

Hidden skewness: On the difficulty of multiplicative compounding under random shocks

-Online Appendix-

April 27, 2016

A Details on additional experimental evidence

A.1 Low volatility treatment variations of Study 2

In two further treatments of Study 2 (referring to Footnote 13 in the paper), *Low Volatility Short* (LVS) and *Low Volatility Long* (LVL), with $\mu^{h,LVS} = \mu^{h,LVL} = 1.012$ and $\mu^{l,LVS} = \mu^{l,LVL} = 1.011$, the price motion is approximately deterministic (i.e., the price volatility is very low) and the price has positive growth with certainty. The number of time periods until maturity is analogous to HVS and HVL at $T^{LVS} = 14$ and $T^{LVL} = 140$. An additional treatment *Low Volatility Long NoCalculator* (LVL_NC) is identical to LVL but does not grant the participants access to calculators. The elicitation procedure was analogous to that of the other treatments in Study 2. Table 1 shows the relevant treatment-specific thresholds t_A and Figure 1 to 3 illustrate the results.

	Values of t_A <i>LVS</i>	Values of t_A <i>LVL</i>	Values of t_A <i>LVL_NC</i>
<i>Task 1</i>	104.0	185	185
<i>Task 2</i>	104.5	210	210
<i>Task 3</i>	105.5	240	240
<i>Task 4</i>	107.0	290	290
<i>Task 5</i>	109.0	340	340
<i>Task 6</i>	111.5	400	400
<i>Task 7</i>	114.5	460	460
<i>Task 8</i>	118.0	520	520
<i>Task 9</i>	122.0	625	625
<i>Task 10</i>	126.5	850	850

Table 1: The thresholds t_A by treatment condition.

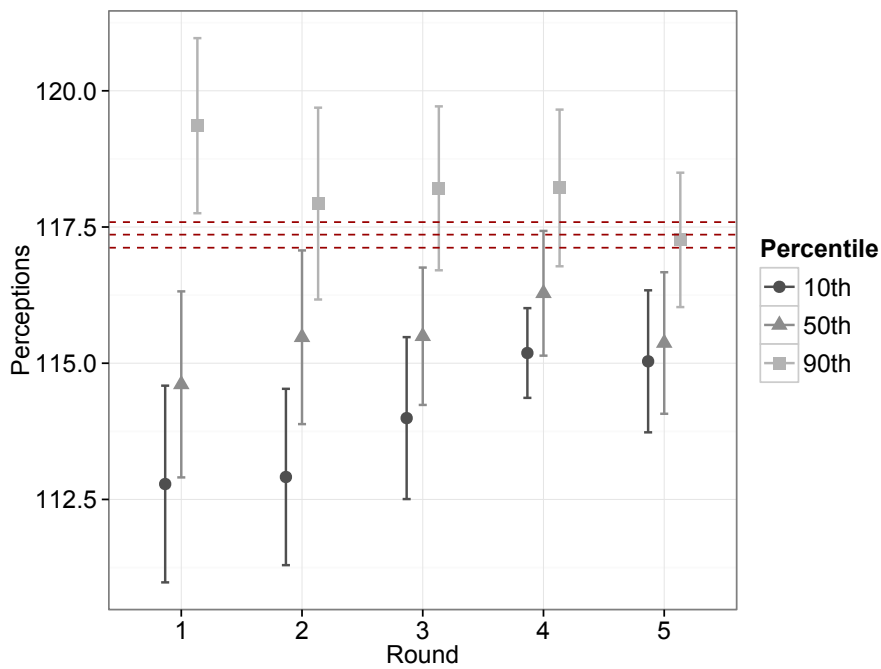


Figure 1: Point estimates of the participants' subjective quantiles of Security A's selling price distribution in LVS enclosed by 95% confidence intervals. For each of the five rounds, separate estimates refer to the subjective 10th percentiles (circle), subjective medians (triangle), and subjective 90th percentiles (square). Dashed lines indicate rational benchmarks for the 10th percentile (lowest), median (middle) and 90th percentile (uppermost).

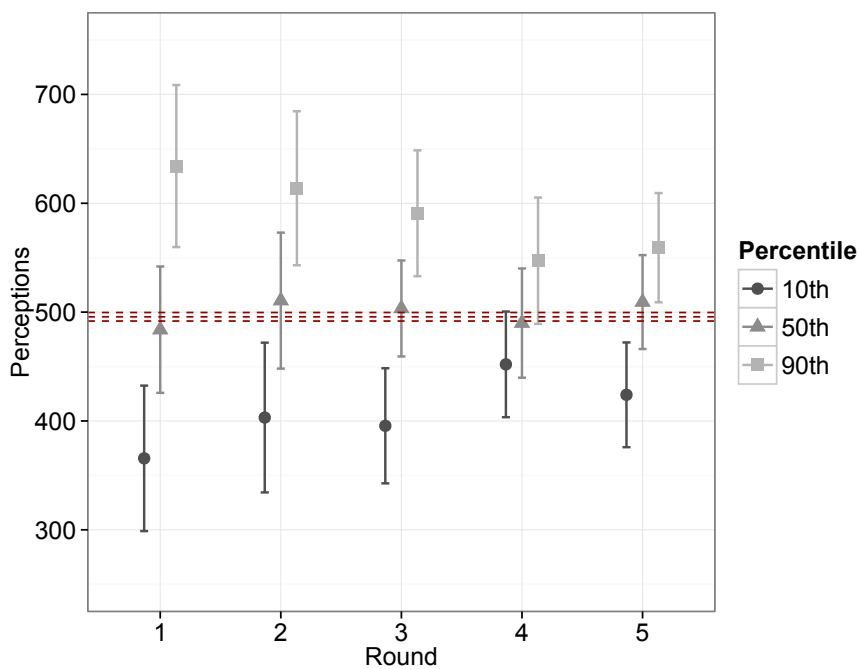


Figure 2: Point estimates of the participants' subjective quantiles of Security A's selling price distribution in LVL enclosed by 95% confidence intervals. For each of the five rounds, separate estimates refer to the subjective 10th percentiles (circle), subjective medians (triangle), and subjective 90th percentiles (square). Dashed lines indicate rational benchmarks for the 10th percentile (lowest), median (middle) and 90th percentile (uppermost).

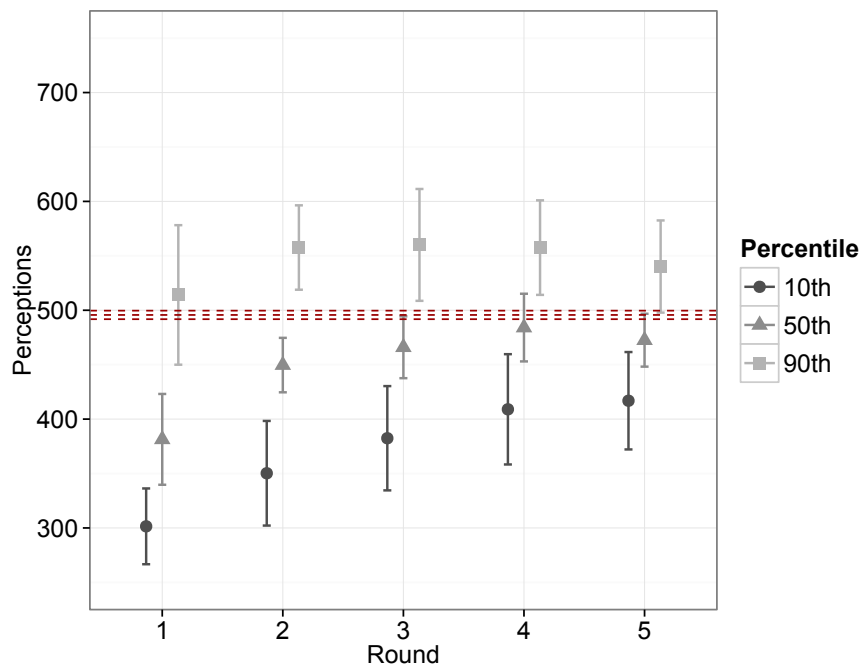


Figure 3: Point estimates of the participants' subjective quantiles of Security A's selling price distribution in LVL_NC enclosed by 95% confidence intervals. For each of the five rounds, separate estimates refer to the subjective 10th percentiles (circle), subjective medians (triangle), and subjective 90th percentiles (square). Dashed lines indicate rational benchmarks for the 10th percentile (lowest), median (middle) and 90th percentile (uppermost).

B Tables

B.1 Interval regressions

	10th Percentile		50th Percentile		90th Percentile	
	Mean	Std.Err.	Mean	Std.Err.	Mean	Std.Err.
<i>Rational Model</i>	39.69		88.64		197.98	
<i>EGB Model</i>	35.90		116.10		196.30	
<i>Round 1</i>	83.56	(11.8)	116.56	(12.7)	221.40	(13.5)
<i>Round 2</i>	70.63	(11.8)	108.84	(11.7)	206.84	(11.4)
<i>Round 3</i>	68.74	(11.7)	108.97	(9.5)	191.24	(11.2)
<i>Round 4</i>	62.72	(6.7)	122.41	(9.8)	183.57	(9.2)
<i>Round 5</i>	54.55	(6.3)	120.79	(11.2)	181.92	(11.9)

Table 2: Interval regression estimates for the mean perceptions of the three elicited percentiles in HVS complemented by EGB and rational predictions at the top of each column.

	10th Percentile		50th Percentile		90th Percentile	
	Mean	Std.Err.	Mean	Std.Err.	Mean	Std.Err.
<i>Rational Model</i>	1.20		29.96		745.58	
<i>EGB Model</i>	0.00		261.00		581.80	
<i>Round 1</i>	82.27	(19.2)	229.80	(27.3)	597.49	(53.2)
<i>Round 2</i>	100.65	(28.9)	202.24	(38.9)	442.75	(50.8)
<i>Round 3</i>	53.68	(9.3)	150.07	(18.2)	373.06	(37.4)
<i>Round 4</i>	79.75	(22.9)	175.52	(24.4)	385.44	(40.9)
<i>Round 5</i>	68.90	(23.4)	165.97	(24.8)	420.60	(59.9)

Table 3: Interval regression estimates for the mean perceptions of the three elicited percentiles in HVL complemented by EGB and rational predictions at the top of each column.

	10th Percentile		50th Percentile		90th Percentile	
	Mean	Std.Err.	Mean	Std.Err.	Mean	Std.Err.
<i>Rational Model</i>	117.12		117.36		117.59	
<i>EGB Model</i>	115.90		116.10		116.30	
<i>Round 1</i>	112.78	(0.92)	114.61	(0.87)	119.36	(0.82)
<i>Round 2</i>	112.91	(0.83)	115.47	(0.81)	117.93	(0.90)
<i>Round 3</i>	113.99	(0.76)	115.49	(0.64)	118.21	(0.77)
<i>Round 4</i>	115.18	(0.42)	116.28	(0.58)	118.21	(0.73)
<i>Round 5</i>	115.03	(0.67)	115.37	(0.66)	117.26	(0.63)

Table 4: Interval regression estimates for the mean perceptions of the three elicited percentiles in LVS complemented by EGB and rational predictions at the top of each column.

