability 50%-50% to higher or lower annual return

For your convenience, we enclose historical information regarding the performance of the index in recent years:

In 2013, the S&P500 return was 32.5%
In 2014, the S&P500 return was 13.7%
In 2015, the S&P500 return was 1.4%
In the first 8 months of 2016 the S&P500 climbed by 7.5%

As explained above, we now ask for your median prediction regarding the annual index return in 2017

The 10 participants that would be selected as winners would receive a prize that depends on their prediction error (the distance between the submitted prediction and the actual return). If the prediction error is smaller than 1%, the prize would be 200 NIS. If the prediction error is larger, but still smaller than 2%, the prize would be 190 NIS and so on… 1% increase in the prediction error decreases the prize by 10 NIS. If the prediction error is larger than 20%, no prize would be paid.

Please submit your most accurate prediction!

What is your median prediction for the S&P500 return in 2017? (please submit your prediction in percentile form) _____*

A.2. The valuation assignment

Assignments 2–3: evaluating a structured deposit

For the problems in this page, assume that you have received an investment budget of 250,000 NIS

The budget represents a childhood savings account that has matured, an inheritance, a recently won grant or bonus, or money from other sources

The special budget is not required for current consumption and you intend to invest the funds in the capital market, while you keep accumulating your pension savings with your salary

Assume also that after eliciting your median forecast for the 2017 S&P500 return, your banker offers you a possibility to invest in a deposit with the following return structure:

If the S&P 500 actual return in 2017 would exceed (or be equal to) the median prediction that you submitted, the deposit would pay positive annual return of 5%

If the S&P 500 actual return in 2017 would be smaller than your median prediction, then the deposit would pay negative annual return of −3%

You should now decide how much, out of the special investment budget of 250,000 NIS, you choose to invest in this structured deposit

The amount I choose to invest in a structured deposit that brings a gain of 5% if S&P 500 2017 return exceeds the median prediction, but brings a loss of -3% if the S&P 500 return in 2017 is smaller than the median prediction is: _____ (any amount between 0 and 250,000 is acceptable)*

Now, try estimate the appeal of such a structured deposit (return of +5% or −3% as explained above) to well-off investors.

Mark one of the circles*

Least appealing	1	2	3	4	5	6	7	8	9	10	Most appealing
	○	○	○	○	○	○	○	○	○	○	

A.3. The binary choice task

Assignment 4: choosing between 2 structured deposits

At this ending assignment we ask you to choose between 2 structured deposits A or B for 2017:

Deposit A would pay 5% if the S&P 500 return exceeds your median prediction, but would pay 0% of the S&P 500 return falls below the median prediction (5% or 0%)

Deposit B would pay 3% if the S&P 500 return exceeds the median prediction, but would pay 2% of the S&P 500 return falls below the median prediction (3% or 2%)

Assuming you must choose one of the two deposits, mark the deposit that you would prefer

○ I prefer deposit A (5% or 0%) to deposit B (3% or 2%)
○ I prefer deposit B (3% or 2%) to deposit A (5% or 0%)

[14] The complete script of the experiment is provided in Web supplement G.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.socec.2017.06.004.

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