	10th Percentile		50th Percentile		90th Percentile	
	Mean	Std.Err.	Mean	Std.Err.	Mean	Std.Err.
<i>Rational Model</i>	491.79		495.69		499.63	
<i>EGB Model</i>	260.20		261.00		261.80	
<i>Round 1</i>	365.65	(34.9)	483.87	(29.6)	634.18	(37.9)
<i>Round 2</i>	403.14	(35.1)	510.56	(31.8)	613.80	(36.1)
<i>Round 3</i>	395.55	(26.9)	503.36	(22.4)	590.81	(29.4)
<i>Round 4</i>	451.99	(24.7)	489.91	(25.6)	547.23	(29.5)
<i>Round 5</i>	424.01	(24.5)	509.23	(22.0)	559.20	(25.6)

Table 5: Interval regression estimates for the mean perceptions of the three elicited percentiles in LVL complemented by EGB and rational predictions at the top of each column.

	10th Percentile		50th Percentile		90th Percentile	
	Mean	Std.Err.	Mean	Std.Err.	Mean	Std.Err.
<i>Rational Model</i>	491.79		495.69		499.63	
<i>EGB Model</i>	260.20		261.00		261.80	
<i>Round 1</i>	301.48	(17.8)	381.39	(21.28)	514.08	(32.7)
<i>Round 2</i>	350.25	(24.5)	449.63	(12.76)	557.62	(19.7)
<i>Round 3</i>	382.42	(24.4)	466.01	(14.51)	560.03	(26.2)
<i>Round 4</i>	408.99	(25.8)	484.08	(15.86)	557.55	(22.1)
<i>Round 5</i>	416.87	(22.8)	472.47	(12.39)	540.17	(21.6)

Table 6: Interval regression estimates for the mean perceptions of the three elicited percentiles in LVL_NC complemented by EGB and rational predictions at the top of each column.

	10th Percentile		50th Percentile		90th Percentile	
	Sim.Value	Bootstr.Conf.Inter.	Sim.Value	Bootstr.Conf.Inter.	Sim.Value	Bootstr.Conf.Inter.
<i>Rational Model</i>	98.80	[94.95 ; 101.25]	152.98	[146.18 ; 162.40]	310.98	[292.75 ; 322.40]
<i>EGB Model</i>	109.36	[104.21 ; 113.83]	162.72	[156.63 ; 169.16]	227.10	[221.59 ; 230.66]
	Mean	Std.Err.	Mean	Std.Err.	Mean	Std.Err.
<i>Round 1</i>	168.02	(24.2)	316.25	(30.8)	722.22	(95.5)
<i>Round 2</i>	159.65	(17.2)	265.84	(27.7)	513.36	(64.8)
<i>Round 3</i>	151.62	(14.4)	246.15	(21.5)	468.22	(58.2)
<i>Round 4</i>	160.56	(13.5)	315.93	(50.9)	551.12	(75.1)
<i>Round 5</i>	155.61	(14.5)	233.18	(21.7)	477.73	(63.9)

Table 7: Interval regression estimates for the mean perceptions of the three elicited percentiles in ETF_1 complemented by EGB and rational predictions at the top of each column.

	10th Percentile		50th Percentile		90th Percentile	
	Sim.Value	Bootstr.Conf.Inter.	Sim.Value	Bootstr.Conf.Inter.	Sim.Value	Bootstr.Conf.Inter.
<i>Rational Model</i>	32.39	[29.24 ; 36.31]	152.14	[123.17 ; 178.88]	1,359.42	[1,163.44 ; 1,555.64]
<i>EGB Model</i>	128.09	[112.64 ; 141.51]	288.17	[269.91 ; 307.49]	481.30	[464.79 ; 491.98]
	Mean	Std.Err.	Mean	Std.Err.	Mean	Std.Err.
<i>Round 1</i>	134.87	(21.3)	297.83	(55.7)	582.54	(82.7)
<i>Round 2</i>	156.07	(27.8)	302.48	(43.3)	681.32	(93.8)
<i>Round 3</i>	172.03	(22.7)	295.44	(34.4)	605.39	(86.4)
<i>Round 4</i>	155.59	(29.6)	268.41	(35.3)	636.71	(87.7)
<i>Round 5</i>	145.72	(29.7)	248.39	(41.5)	624.07	(93.6)

Table 8: Interval regression estimates for the mean perceptions of the three elicited percentiles in ETF_3 complemented by EGB and rational predictions at the top of each column.

C Copies of experimental instructions

Welcome!

You are about to participate in an experiment in decision making.

In this experiment we will first ask you to read instructions that explain the decision scenarios you will be faced with. We will also ask you to answer questions that test your understanding of what you read. Finally, you will be asked to make decisions that will allow you to earn money. Your monetary earnings will be determined by your decisions and by chance. All that you earn is yours to keep and will be paid to you in private, in cash, after today's session.

Only for coming here and completing the experiment, you will also receive a fixed participation fee of EUR 5.00. The earnings that you make during the experiment will be added to this amount.

It is important to us that you remain silent and do not look at other people's work. If you have any questions or need assistance of any kind, please raise your hand, and an experimenter will come to you. If you talk, exclaim out loud, etc., you will be asked to leave and will forfeit your earnings. Thank you. Please switch your mobile phones and all other electronic devices and leave them switched off until the end of the experiment

Please read the instructions that we will now hand out to you.

Procedure and payment structure

You will be asked to make a decision. You have the opportunity to earn a bonus of Euro 20.00. In what follows, the term “bonus” will always refer to this Euro 20.00. If you earn the bonus it will be paid to you in cash after the experiment in addition to the Euro 5.00 that you are paid for your participation. If you do not earn the bonus you will only be paid the Euro 5.00

The decision is described on the following pages.

Investment Task

Setting

You are a manager and have to make a decision between five possible investments, which we label "Investment 1", "Investment 2", "Investment 3", "Investment 4" and "Investment 5". The gains or losses of the 5 possible investments depend on the performance of a certain financial product that we call "Security A". It is of particular importance how the price of Security A moves within 12 months. Let us therefore describe how the price of Security A moves.

Security A:

You can buy the security at a price of Euro 10,000 . During each month, the security's price either increases by 70% or decreases by 60%. The two possible price changes in each month occur with equal probabilities ("fifty-fifty"). The direction of price change (increase/decrease) is not influenced by the direction of price changes in previous months.

Thus, at the end of month 1, the price is either 70% higher or 60% lower than at the beginning of month 1. That is, the price is either Euro 17,000 or Euro 4,000. At the end of month 2, the price is either 70% higher or 60% lower than at the end of month 1. At the end of month 3, the price is either 70% higher or 60% lower than at the end of month 2. And so on, until you sell the security at its price at the end of month 12.

The following table lists which of the possible investments yields a gain, depending on the prices of Security A after 12 months. The possible final prices, i.e., the prices after 12 months of Security A, are summarized at the top of table 5. The rows underneath show for every possible investment whether it yields a gain or a loss depending on the region in which the final price of Security A is located. A gain is marked by a +, a loss by a -.

Please take a moment to look at the table. You will find that e.g. Investment 1 will make a gain if the selling price is below Euro 6,400. Investment 2 will make a gain if the selling price is between 6,400 and 12,800. And so on for the other possible Investments.

Price range of Security A after 12 months	Less than Euro 6,400	Between Euro 6,400 and Euro 12800 Euro	Between Euro 12800 and Euro 19200	Between Euro 19,200 and Euro 25,600	At least Euro 25,600 Euro
Investment 1	+	-	-	-	-
Investment 2	-	+	-	-	-
Investment 3	-	-	+	-	-
Investment 4	-	-	-	+	-
Investment 5	-	-	-	-	+

Your payment in this experiment depends on the movement of the price of Security A and on the possible investment for which you opt as follows: You choose exactly one of the 5

possible investments. You receive the bonus if the investment that you chose makes a gain. If it makes a loss you do not get the bonus.

After you have made your decision the computer will simulate a selling price for you. The simulation follows the random process for Security A that was described on the previous page, that is, the computer will simulate a random process over 12 months. Depending on the outcome of this simulation we will determine whether your investment has made a gain or a loss. We will simulate a price path independently for every participant. Depending on the simulation that we conduct for you and conditional on your decision between the 5 possible investments you will receive the bonus or not.

Examples

The following examples outline the link between gain and bonus, based on the table that was already shown above.

Price range of security A after 12 months	Less than Euro 6,400	Between Euro 6,400 and 12,800	Between Euro 12,800 and Euro 19,200	Between Euro 19,200 and Euro 25,600	At least Euro 25,600
Investment 1	+	-	-	-	-
Investment 2	-	+	-	-	-
Investment 3	-	-	+	-	-
Investment 4	-	-	-	+	-
Investment 5	-	-	-	-	+

The examples are to illustrate the context and do not allow any conclusions about the actual outcome of the experiment.

Example 1

Suppose that you choose investment 5. If the price of Security A after 12 months is at or above Euro 25,600 you receive the bonus. Should the price of Security A be strictly less than Euro 25,600 after 12 months you do not receive the bonus.

Example 2

Suppose that you choose investment 3. Should the selling price of Security A be at or above Euro 12,800 but strictly less than Euro 19,200 after 12 months you receive the bonus. Should the price of Security A exceed Euro 19,200 or be strictly less than Euro 12,800 after 12 months you do not receive the bonus.

Example 3

Suppose you choose investment 1. Should the price of Security A be strictly less than Euro 6,400 after 12 months you receive the bonus. Should the price of Security A be at or above Euro 6,400 after 12 months you do not receive the bonus.

Do you have any questions? If so please raise your hand and an experimenter will come to your desk.

We will now proceed with a short understanding test. You may only proceed with the experiment if you correctly answer all questions.

Please make sure to write the lab code number that you just received on the understanding test.

Code number: _____

Understanding test

Please record your code number on this sheet

Please answer questions (1) and (2). Please raise your hand in case you need assistance.

Questions:

(1) Suppose you chose investment 2. Suppose further that the selling price of Security A after 12 months was Euro 17,000. Will you receive the bonus?

(2) Suppose that you chose investment 4. Suppose further that the selling price of Security A after 12 months is between Euro 6,400 and 12,800. Will you receive the bonus?

Please wait for further instructions once you have completed the test.

Please make sure that your code number is recorded on this sheet.

Instructions for Study 1(a)

Welcome !

You are about to participate in an experiment in decision making. The experiment is financed by different institutions, such as universities and research agencies.

We will first ask you to read the instructions for the experiment which explain the decision settings you will be faced with. We will also ask you to answer some questions that test your understanding of what you read. Finally, you will be asked to make decisions that will allow you to earn money. Your monetary earnings will be determined by your decisions and by chance. All that you earn is yours to keep and will be paid to you individually, in cash, after today's session.

Only for coming here and completing the experiment, you will receive a fixed participation fee of 5 Euro. The earnings that you make during the experiment will be added to this amount.

It is important to us that you remain silent and do not look at other people's work. If you have any questions or need assistance of any kind, please raise your hand, and an experimenter will come to you. If you talk, exclaim out loud, etc., you will be asked to leave and will forfeit your earnings.

Thank you.

A further notice: please switch off your mobile phones and all other electronic devices and leave them off during the whole experiment.

Please read the instructions that we will now hand out to you.

Procedure and payment structure

You will be asked to make two investment decisions. Depending on the two decisions, you will receive a bonus amounting to 20 Euro or not. In particular the computer will present one of two investment settings. The two possible investment settings occur with equal probabilities (“fifty-fifty”).

We will simulate a price path independently for every participant. You receive the bonus if the decision that you took in the investment setting simulated by the computer is successful. In the other case you won't receive the bonus. A successful decision means that the price forecast is accurate. This is described in details on the following pages.

Independently from the simulated investment setting and from your decision, you receive 5 Euro for your participation.

At the end of the experiment you either receive 5 Euro only for your participation (no bonus) or 25 Euro (5 Euro for participation + bonus).

The two investment settings are described on the following pages.

Investment setting 1

Starting point

You are a manager and have to forecast the trend of a security. In particular, you have to forecast the price of the security at one given date. You receive the bonus amounting to 20 Euro if the price you forecast is accurate and the computer simulates investment setting 1. On the following pages we describe the security and the payment structure.

The security:

You can buy the security at a price of 100 Euro. During each year, the security's price either increases by 70% or decreases by 60%. The two possible price changes in each year occur with equal probabilities ("fifty-fifty"). The changes within any given year (+70%/-60%) are not influenced by the price change direction in previous years.

Thus, at the end of the first year, the price is either 70% higher or 60% lower than at the beginning. That is, the price is either 170 Euro or 40 Euro. At the end of the second year, the price is either 70% higher or 60% lower than at the end of the first year. At the end of year 3, the price is either 70% higher or 60% lower than at the end of year 2. And so on...

The due date for your forecast is at the end of year 12. Your task is to forecast how the price of the security develops in the course of 12 years.

The decision: price forecasting

In the experiment you have to determine a price for the security on a given due date, that is after 12 years.

The computer will simulate 100 times the price evolution for the first 12 years. The simulations, which are independent from each other and according to the rules set in the paragraph "security", will forecast 100 times the price of the security on the due date. We will simulate price paths independently for every participant.

If at least one of the 100 simulated prices is the same as the price you forecast, you receive the bonus. The price is a round figure. That is, the price simulated by the computer will be considered equal to yours if the difference between the two values is not greater than 1 Euro.

Do you have any questions? If so, please raise your hand and an experimenter will come to your desk.

We will now proceed with a short understanding test. You may only proceed with the experiment if you answer correctly all questions. Please notice that the mentioned price in the understanding test does not refer to the actual price trend of the security. The numbers are randomly chosen and only serve as illustration of the experiment rules.

Please make sure to write the lab code number that you just received on the understanding test.

Codenummer: _____

UnderstandingTest

Please record your code number on this sheet.

Please answer questions (1) and (2). Please raise your hand in case you need assistance.

Questions:

- (1) Suppose the computer simulates investment setting 1, whose instructions you have just read. Let's assume you forecast a price of 35 Euros and that the next price simulated by the computer is 34,61 Euro. Will you receive the bonus?

Yes/No ?

Please explain your answer _____

- (2) Suppose the computer simulates investment setting 1. Let's assume you forecast a price of 84 Euros and that the next price simulated by the computer is 77,81Euro. What is the payment at the end of the experiment, including the bonus (in Euro)?

As mentioned before, the numbers in these questions have been randomly chosen and only serve to test your understanding of the experiment rules.

Please wait for further instructions once you have completed the test.

Please make sure that your code number is recorded on this sheet.

Investment setting 2

Investment setting 2 is the same as investment setting 1, with the only difference that the price trend of the security varies between +7.5% and +2.5% instead +70% and -60%.

There are no further differences to investment setting 1. For the sake of completeness we describe the starting point and the security again.

Starting point

You are a manager and you have to forecast the trend of a security. In particular, you have to forecast the price of the security at one given date. You receive the bonus amounting to 20 Euro if the price you forecast is accurate and the computer simulates investment setting 2.

On the following pages we describe the security and the payment structure.

The security:

You can buy the security at a price of Euro 100 Euro. During each year, the security's price either increases by +7.5% or by +2.5%. The two possible price changes in each year occur with equal probabilities ("fifty-fifty"). The changes in any given year (+7.5%/+2.5%) are not influenced by the price increase in previous years.

Thus, at the end of year 1, the price is either 7.5% higher or 2.5% higher than at the beginning. That is, the price is either Euro 107.5 Euro or 102.5 Euro. At the end of year 2, the price is either 7.5% higher or 2.5% higher than at the end of year 1. At the end of year 3, the price is either 7.5% higher or 2.5% higher than at the end of year 2. And so on...

The due date for your forecast is at the end of year 12. Your task is to forecast how the price of the security develops in the course of 12 years.

The decision: price forecasting

In the experiment you have to forecast a price for the security on a given due date, that is after 12 years.

The computer will simulate 100 times the price evolution for the first 12 years. The simulations, which are independent from each other and according to the rules set in the paragraph "security", will forecast 100 times the price of the security on the due date.

We will simulate price paths independently for every participant.

If at least one of the simulated prices is the same as the price you forecast, you receive the bonus. The price is a round figure. That is, the price simulated by the computer will be considered equal to yours if the difference between the two values is not greater than 1 Euro.

Instructions for Study 1(b)

Appendix (not intended for publication): Instructions

Welcome!

You are about to participate in an experiment in decision making. Universities and research agencies have provided the funds for this experiment.

In this experiment we will first ask you to read instructions that explain the decision scenarios you will be faced with. We will also ask you to answer questions that test your understanding of what you read. Finally, you will be asked to make decisions that will allow you to earn money. Your monetary earnings will be determined by your decisions and by chance. All that you earn is yours to keep and will be paid to you in private, in cash, after today's session.

Only for coming here and completing the experiment, you will also receive a fixed participation fee of EUR 5.00. The earnings that you make during the experiment will be added to this amount.

It is important to us that you remain silent and do not look at other people's work. If you have any questions or need assistance of any kind, please raise your hand, and an experimenter will come to you. If you talk, exclaim out loud, etc., you will be asked to leave and will forfeit your earnings. Thank you.

[page break]

Procedure and payment structure

You are asked to make a sequence of decisions. There are five rounds in this experiment. In each round, you have the opportunity to earn a bonus of EUR 5.00. In what follows, the term “bonus” will always refer to these EUR 5.00. All bonuses that you earn in any of the five rounds will be paid to you in cash after the experiment.

Each round consists of a list of ten tasks. One of the ten tasks will be chosen by a random draw made on the computer. This task will be paid out for real. That is, if you were successful in the task that the computer picked, you will earn the bonus of EUR 5.00. If you were unsuccessful in the task that the computer picked, you will not receive a bonus in this round.

The tasks are described on the next pages.

[page break]

INVESTMENT TASK

Setting

You are a manager and have to make a decision between two risky investments, either to buy security A or to buy security B. Either security, if bought, has to be held for 12 months. After the 12 months you sell the security. Depending on your investment success, you have the chance to earn a bonus.

Security A:

You can buy the security at a price of 10,000 Euros. During each month, the security's price either increases by 70% or decreases by 60%. The two possible price changes in each month occur with equal probabilities ("fifty-fifty"). The direction of price change (increase/decrease) is not influenced by the direction of price changes in previous months.

Thus, at the end of month 1, the price is either 70% higher or 60% lower than at the beginning of month 1. That is, the price is either 17,000 Euros or 4,000 Euros. At the end of month 2, the price is either 70% higher or 60% lower than at the end of month 1. At the end of month 3, the price is either 70% higher or 60% lower than at the end of month 2. And so on, until you sell the security at its price at the end of month 12.

Security B:

You can buy the security at a price of 10,000 Euros. During month 1, the price of security B moves identically to the price of security A. After the end of month 1, the price stays constant until the end of month 12.

Thus, at the end of month 1, the price is either 70% higher or 60% lower than at the beginning of month 1, with equal probability. That is, the price is either 17,000 Euros or 4,000 Euros. The price then stays constant until you sell the security at the end of month 12.

The following rule determines your payment: If the selling price of the security that you bought is higher than a certain threshold, you receive the bonus.

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Thresholds

The thresholds differ between security A and security B. Security B's threshold always equals its initial price of 10,000 Euros. Security A's threshold varies between 100 and 250,000 Euros.

For each of the possible thresholds of security A and security B that are presented in the table below, you will be asked to make a decision between A and B. These are the 10 tasks for one round of this experiment.

	Threshold for security A:	Threshold for security B:	Your decision (A or B):
Task 1	100	10,000	
Task 2	500	10,000	
Task 3	2,000	10,000	
Task 4	6,000	10,000	
Task 5	9,000	10,000	
Task 6	12,000	10,000	
Task 7	20,000	10,000	
Task 8	35,000	10,000	
Task 9	90,000	10,000	
Task 10	250,000	10,000	

Example 1

Consider *Task 1*, where the threshold for security A is 100 Euros, and the threshold for security B is 10,000 Euros.

Suppose that you decide to buy *security A*. If the selling price of security A is higher than 100 Euros, you receive the bonus. If the selling price is less than or equal to 100 Euros, you do not receive the bonus.

Now, suppose instead that you decide to buy *security B*. If the selling price of security B is higher than 10,000 Euros, you receive the bonus. If the selling price of security B is less than or equal to 10,000 Euros, you do not receive the bonus.

Example 2

Consider *Task 2*, where the threshold of security A is higher than in the previous example, at 500 Euros, and the threshold for security B is again 10,000 Euros.

First, suppose that you decide to buy *security A*. In this case, if security A's selling price is higher than 500 Euros, you receive the bonus. Otherwise, you do not receive the bonus.

If, instead, you decide to buy *security B*, you receive the bonus if the selling price of security B is higher than 10,000. Otherwise, you do not receive the bonus.

And so on, analogously for *Task 3*, *Task 4*, etc., until *Task 10*.

[page break]

[The following page is for participants in condition *TREATMENT* only.]

How likely does security A's selling price exceed its threshold?

As security A's selling price is determined by 12 price changes, there are 13 possible selling prices for security A altogether: the lowest price results if security A's price decreases in each of the 12 months; the second-to-lowest price results if 11 price changes are decreases and 1 is an increase; and so on.

An important property of security A is that if the price decreases *once* it requires *multiple* price increases to compensate for the decrease. A single price increase by 70% cannot make up for a single decrease by 60%.

For example, consider the price at the end of month 2. If the price change in month 1 is downward, i.e. a decrease from 10,000 Euros to 4,000 Euros, then an increase in month 2 would only yield a price of 6,800 Euros, well below the starting price of 10,000 Euros. Likewise, if the first price change is an increase from 10,000 Euros to 17,000 Euros but the second price change is a decrease, then the price at the end of month 2 would again be only 6,800 Euros (which is 40% of 17,000 Euros). For the price to exceed 10,000 Euros at the end of month 2, the price would therefore have to increase twice in a row – from 10,000 Euros to 17,000 Euros in month 1, and from 17,000 Euros to 28,900 Euros in month 2.

The example illustrates a general feature of security A: it has a small probability of ending up at an extremely high price, and a large probability of ending up at low prices.

The following table shows how many price increases are required for security A's selling price to exceed the threshold, in each of the 10 investment tasks. The table's final column shows exactly how likely the selling price exceeds the threshold.

	Threshold for security A:	Required # of increases, to exceed threshold	Probability of exceeding threshold
Task 1	100	5 or more	80.6 %
Task 2	500	6 or more	61.3 %
Task 3	2,000	7 or more	38.7 %
Task 4	6,000	8 or more	19.4 %
Task 5	9,000	8 or more	19.4 %
Task 6	12,000	8 or more	19.4 %
Task 7	20,000	9 or more	7.3 %
Task 8	35,000	9 or more	7.3 %
Task 9	90,000	10 or more	1.9 %
Task 10	250,000	11 or more	0.3 %

For example, in Task 1, the selling price of security A exceeds the threshold if the price increases during 5 or more of the 12 months. This happens with probability 80.6%. The higher the threshold, the higher the number of required price increases. For example, in Task 2, the selling price exceeds the threshold if the price increases in 6 or more months. This happens only with probability 61.3%. Similarly, you can read in the subsequent lines how likely the threshold is met in the other tasks.

For comparison, recall that security B has a selling price of 17,000 Euros or 4,000 Euros, with equal probability, and a threshold of 10,000 Euros. Therefore, in each task, security B's selling price exceeds its threshold with probability 50%.

[end of insert for condition TREATMENT]

[page break]

Payment

For each round, one of the 10 tasks is picked at random. Each task is picked with equal probability by a computerized random draw. Depending on your decision in the task that is picked by the computer, you will receive the bonus or not.

After each round, you will learn the selling prices of both securities. We obtain these prices by means of computer simulation, which is conducted individually for each participant. You will receive the price information on a separate sheet of paper after each round. The selling price of your chosen security determines whether you receive the bonus in this round.

We then continue with another round of 10 tasks. (Recall there are 5 rounds.)

Are there questions about the tasks or payment rules in this experiment? If so, please raise your hand and we will help you at your desk.

If there are no further questions at this point, you will now face a brief understanding test. Only if you answer all questions correctly, you will proceed to the actual tasks.

In the top right corner of the understanding test, please enter the code number that you were assigned when you entered the laboratory. Please also enter this number on all subsequent sheets during this experiment.

[page break]

Understanding test

Code number: _____

Please record your code number on this sheet, as well as on all subsequent sheets during the experiment

Consider questions (1) to (4) below. You will only be allowed to continue with the experiment after answering all questions correctly. If you have a question of any kind, please raise your hand.

Questions:

(1) Suppose you buy security B in the task that is picked by the computer. Suppose the selling price of security B is 17,000 Euros. Do you receive a bonus? _____

(2) Suppose you buy security A in Task 1. Suppose the selling price of security A is higher than 100 Euros. Do you receive a bonus if Task 1 is picked by the computer?

(3) Suppose you buy security A in Task 10. Suppose the selling price of security A is less than 250,000 Euros. Do you receive a bonus if Task 10 is picked by the computer?

(4) Suppose you buy security A in both Task 1 and Task 10. Which of the two tasks has the higher chance that the selling price exceeds the threshold? _____

Once you finish the understanding test, please wait for instructions for the decisions. If you have a question, please raise your hand. Please make sure that the code number is recorded on the understanding test.

[page break]

[decision form]

Code number: _____

Round 1

	Threshold for security A:	Threshold for security B:	Your decision (A or B):
Task 1	100	10,000	
Task 2	500	10,000	
Task 3	2,000	10,000	
Task 4	6,000	10,000	
Task 5	9,000	10,000	
Task 6	12,000	10,000	
Task 7	20,000	10,000	
Task 8	35,000	10,000	
Task 9	90,000	10,000	
Task 10	250,000	10,000	

Once you finish making the decisions, please wait until the experimenter collects the decision sheets. If you have a question, please raise your hand. Please make sure that the code number is recorded on the first decision sheet.

[page break]

[feedback form]

Code number: _____

Selling prices in round 1:

Security A: _____

Security B: _____

[round 2 to 5 identically]

[page break]

SURVEY

Please provide the information requested below, but do **not** write your name. (Please respond truthfully to aid us in our research. You can be assured that all information will be stored in a 100% anonymous way, ensuring your privacy.)

CODE NUMBER _____

Date

_____.

Age:____ **Sex:**____ **Nationality:** _____

Undergraduate__ **Graduate**__ **Year of study** _____.

Main Subject of Study _____

Your average monthly budget, including all expenses for food and lodging:

Do you currently work for money? _____

Please indicate your main source of income: _____

In your household, do you live (check all that apply): ___with parents ___alone
___with partner ___with children ___none of the aforementioned, but sharing an
apartment with someone else.

Did you take a mathematics course as an undergraduate? ___yes ___no

**Indicate the duration of schooling that your mother received, including any higher
education, by checking the number of years that comes closest:** ___4 ___8 ___12
___16 ___20

Indicate your father's years of schooling: ___4 ___8 ___12 ___16 ___20

**THE FOLLOWING ARE SOME NUMERICAL PROBLEMS. PLEASE ANSWER
THEM AS BEST YOU CAN.**

First problem: What is 15% of 1,000? _____

Second problem: A car rental agency charges \$35 a day plus \$0.14 per mile for its rental cars. If these charges include tax, what is the total cost of travelling 300 miles over 3 days in a car rented from this agency?

_____ \$42 _____ \$105 _____ \$125 _____ \$147 _____ \$300

Third problem: Which of the following is larger than $\frac{3}{5}$?

_____ $\frac{19}{35}$ _____ $\frac{13}{20}$ _____ $\frac{4}{7}$ _____ $\frac{7}{13}$ _____ None of the above

Fourth problem: If it takes 5 people 5 months to save a total of \$5,000, how many months would it take 100 people to save a total of \$100,000? _____

Fifth problem: A TV and a radio cost \$110 in total. The TV costs \$100 more than the radio. How much does the radio cost? _____

Sixth problem: In a lake, there is a patch of lily pads. Each day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? _____

Appendix (not intended for publication): Instructions

Welcome!

You are about to participate in an experiment in decision making. Universities and research agencies have provided the funds for this experiment.

In this experiment we will first ask you to read instructions that explain the decision scenarios you will be faced with. We will also ask you to answer questions that test your understanding of what you read. Finally, you will be asked to make decisions that will allow you to earn money. Your monetary earnings will be determined by your decisions and by chance. All that you earn is yours to keep and will be paid to you in private, in cash, after today's session.

Only for coming here and completing the experiment, you will also receive a fixed participation fee of EUR 5.00. The earnings that you make during the experiment will be added to this amount.

It is important to us that you remain silent and do not look at other people's work. If you have any questions or need assistance of any kind, please raise your hand, and an experimenter will come to you. If you talk, exclaim out loud, etc., you will be asked to leave and will forfeit your earnings. Thank you.

[page break]

Procedure and payment structure

You are asked to make a sequence of decisions. There are five rounds in this experiment. In each round, you have the opportunity to earn a bonus of EUR 5.00. In what follows, the term “bonus” will always refer to these EUR 5.00. All bonuses that you earn in any of the five rounds will be paid to you in cash after the experiment.

Each round consists of a list of ten tasks. One of the ten tasks will be chosen by a random draw made on the computer. This task will be paid out for real. That is, if you were successful in the task that the computer picked, you will earn the bonus of EUR 5.00. If you were unsuccessful in the task that the computer picked, you will not receive a bonus in this round.

The tasks are described on the next pages.

[page break]

INVESTMENT TASK

Setting

You are a manager and have to make a decision between two risky investments, either to buy security A or to buy security B. Either security, if bought, has to be held for 12 months. After the 12 months you sell the security. Depending on your investment success, you have the chance to earn a bonus.

Security A:

You can buy the security at a price of 10,000 Euros. During each month, the security's price either increases by 70% or decreases by 60%. The two possible price changes in each month occur with equal probabilities ("fifty-fifty"). The direction of price change (increase/decrease) is not influenced by the direction of price changes in previous months.

Thus, at the end of month 1, the price is either 70% higher or 60% lower than at the beginning of month 1. That is, the price is either 17,000 Euros or 4,000 Euros. At the end of month 2, the price is either 70% higher or 60% lower than at the end of month 1. At the end of month 3, the price is either 70% higher or 60% lower than at the end of month 2. And so on, until you sell the security at its price at the end of month 12.

Security B:

You can buy the security at a price of 10,000 Euros. During month 1, the price of security B moves identically to the price of security A. After the end of month 1, the price stays constant until the end of month 12.

Thus, at the end of month 1, the price is either 70% higher or 60% lower than at the beginning of month 1, with equal probability. That is, the price is either 17,000 Euros or 4,000 Euros. The price then stays constant until you sell the security at the end of month 12.

The following rule determines your payment: If the selling price of the security that you bought is higher than a certain threshold, you receive the bonus.

[page break]

Thresholds

The thresholds differ between security A and security B. Security B's threshold always equals its initial price of 10,000 Euros. Security A's threshold varies between 100 and 250,000 Euros.

For each of the possible thresholds of security A and security B that are presented in the table below, you will be asked to make a decision between A and B. These are the 10 tasks for one round of this experiment.

	Threshold for security A:	Threshold for security B:	Your decision (A or B):
Task 1	100	10,000	
Task 2	500	10,000	
Task 3	2,000	10,000	
Task 4	6,000	10,000	
Task 5	9,000	10,000	
Task 6	12,000	10,000	
Task 7	20,000	10,000	
Task 8	35,000	10,000	
Task 9	90,000	10,000	
Task 10	250,000	10,000	

Example 1

Consider *Task 1*, where the threshold for security A is 100 Euros, and the threshold for security B is 10,000 Euros.

Suppose that you decide to buy *security A*. If the selling price of security A is higher than 100 Euros, you receive the bonus. If the selling price is less than or equal to 100 Euros, you do not receive the bonus.

Now, suppose instead that you decide to buy *security B*. If the selling price of security B is higher than 10,000 Euros, you receive the bonus. If the selling price of security B is less than or equal to 10,000 Euros, you do not receive the bonus.

Example 2

Consider *Task 2*, where the threshold of security A is higher than in the previous example, at 500 Euros, and the threshold for security B is again 10,000 Euros.

First, suppose that you decide to buy *security A*. In this case, if security A's selling price is higher than 500 Euros, you receive the bonus. Otherwise, you do not receive the bonus.

If, instead, you decide to buy *security B*, you receive the bonus if the selling price of security B is higher than 10,000. Otherwise, you do not receive the bonus.

And so on, analogously for *Task 3*, *Task 4*, etc., until *Task 10*.

[page break]

[The following page is for participants in condition *TREATMENT* only.]

How likely does security A's selling price exceed its threshold?

As security A's selling price is determined by 12 price changes, there are 13 possible selling prices for security A altogether: the lowest price results if security A's price decreases in each of the 12 months; the second-to-lowest price results if 11 price changes are decreases and 1 is an increase; and so on.

An important property of security A is that if the price decreases *once* it requires *multiple* price increases to compensate for the decrease. A single price increase by 70% cannot make up for a single decrease by 60%.

For example, consider the price at the end of month 2. If the price change in month 1 is downward, i.e. a decrease from 10,000 Euros to 4,000 Euros, then an increase in month 2 would only yield a price of 6,800 Euros, well below the starting price of 10,000 Euros. Likewise, if the first price change is an increase from 10,000 Euros to 17,000 Euros but the second price change is a decrease, then the price at the end of month 2 would again be only 6,800 Euros (which is 40% of 17,000 Euros). For the price to exceed 10,000 Euros at the end of month 2, the price would therefore have to increase twice in a row – from 10,000 Euros to 17,000 Euros in month 1, and from 17,000 Euros to 28,900 Euros in month 2.

The example illustrates a general feature of security A: it has a small probability of ending up at an extremely high price, and a large probability of ending up at low prices.

The following table shows how many price increases are required for security A's selling price to exceed the threshold, in each of the 10 investment tasks. The table's final column shows exactly how likely the selling price exceeds the threshold.

	Threshold for security A:	Required # of increases, to exceed threshold	Probability of exceeding threshold
Task 1	100	5 or more	80.6 %
Task 2	500	6 or more	61.3 %
Task 3	2,000	7 or more	38.7 %
Task 4	6,000	8 or more	19.4 %
Task 5	9,000	8 or more	19.4 %
Task 6	12,000	8 or more	19.4 %
Task 7	20,000	9 or more	7.3 %
Task 8	35,000	9 or more	7.3 %
Task 9	90,000	10 or more	1.9 %
Task 10	250,000	11 or more	0.3 %

For example, in Task 1, the selling price of security A exceeds the threshold if the price increases during 5 or more of the 12 months. This happens with probability 80.6%. The higher the threshold, the higher the number of required price increases. For example, in Task 2, the selling price exceeds the threshold if the price increases in 6 or more months. This happens only with probability 61.3%. Similarly, you can read in the subsequent lines how likely the threshold is met in the other tasks.

For comparison, recall that security B has a selling price of 17,000 Euros or 4,000 Euros, with equal probability, and a threshold of 10,000 Euros. Therefore, in each task, security B's selling price exceeds its threshold with probability 50%.

[end of insert for condition TREATMENT]

[page break]

Payment

For each round, one of the 10 tasks is picked at random. Each task is picked with equal probability by a computerized random draw. Depending on your decision in the task that is picked by the computer, you will receive the bonus or not.

After each round, you will learn the selling prices of both securities. We obtain these prices by means of computer simulation, which is conducted individually for each participant. You will receive the price information on a separate sheet of paper after each round. The selling price of your chosen security determines whether you receive the bonus in this round.

We then continue with another round of 10 tasks. (Recall there are 5 rounds.)

Are there questions about the tasks or payment rules in this experiment? If so, please raise your hand and we will help you at your desk.

If there are no further questions at this point, you will now face a brief understanding test. Only if you answer all questions correctly, you will proceed to the actual tasks.

In the top right corner of the understanding test, please enter the code number that you were assigned when you entered the laboratory. Please also enter this number on all subsequent sheets during this experiment.

[page break]

Understanding test

Code number: _____

Please record your code number on this sheet, as well as on all subsequent sheets during the experiment

Consider questions (1) to (4) below. You will only be allowed to continue with the experiment after answering all questions correctly. If you have a question of any kind, please raise your hand.

Questions:

(1) Suppose you buy security B in the task that is picked by the computer. Suppose the selling price of security B is 17,000 Euros. Do you receive a bonus? _____

(2) Suppose you buy security A in Task 1. Suppose the selling price of security A is higher than 100 Euros. Do you receive a bonus if Task 1 is picked by the computer?

(3) Suppose you buy security A in Task 10. Suppose the selling price of security A is less than 250,000 Euros. Do you receive a bonus if Task 10 is picked by the computer?

(4) Suppose you buy security A in both Task 1 and Task 10. Which of the two tasks has the higher chance that the selling price exceeds the threshold? _____

Once you finish the understanding test, please wait for instructions for the decisions. If you have a question, please raise your hand. Please make sure that the code number is recorded on the understanding test.

[page break]

[decision form]

Code number: _____

Round 1

	Threshold for security A:	Threshold for security B:	Your decision (A or B):
Task 1	100	10,000	
Task 2	500	10,000	
Task 3	2,000	10,000	
Task 4	6,000	10,000	
Task 5	9,000	10,000	
Task 6	12,000	10,000	
Task 7	20,000	10,000	
Task 8	35,000	10,000	
Task 9	90,000	10,000	
Task 10	250,000	10,000	

Once you finish making the decisions, please wait until the experimenter collects the decision sheets. If you have a question, please raise your hand. Please make sure that the code number is recorded on the first decision sheet.

[page break]

[feedback form]

Code number: _____

Selling prices in round 1:

Security A: _____

Security B: _____

[round 2 to 5 identically]

[page break]

SURVEY

Please provide the information requested below, but do **not** write your name. (Please respond truthfully to aid us in our research. You can be assured that all information will be stored in a 100% anonymous way, ensuring your privacy.)

CODE NUMBER _____

Date

_____.

Age:____ **Sex:**____ **Nationality:** _____

Undergraduate__ **Graduate**__ **Year of study** _____.

Main Subject of Study _____

Your average monthly budget, including all expenses for food and lodging:

Do you currently work for money? _____

Please indicate your main source of income: _____

In your household, do you live (check all that apply): ___with parents ___alone
___with partner ___with children ___none of the aforementioned, but sharing an
apartment with someone else.

Did you take a mathematics course as an undergraduate? ___yes ___no

**Indicate the duration of schooling that your mother received, including any higher
education, by checking the number of years that comes closest:** ___4 ___8 ___12
___16 ___20

Indicate your father's years of schooling: ___4 ___8 ___12 ___16 ___20

**THE FOLLOWING ARE SOME NUMERICAL PROBLEMS. PLEASE ANSWER
THEM AS BEST YOU CAN.**

First problem: What is 15% of 1,000? _____

Second problem: A car rental agency charges \$35 a day plus \$0.14 per mile for its rental cars. If these charges include tax, what is the total cost of travelling 300 miles over 3 days in a car rented from this agency?

_____ \$42 _____ \$105 _____ \$125 _____ \$147 _____ \$300

Third problem: Which of the following is larger than $\frac{3}{5}$?

_____ $\frac{19}{35}$ _____ $\frac{13}{20}$ _____ $\frac{4}{7}$ _____ $\frac{7}{13}$ _____ None of the above

Fourth problem: If it takes 5 people 5 months to save a total of \$5,000, how many months would it take 100 people to save a total of \$100,000? _____

Fifth problem: A TV and a radio cost \$110 in total. The TV costs \$100 more than the radio. How much does the radio cost? _____

Sixth problem: In a lake, there is a patch of lily pads. Each day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? _____

Instructions for Treatment HVL

PROCEDURE AND PAYMENT STRUCTURE

There are five rounds in this experiment. In each round, you have the opportunity to earn a bonus of £5. In what follows, the term *bonus* will always refer to these £5. All bonuses that you earn in any of the five rounds will be paid to you in cash after the experiment.

Each round consists of a number of tasks. In every round, one of these tasks will be chosen by a random draw made on the computer. This task will be paid out for real. That is, if you were successful in the task that the computer picked, you will earn the bonus of £5. If you were unsuccessful in the task that the computer picked, you will not receive a bonus in this round.

The tasks and the structure of the rounds are described on the next pages.

STRUCTURE OF THE ROUNDS

PART 1: CHOICE TASKS

You are an investment manager and have to decide between pairs of risky securities. There are three different investment situations. The three investment situations differ only in the selectable securities. In situation 1, you can either invest in security A or invest in security B1. In situation 2, you can either invest in security A or invest in security B2. And in situation 3, you can either invest in security A or invest in security B3. In all situations, either security, if bought, has to be held for 140 investment periods. After the 140 periods you sell the security. Depending on your investment success, you have the chance to earn a bonus.

Security A has the following properties:

Security A can be bought at a price of £100. During each of the investment periods, the security's price either increases by 21.2% or decreases by 18.9%. The two possible price changes in each period occur with equal probabilities ("fifty-fifty"). The direction of the price change (increase/decrease) is not influenced by the direction of price changes in previous periods.

Thus, at the end of period 1, the price is either 21.2% higher or 18.9% lower than at the beginning of period 1. That is, the price is either £121.2 or £81.1. At the end of period 2, the price is either 21.2% higher or 18.9% lower than at the end of period 1. At the end of period 3, the price is either 21.2% higher or 18.9% lower than at the end of period 2. And so on, until you sell the security at its price at the end of period 140.

If you choose security A, you get the bonus if the selling price of security A is higher than a threshold. This is explained in detail in the section "Thresholds" below.

The three securities B1, B2, and B3 are investment opportunities that are independent of all other securities and differ only in the probabilities of giving you the bonus:

Security B1 can be bought at a price of £100. At the end of of period 140, you receive the bonus with a probability of 90%. With the remaining 10% you do not receive the bonus.

Security B2 can be bought at a price of £100. At the end of of period 140, you receive the bonus with a probability of 50%. With the remaining 50% you do not receive the bonus.

Security B3 can be bought at a price of £100. At the end of of period 140, you receive the bonus with a probability of 10%. With the remaining 90% you do not receive the bonus.

Thus, choosing securities B1, B2, or B3, gives you the bonus with probabilities 90%, 50%, and 10%, respectively.

THRESHOLDS

There are 10 different thresholds for security A. The thresholds vary between £2 and £1000. For each of the 10 thresholds you have to choose between investing in security A and investing in one of the securities B1, B2, or B3, respectively. That is, first you have to choose between security A and security B1 for all 10 thresholds, then between security A and security B2 for all 10 thresholds, and finally between security A and security B3 for all 10 thresholds. If, for a given threshold value, you chose security A, you receive the bonus if the final price of security A exceeds that threshold. You do not receive the bonus if the price is below the threshold. The choice tasks are listed in tables 1 to 3 below.

	Thresholds for security A	Your decision (A or B1)
<i>Task 1</i>	2	
<i>Task 2</i>	5	
<i>Task 3</i>	15	
<i>Task 4</i>	60	
<i>Task 5</i>	140	
<i>Task 6</i>	230	
<i>Task 7</i>	350	
<i>Task 8</i>	550	
<i>Task 9</i>	700	
<i>Task 10</i>	1000	

Table 1: The 10 binary decisions between A and B1.

	Thresholds for security A	Your decision (A or B2)
<i>Task 1</i>	2	
<i>Task 2</i>	5	
<i>Task 3</i>	15	
<i>Task 4</i>	60	
<i>Task 5</i>	140	
<i>Task 6</i>	230	
<i>Task 7</i>	350	
<i>Task 8</i>	550	
<i>Task 9</i>	700	
<i>Task 10</i>	1000	

Table 2: The 10 binary decisions between A and B2.

	Thresholds for security A	Your decision (A or B3)
<i>Task 1</i>	2	
<i>Task 2</i>	5	
<i>Task 3</i>	15	
<i>Task 4</i>	60	
<i>Task 5</i>	140	
<i>Task 6</i>	230	
<i>Task 7</i>	350	
<i>Task 8</i>	550	
<i>Task 9</i>	700	
<i>Task 10</i>	1000	

Table 3: The 10 binary decisions between A and B3.

The following examples are intended to make you more familiar with the mechanics of these tasks:

Example 1:

Consider *Task 1* in situation 1 (choice between security A and security B1, Table 1). The threshold for security A is £2. Suppose that you decide to buy security A. If the selling price of security A is higher than £2, you receive the bonus. If the selling price is less than or equal to £2, you do not receive the bonus. Now, suppose instead that you decide to buy security B1. This means that you choose a lottery that pays the bonus with a 90% probability.

Example 2:

Now consider *Task 2* in situation 1, where the threshold of security A is higher than in the previous example, at £5, and security B1 again yields the bonus with a probability of 90%. Suppose that you decide to buy security A. In this case, if security A's selling price is higher than £5, you receive the bonus. Otherwise, you do not receive the bonus. If instead you decide to buy security B1, you again receive the bonus with 90% probability.

And so on, analogously for *Task 3*, *Task 4*, etc., until *Task 10*. You then repeat this process for situations 2 and 3. However, there are two restrictions to your choices.

Restriction 1: Within 10 tasks, you may only switch once from choosing security A to choosing the B type security. That is, if you choose to invest in security A for the first few tasks and then switch to the B type security, you have to stay with this choice until *Task 10*.

Note that this restriction serves your own payout. The thresholds for security A increase with each task. The higher the threshold the less likely it is that the security's selling price will exceed it. Thus, if you believe that security A in a given task gives you a larger chance of receiving the bonus than the B type security, then you should choose security A for all lower tasks as well. Hence, you should not switch back and forth between security A and the B type security.

Restriction 2: Within one round, the threshold at which you switch from security A to security B1 cannot exceed the threshold at which you switch from security A to security B2 which cannot exceed the threshold at which you switch from security A to security B3.

This restriction, too, serves your own payout. To see this, suppose that for a given task you prefer security B2 to security A. This implies that you estimate the chance of security A's selling price being above that threshold to be less than 50%. But then you should also prefer security B1 to security A at this threshold, as security B1's odds of returning the bonus are even better than those of security B2. In the comparison between security A and security B2, you should therefore choose security A for at least as many threshold values as in the comparison between security A and security B1. That is, you should switch to security B1 no later than when you switch to security B2. The same logic applies when comparing switching in situations 2 and 3.

In order to help you not violating this restriction, for situations 2 and 3 during the whole experiment, the number of tasks at which you chose security A in the previous situation is shown to you on the right side of the computer screen. This shown number is the minimal number of tasks at which you have to choose security A in the current situation.

When you have completed the choice tasks of this part of the round, we will ask you to state your believed probability of security A making a profit, i.e., whether the final price of security A lies above 100. The details are outlined in the following paragraphs.

PART 2: STATING PROBABILITIES

In order to elicit your believed probability of security A making a profit in the 140 periods we will again ask you to compare an investment in security A with alternative investments.

More specifically, we want you to consider a pool of different securities of which you can pick one at random. For this "random picking", simply imagine that you take one of the available securities from a bag of securities, without being able to see inside the bag. After you have picked the security, you can see it and observe its probability of making a profit. Each one of these securities has some probability of making a profit after the 140 periods. These probabilities can assume any decimal number between 0% and 100%, and each number has equal probability. For example, there is one alternative security that makes a profit with a probability of 20.5%. If you invest in this security you receive the bonus with a probability of 20.5%. You can either invest in security A or in the randomly chosen alternative security. The general payoff rule is that for any security that you invest in, you receive the bonus if the security makes a profit.

To determine your investment decision between security A and the randomly chosen security, we would like you to state an integer number X that satisfies the following statement:

"If I pick an alternative security at random with a profit probability less or equal to X , I rather invest in security A. However, if I pick an alternative security that has a profit probability greater than X , I invest in this alternative security."

The number X that we want you to write down is therefore equal to your believed probability of security A making a profit. Just in case you doubt that it is indeed in your best interest to answer truthfully, you can go through the following explanation (smaller print):

Suppose you believe that the profit probability of security A is 50%. Then you should state 50% as your value X . Why? Assume you lie and state a higher number than you really believe, say, 60%. This paragraph argues that you can only lose from such a statement, relative to telling the truth. Specifically, one of three things will happen if you state 60%. First it could happen that the picked security has a profit probability which is higher than your believed number (50%) but lower than your stated number, e.g., 59%. You would then still, according to the rules, advise to invest in security A which in your opinion has a profit probability of 50%. If you had stated your true belief, however, you would advise to invest in the alternative security, which makes a profit with 59%. Thus, your chances to receive the bonus would be higher if you state your true belief. The two remaining cases are: you draw from the alternative security pool a security with a probability that is either greater than your stated 60% or lower than your believed 50%. In both cases you cannot benefit from lying; if your draw has a probability greater than 60% you would have preferred it either way. Conversely, a draw with less than 50% probability always lets you stay with security A.

Now suppose you state a number which is lower than your believed 50%, say, 40%. Then again, it could happen that

the chosen security has a winning probability which is between your believed 50% and your stated 40%, say, 45%. You would then advise to invest in this security, which gives you the bonus with a 45% chance. If you had stated your true belief, you would have advised to invest in security A which, according to your belief, would have given you a winning probability of 50% instead. So misstating your belief made you worse off. Finally, if you draw an security with a winning probability of less than your stated 40% or above your believed 50% your odds of receiving the bonus are the same as when you state your true belief.

Summarizing the above, it is generally true that not writing down what you really believe would worsen your chances of getting the bonus.

After you have stated your believed probability of security A making a profit at the end of 140 periods, the round is completed. The whole procedure is repeated five times. Thus, every round consists of the decisions between security A and the securities B1, B2, and B3, respectively (Part 1), and your estimate of your believed profit probability of security A (Part 2).

PAYMENT AND FEEDBACK

For each round, one of the 30 choice tasks from Part 1 of the round (choosing between security A and one of the securities B1, B2, or B3) is selected at random by a computerized draw. Each of the tasks is chosen with the same probability. Then, the computer will make a further draw to choose between Part 1 and Part 2. Each of the two parts is picked with equal probability ("fifty-fifty") to be relevant for your payout. For the picked part, you will receive the bonus if you were successful in the selected choice or estimation task. If you were unsuccessful, you will not receive a bonus in this round. This procedure is then conducted for each of the 5 rounds. Let's look at an example:

Suppose that in round 1 the computer picks Part 1 and selects *Task 3* of the comparison between security A and security B1 to be the payoff relevant task. Now, depending on your choice in this task you receive the bonus for round 1 or not. That is, if you chose security A in situation 1, *Task 3*, and security A's selling price was above the threshold for *Task 3* (which is 15), you receive the bonus in round 1. If instead you chose security B1 in this task you get the bonus if B1 was successful in this task (which happens with a 90% probability).

Alternatively, suppose that the computer picks Part 2, i.e., the probability stating task, to be the relevant task in round 1. Then you get the bonus if you are successful in this task. That is, the computer will pick and simulate a security in accordance with your stated probability (i.e., the integer number X) as described above and return the bonus if this security or security A - depending on your choice - returns a profit after 140 periods.

After each round, you will receive the realized price of security A after 140 periods as feedback. If you chose A in the task that is randomly picked by the computer then your payment for the round is calculated according to this received price.

Are there questions about the tasks or payment rules in this experiment? If so, please raise your hand and we will help you at your desk. If there are no further questions at this point, you will now face a brief understanding test. Only if you answer all questions correctly, you will proceed to the actual tasks.

Calculators are allowed during the whole experiment.

Instructions for Treatment LVL

Procedure and payment structure

There are five rounds in this experiment. In each round, you have the opportunity to earn a bonus of £5. In what follows, the term *bonus* will always refer to these £5. All bonuses that you earn in any of the five rounds will be paid to you in cash after the experiment.

Each round consists of a number of tasks. In every round, one of these tasks will be chosen by a random draw made on the computer. This task will be paid out for real. That is, if you were successful in the task that the computer picked, you will earn the bonus of £5. If you were unsuccessful in the task that the computer picked, you will not receive a bonus in this round.

The tasks and the structure of the rounds are described on the next pages.

Structure of the rounds

Choice tasks

You are an investment manager and have to decide between pairs of risky securities. There are three different investment situations. The three investment situations differ only in the selectable securities. In situation 1, you can either invest in security A or invest in security B1. In situation 2, you can either invest in security A or invest in security B2. And in situation 3, you can either invest in security A or invest in security B3. In all situations, either security, if bought, has to be held for 140 investment periods. After the 140 periods you sell the security. Depending on your investment success, you have the chance to earn a bonus.

Security A has the following properties:

Security A can be bought at a price of £100. During each of the investment periods, the security's price either increases by 1.2% or by 1.1%. The two possible price changes in each period occur with equal probabilities ("fifty-fifty"). The price change is not influenced by the price changes in previous periods.

Thus, at the end of period 1, the price is either 1.2% or 1.1% higher than at the beginning of period 1. That is, the price is either £101.2 or £101.1. At the end of period 2, the price is either 1.2% or 1.1% higher than at the end of period 1. At the end of period 3, the price is either 1.2% or 1.1% higher than at the end of period 2. And so on, until you sell the security at its price at the end of period 140.

If you choose security A, you get the bonus if the selling price of security A is higher than a threshold. This is explained in detail in the section "Thresholds" below.

The three securities B1, B2, and B3 are investment opportunities that are independent of all other securities and differ only in the probabilities of giving you the bonus:

Security B1 can be bought at a price of £100. At the end of of period 140, you receive the bonus with a probability of 90%. With the remaining 10% you do not receive the bonus.

Security B2 can be bought at a price of £100. At the end of of period 140, you receive the bonus with a probability of 50%. With the remaining 50% you do not receive the bonus.

Security B3 can be bought at a price of £100. At the end of of period 140, you receive the bonus with a probability of 10%. With the remaining 90% you do not receive the bonus.

Thus, choosing securities B1, B2, or B3, gives you the bonus with probabilities 90%, 50%, and 10%, respectively.

Thresholds

There are 10 different thresholds for security A. The thresholds vary between £185 and £850. For each of the 10 thresholds you have to choose between investing in security A and investing in one of the securities B1, B2, or B3, respectively. That is, first you have to choose between security A and security B1 for all 10 thresholds, then between security A and security B2 for all 10 thresholds, and finally between security A and security B3 for all 10 thresholds. If, for a given threshold value, you chose security A, you receive the bonus if the final price of security A exceeds that threshold. You do not receive the bonus if the price is below the threshold. The choice tasks are listed in tables 1 to 3 below.

	Thresholds for security A	Your decision (A or B1)
<i>Task 1</i>	185	
<i>Task 2</i>	210	
<i>Task 3</i>	240	
<i>Task 4</i>	290	
<i>Task 5</i>	340	
<i>Task 6</i>	400	
<i>Task 7</i>	460	
<i>Task 8</i>	520	
<i>Task 9</i>	625	
<i>Task 10</i>	850	

Table 1: The 10 binary decisions between A and B1.

	Thresholds for security A	Your decision (A or B2)
<i>Task 1</i>	185	
<i>Task 2</i>	210	
<i>Task 3</i>	240	
<i>Task 4</i>	290	
<i>Task 5</i>	340	
<i>Task 6</i>	400	
<i>Task 7</i>	460	
<i>Task 8</i>	520	
<i>Task 9</i>	625	
<i>Task 10</i>	850	

Table 2: The 10 binary decisions between A and B2.

	Thresholds for security A	Your decision (A or B3)
<i>Task 1</i>	185	
<i>Task 2</i>	210	
<i>Task 3</i>	240	
<i>Task 4</i>	290	
<i>Task 5</i>	340	
<i>Task 6</i>	400	
<i>Task 7</i>	460	
<i>Task 8</i>	520	
<i>Task 9</i>	625	
<i>Task 10</i>	850	

Table 3: The 10 binary decisions between A and B3.

The following examples are intended to make you more familiar with the mechanics of these tasks:

Example 1:

Consider *Task 1* in situation 1 (choice between security A and security B1, Table 1). The threshold for security A is £185. Suppose that you decide to buy security A. If the selling price of security A is higher than £185, you receive the bonus. If the selling price is less than or equal to £185, you do not receive the bonus. Now, suppose instead that you decide to buy security B1. This means that you choose a lottery that pays the bonus with a 90% probability.

Example 2:

Now consider *Task 2* in situation 1, where the threshold of security A is higher than in the previous example, at £210, and security B1 again yields the bonus with a probability of 90%. Suppose that

you decide to buy security A. In this case, if security A's selling price is higher than £210, you receive the bonus. Otherwise, you do not receive the bonus. If instead you decide to buy security B1, you again receive the bonus with 90% probability.

And so on, analogously for *Task 3*, *Task 4*, etc., until *Task 10*. You then repeat this process for situations 2 and 3. However, there are two restrictions to your choices.

Restriction 1: Within 10 tasks, you may only switch once from choosing security A to choosing the B type security. That is, if you choose to invest in security A for the first few tasks and then switch to the B type security, you have to stay with this choice until *Task 10*.

Note that this restriction serves your own payout. The thresholds for security A increase with each task. The higher the threshold the less likely it is that the security's selling price will exceed it. Thus, if you believe that security A in a given task gives you a larger chance of receiving the bonus than the B type security, then you should choose security A for all lower tasks as well. Hence, you should not switch back and forth between security A and the B type security.

Restriction 2: Within one round, the threshold at which you switch from security A to security B1 cannot exceed the threshold at which you switch from security A to security B2 which cannot exceed the threshold at which you switch from security A to security B3.

This restriction, too, serves your own payout. To see this, suppose that for a given task you prefer security B2 to security A. This implies that you estimate the chance of security A's selling price being above that threshold to be less than 50%. But then you should also prefer security B1 to security A at this threshold, as security B1's odds of returning the bonus are even better than those of security B2. In the comparison between security A and security B2, you should therefore choose security A for at least as many threshold values as in the comparison between security A and security B1. That is, you should switch to security B1 no later than when you switch to security B2. The same logic applies when comparing switching in situations 2 and 3.

In order to help you not violating this restriction, for situations 2 and 3 during the whole experiment, the number of tasks at which you chose security A in the previous situation is shown to you on the right side of the computer screen. This shown number is the minimal number of tasks at which you have to choose security A in the current situation.

When you have stated your investment decisions in the 30 choice tasks, the round is completed. The whole procedure is repeated five times.

Payment and Feedback

For each round, one of the 30 choice tasks (choosing between security A and one of the securities B1, B2, or B3) is selected at random by a computerized draw. Each of the tasks is chosen with the same

probability. You will receive the bonus if you were successful in the selected choice task. If you were unsuccessful, you will not receive a bonus in this round. This procedure is then conducted for each of the 5 rounds. Let's look at an example:

After each round, one of the 30 choice tasks is chosen at random (and with equal probability). Suppose that in round 1 the computer picks *Task 3* of the comparison between security A and security B1 to be the payoff relevant task. Now, depending on your choice in this task you receive the bonus for round 1 or not. That is, if you chose security A in situation 1, *Task 3*, and security A's selling price was above the threshold for *Task 3*, you receive the bonus in round 1. If instead you chose security B1 in that task you get the bonus if B1 was successful in that task (which happens with a 90% probability).

After each round, you will receive the realized price of security A after 140 periods as feedback. If you chose A in the task that is randomly picked by the computer then your payment for the round is calculated according to this received price.

Are there questions about the tasks or payment rules in this experiment? If so, please raise your hand and we will help you at your desk. If there are no further questions at this point, you will now face a brief understanding test. Only if you answer all questions correctly, you will proceed to the actual tasks.

Calculators are allowed during the whole experiment.

Instructions for Treatment ETF_3

PROCEDURE AND PAYMENT STRUCTURE

There are five rounds in this experiment. In each round, you have the opportunity to earn a bonus of £5. In what follows, the term *bonus* will always refer to these £5. All bonuses that you earn in any of the five rounds will be paid to you in cash after the experiment.

Each round consists of a number of tasks. In every round, one of these tasks will be chosen by a random draw made on the computer. This task will be paid out for real. That is, if you were successful in the task that the computer picked, you will earn the bonus of £5. If you were unsuccessful in the task that the computer picked, you will not receive a bonus in this round.

The tasks and the structure of the rounds are described on the next pages.

STRUCTURE OF THE ROUNDS

CHOICE TASKS

You are an investment manager and have to decide between pairs of risky securities. There are three different investment situations. The three investment situations differ only in the selectable securities. In situation 1, you can either invest in an ETF security or invest in security B1. In situation 2, you can either invest in an ETF security or invest in security B2. And in situation 3, you can either invest in an ETF security or invest in security B3. In all situations, either security, if bought, has to be held for 2000 trading days (roughly 8 years). After the 2000 trading days you sell the security. Depending on your investment success, you have the chance to earn a bonus.

The ETF security has the following properties:

The ETF security can be bought at a price of £100. It is a so-called triple leveraged ETF on the DAX30. The DAX30 is a stock index composed of stocks of 30 major German companies from across all sectors of the economy. This includes automotive companies such as VW and Daimler, utilities such as E.on or banks and insurances such as Deutsche Bank or Allianz. The DAX30 summarizes the stock performance of these 30 companies. Now, the triple leveraged ETF on the DAX30 is a financial product (an *exchange traded fund* or ETF) that moves in the same direction as the DAX30 itself. If the DAX30 increases on a given trading day, then so does the triple leveraged ETF, and vice versa. But the movements of the triple leveraged ETF are stronger than that of the underlying DAX30. More precisely, they are 3 times as strong (hence the name triple leveraged). That is, the triple leveraged ETF gains 3% in value on a day where the DAX30 gains 1% in value and it loses 3% on a day where the DAX30 loses 1%.

For example, suppose on the first trading day the DAX30 increases by 1.5%. Then, the value of your holdings in the triple leveraged ETF increases by 4.5%. That is, the price of the ETF security would be £104.5 after trading day 1. Likewise, if the DAX30 decreases by 1.5% on trading day 1, then the price of the ETF security would be £95.5 after trading day 1. If then on the second trading day the DAX30 decreases by, say, 0.8% the value of your holdings in the ETF security after trading day 2 are 2.4% lower than after trading day 1 (and analogously for gains on trading day 2). And so on, until you sell the ETF security at its price at the end of trading day 2000.

To determine your payment (to be explained in detail later), we will use real-world historical data of the DAX30, going back to the year 1964 when the DAX30 was first compiled. In this period, the magnitudes of daily changes can be summarized as follows: In 90% of all trading days the DAX30 exhibited percentage changes in a range between -1.8% and 1.8% . The average percentage change over all trading days of the DAX30 since 1964 is 0.03% . The overall daily percentage changes of the DAX30 are illustrated in Figure 1:

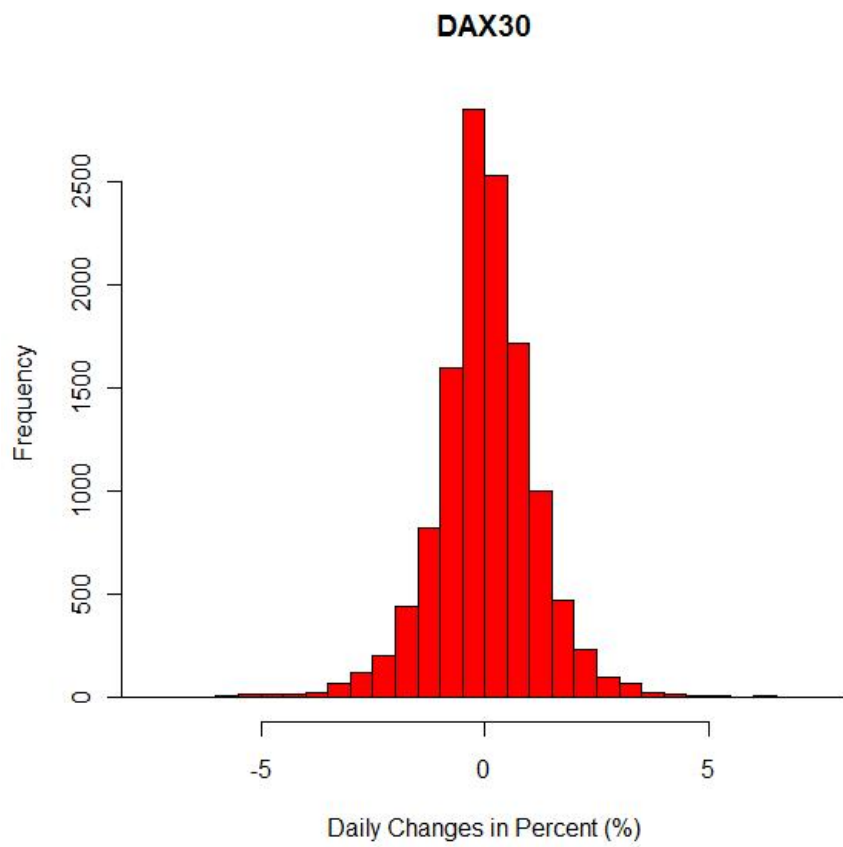


Figure 1: Daily percentage changes in the total history of the DAX30.

If you choose to invest in the ETF security in the choice task of this experiment, you receive the bonus if the selling price of the ETF security is higher than a threshold. This is explained in detail in the section "Thresholds" below.

The three securities B1, B2, and B3 differ only in the probabilities of giving you the bonus:

Security B1 can be bought at a price of £100. At the end of trading day 2000, you receive the bonus with a probability of 90%. With the remaining 10% you do not receive the bonus.

Security B2 can be bought at a price of £100. At the end of trading day 2000, you receive the bonus with a probability of 50%. With the remaining 50% you do not receive the bonus.

Security B3 can be bought at a price of £100. At the end of trading day 2000, you receive the bonus with a probability of 10%. With the remaining 90% you do not receive the bonus.

Thus, choosing securities B1, B2, or B3, gives you the bonus with probabilities 90%, 50%, and 10%, respectively.

THRESHOLDS

There are 11 different thresholds. The thresholds vary between £30 and £1600. For each of the 11 thresholds you have to choose between investing in the ETF security and investing in one of the securities B1, B2, or B3, respectively. That is, first you have to choose between the ETF security and security B1 for all 11 thresholds, then between the ETF security and security B2 for all 11 thresholds, and finally between the ETF security and security B3 for all 11 thresholds. If, for a given threshold value, you chose the ETF security, you receive the bonus if the final price of the ETF security exceeds that threshold. The choice tasks are listed in tables 1 to 3 below.

	Thresholds for the ETF security	Your decision (ETF or B1)
<i>Task 1</i>	30	
<i>Task 2</i>	60	
<i>Task 3</i>	90	
<i>Task 4</i>	140	
<i>Task 5</i>	200	
<i>Task 6</i>	260	
<i>Task 7</i>	330	
<i>Task 8</i>	450	
<i>Task 9</i>	650	
<i>Task 10</i>	1000	
<i>Task 11</i>	1600	

Table 1: The 11 binary decisions between ETF and B1.

	Thresholds for the ETF security	Your decision (ETF or B2)
<i>Task 1</i>	30	
<i>Task 2</i>	60	
<i>Task 3</i>	90	
<i>Task 4</i>	140	
<i>Task 5</i>	200	
<i>Task 6</i>	260	
<i>Task 7</i>	330	
<i>Task 8</i>	450	
<i>Task 9</i>	650	
<i>Task 10</i>	1000	
<i>Task 11</i>	1600	

Table 2: The 11 binary decisions between ETF and B2.

	Thresholds for the ETF security	Your decision (ETF or B3)
<i>Task 1</i>	30	
<i>Task 2</i>	60	
<i>Task 3</i>	90	
<i>Task 4</i>	140	
<i>Task 5</i>	200	
<i>Task 6</i>	260	
<i>Task 7</i>	330	
<i>Task 8</i>	450	
<i>Task 9</i>	650	
<i>Task 10</i>	1000	
<i>Task 11</i>	1600	

Table 3: The 11 binary decisions between ETF and B3.

The following examples are intended to make you more familiar with the mechanics of these tasks:

Example 1:

Consider *Task 1* in situation 1 (choice between the ETF security and security B1, Table 1). The threshold for the ETF security is £30. Suppose that you decide to buy the ETF security. If the selling price of the ETF security is higher than £30, you receive the bonus. If the selling price is less than or equal to £30, you do not receive the bonus. Now, suppose instead that you decide to buy security B1. This means that you choose a lottery that pays the bonus with a 90% probability.

Example 2:

Now consider *Task 2* in situation 1, where the threshold of the ETF security is higher than in the previous example, at £60, and security B1 again yields the bonus with a probability of 90%. Suppose that you decide to buy the ETF security. In this case, if the ETF security's selling price is higher than £60, you receive the bonus. Otherwise, you do not receive the bonus. If instead you decide to buy security B1, you again receive the bonus with 90% probability.

And so on, analogously for *Task 3*, *Task 4*, etc., until *Task 11*. You then repeat this process for situations 2 and 3. However, there are two restrictions to your choices.

Restriction 1: Within 11 tasks, you may only switch once from choosing the ETF security to choosing the B type security. That is, if you choose to invest in the ETF security for the first few tasks and then switch to the B type security, you have to stay with this choice until *Task 11*.

Note that this restriction cannot diminish your estimated chances of receiving the bonus. The thresholds for the ETF security increase with each task. The higher the threshold the less likely it is that the

security's selling price will exceed it. Thus, if you believe that the ETF security in a given task gives you a larger chance of receiving the bonus than the B type security, then you should choose the ETF security for all lower tasks as well. Hence, you should not switch back and forth between the ETF security and the B type security.

Restriction 2: Within one round, the threshold at which you switch from the ETF security to security B1 cannot exceed the threshold at which you switch from the ETF security to security B2 which cannot exceed the threshold at which you switch from the ETF security to security B3.

Again, this restriction cannot diminish your estimated chances of receiving the bonus. To see this, suppose that for a given task you prefer security B2 to the ETF security. This implies that you estimate the chance of the ETF security's selling price being above that threshold to be less than 50%. But then you should also prefer security B1 to the ETF security at this threshold, as security B1's odds of returning the bonus are even better than those of security B2. In the comparison between the ETF security and security B2, you should therefore choose the ETF security for at least as many threshold values as in the comparison between the ETF security and security B1. That is, you should switch to security B1 no later than when you switch to security B2. The same logic applies when comparing switching in situations 2 and 3.

In order to help you not violating this restriction, for situations 2 and 3 during the whole experiment, the number of tasks at which you chose the ETF security in the previous situation is shown to you on the right side of the computer screen. This shown number is the minimal number of tasks at which you have to choose the ETF security in the current situation.

When you have completed the choice tasks we will ask you to state your believed probability of the ETF security making a profit, i.e., whether the final price of the ETF security lies above 100. The details are outlined in the following paragraphs.

STATING PROBABILITIES

In order to elicit your believed probability of the ETF security making a profit in the 2000 trading days, we will again ask you to compare an investment in the ETF security with alternative investments.

More specifically, we want you to consider a pool of different securities of which you can choose one at random. Imagine that you pick one of these securities from a bag of securities, without being able to see inside the bag. After you have picked the security, you can see it and observe its probability of making a profit. Each one of these securities has some probability of making a profit after the 2000 trading days. These probabilities can assume any decimal number between 0% and 100%, and each number has equal probability. For example, there is one alternative security that makes a profit with a probability of 20.5%. If you invest in this security you receive the bonus with a probability of 20.5%. You can either invest in the ETF security or in the randomly chosen alternative security. The general

payoff rule is that for any security that you invest in, you receive the bonus if the security makes a profit.

To determine your investment decision between the ETF security and the randomly chosen security, we would like you to state an integer number X that satisfies the following statement:

"If I choose an alternative security at random with a profit probability less or equal to X , I keep investing in the ETF security. However, if an alternative security is chosen which has a profit probability greater than X , I invest in this alternative security."

The number X that we want you to write down is therefore equal to your believed probability of the ETF security making a profit. Just in case you doubt that it is indeed in your best interest to answer truthfully, you can go through the following explanation (smaller print):

Suppose you believe that the profit probability of the ETF security is 50%. Then you should state 50% as the threshold. Why? Assume you lie and state a higher number than you really believe, say, 60%. Then one of three things will happen. First it could happen that the drawn security has a profit probability which is higher than your believed number but lower than your stated number, e.g., 59%. You would then still, according to the rules, advise to invest in the ETF security which in your opinion has a profit probability of 50%. If you had stated your true belief, however, you would advise to invest in the alternative security. Thus, your chances to receive the bonus would be higher if you state your true belief. The two remaining cases are draws from the alternative security pool that are securities with probabilities either greater than your stated 60% or lower than your believed 50%. In both cases you cannot benefit from lying; if your draw has a probability greater than 60% you would have preferred it either way. Conversely, a draw with less than 50% probability always lets you stay with the ETF security.

Now suppose you state a number which is lower than your believed 50%, say, 40%. Then again, it could happen that the chosen security has a winning probability which is in between your believed 50% and your stated 40%, say, 45%. You would then advise to invest in this security, which gives you the bonus with a 45% chance. If you had stated your true belief, you would have advised to invest in the ETF security, which would have given you a winning probability of 50% instead. So misstating your belief made you worse off. Finally, if you draw an security with a winning probability of less than your stated 40% or above your believed 50% your odds of receiving the bonus are the same as when you state your true belief.

Summarizing the above, it is generally true that not writing down what you really believe would worsen your chances of getting the bonus.

After you have stated your believed probability of the ETF security making a profit at the end of 2000 trading days, the round is completed. The whole procedure is repeated five times. Thus, every round consists of the decisions between the ETF security and the securities B1, B2, and B3, respectively, and your estimate of your believed profit probability of the ETF security.

PAYMENT AND FEEDBACK

For each round, one of the 33 choice tasks (choosing between the ETF security and one of the securities B1, B2, or B3) is selected at random by a computerized draw. Each of the tasks is chosen with the same probability. Then, the computer will be used to make a further draw to choose between the selected task and your final question of the round, where you stated the profit probability of the ETF security. Each of the two numbers is picked with equal probability ("fifty-fifty"). Depending on whether the choice task or your stated profit probability is picked by the computer, you will receive the bonus if you were successful in the selected choice or estimation task. If you were unsuccessful, you will not receive a bonus in this round. This procedure is then conducted for each of the 5 rounds. As mentioned above, the DAX30 and leveraged ETFs are real-world financial products. Thus, we will use real-world historical data. More precisely, a computer will randomly pick a trading day as day 1 of the 2000 trading days period. This can be any trading day between 31 December, 1964, and 11 November, 2004. All days are chosen with the same probability and the draws are made independently for each round and each participant. The 2000 trading days following this day are your investment period. You receive the bonus if the selling price of the ETF security is above the relevant threshold after this period. Let's look at an example:

After each round, the computer makes a "fifty-fifty" selection between the choice tasks and the probability stating task. Suppose first that it picks the choice tasks. Then, one of the 33 choice tasks is chosen at random (and with equal probability) to be the relevant one. Suppose that in round 1 the computer picks *Task 3* of the comparison between the ETF security and security B1 to be the payoff relevant task. Now, depending on your choice in this task you receive the bonus for round 1 or not. That is, if you chose the ETF security in situation 1, *Task 3*, and the ETF security's selling price was above the threshold for *Task 3*, you receive the bonus in round 1. If instead you chose security B1 in that task you get the bonus if B1 was successful in that task (which happens with a 90% probability). Alternatively, suppose that the computer picks the probability stating task to be the relevant task in round 1. Then you get the bonus if you are successful in this task. That is, the computer will pick and simulate a security in accordance with your stated probability (i.e., the integer number X) as described above and return the bonus if this security or the ETF security - depending on your choice - does return a profit.

After each round, you will receive the realized price of the ETF security after 2000 trading days as feedback. This realized price is generated from real-world data by a computer. The computer randomly picks the 2000 trading days period according to the procedure described above.

Are there questions about the tasks or payment rules in this experiment? If so, please raise your hand and we will help you at your desk. If there are no further questions at this point, you will now

face a brief understanding test. Only if you answer all questions correctly, you will proceed to the actual tasks.

Calculators are allowed during the whole experiment.