

Supplements to "Optimistic, but Selling Riskier Stocks – An Arbitrage Experiment in Crisis Market"

Translated Script of the Experiment

Page 1

Welcome to the Arbitrage Experiment of the College of Management!

The experiment is run by researchers at the college of management in order to examine various hypotheses regarding the Israeli stock market and aspects of financial decision on stock purchase and sale.

Participation is not restricted in time - you may complete the experiment in your own pace with no disruptions

First, we ask you to fill-in some personal details

Private Name: _____

Family Name: _____

I.D. number: _____

Email: _____

Age: _____

Gender: Male _____/ Female _____

Education:

Years in school (including current academic year): _____

MBA or Student pursuing the MBA degree: Yes / No

Current Profession: (mark the most suitable option)

- A. Professional job within the “financial investment” industry (consulting, investment management, brokerage etc)
- B. Other professional job related to money management or finance
- C. Other occupation. Please explain: _____
- D. Unemployed

Experience:

Number of years where you held a professional job within the “financial investment” industry (consulting, investment management, brokerage etc)

Marital Condition:

- A. Married with children
- B. Married without children
- C. Single
- D. Other

Net Monthly Income:

- A. Less than 4000 NIS
- B. Between 4000 NIS and 8000 NIS
- C. Between 8000 NIS and 12000 NIS
- D. More than 12000 NIS

Please rank in 1-7 scale your theoretical knowledge in finance? (academic courses, financial literature etc)

- 1 - minimal knowledge
 - 7 - real expert
- _____

Please rank in 1-7 scale your familiarity with the Israeli financial market? (Prices, returns. Companies etc)

- 1 - minimal knowledge
 - 7 – real expert
- _____

In my opinion, in the next 3 months the TA100 index would:

- A. Rise by 10% or more
- B. Rise by more than 5% but less than 10%
- C. Rise by less than 5%
- D. Decrease by no more than 5%
- E. Decrease by more than 5%

In my opinion, in the next 12 months the TA100 index would:

- A. Rise by 20% or more

- B. Rise by more than 10% but less than 10%
 - C. Rise by less than 10%
 - D. Decrease by no more than 10%
 - E. Decrease by more than 10%
-

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Arbitrage Transactions: Synopsis

In the experiment you would be requested to buy and sell simultaneously stocks that are traded in the Tel-Aviv stock exchange in total amount of 1000 NIS

Using common professional terminology our main experimental task is an “arbitrage transaction”: parallel purchase and sale of securities intended to produce positive return with minimal risk

The purchase of stocks within the arbitrage transaction is standard: The arbitrageur is supposed to buy stocks that should subsequently increase in order to profit from the holding

The sale of stocks within the arbitrage transaction however is a “short sale”: The arbitrageur sells stocks that she does not currently hold, intending to cover the short subsequently – by purchasing the stocks that she sold. If possible, the arbitrageur would clearly prefer to short stocks that would decrease subsequently in order to gain the difference between the expensive selling price and the lower buying price.

Here is a simple example to profitable arbitrage: Suppose the investor has purchased in 1.1.2007 some stock A at the amount of 1000 NIS and – in parallel – has sold stock B in similar amount. The investor has closed the arbitrage transaction at 9.30.2007. Assume that the price of stock A has increased to 1200 while the price of stock B has decreased to 950 by this date. The arbitrage in this scenario turned out quite profitable. The investor has purchased a stock that gained 200 NIS while shorting a stock that lost 50 NIS. The total arbitrage gains are therefore 250: the 1200 that the investor collects from selling A minus the 950 paid for purchasing stock B. The cash flow from the arbitrage is summarized in the following table (positive figures refer to revenues from selling stocks while negative figures represent payments for purchasing stocks):

	1/1/2007	9/30/2007
Stock A (purchase)	-1000	+1200
Stock B (short sale)	+1000	-950
Net Revenue	0	+250

Clearly, it is easy to imagine other scenarios where the arbitrage would actually fail. If for instance the price of stock A went down from 1000 to 900 while the price of stock B increased from 1000 to 1150 then the arbitrageur would lose an amount of 250: the 900 NIS that would be received in selling stock A would not cover the amount that should be paid to “cover the short” and purchase stock B (1150). The next table summarizes the outcome of the arbitrage in this alternative scenario:

	1/1/2007	9/30/2007
Stock A (purchase)	-1000	+900
Stock B (short sale)	+1000	-1150
Net Revenue	0	-250

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The Rational Behind Such Arbitrage Transactions

Comment: This page discussed very briefly some aspects of risk management in arbitrage transactions. In case you are familiar with the topic and short in participation time – you may skip this material and continue to the next page immediately

Arbitrage transactions are especially common today in the hedging-funds industry

Hedging funds enjoy tremendous gains from successful arbitrage:

<http://optionarmageddon.blogspot.com/2008/01/other-paulson.html>

But also suffer immense losses when their arbitrage gambles fail:

<http://www.post-gazette.com/pg/06263/723449-28.stm>

What is the rational for such cyclic transactions?

Assuming that the risk level of stocks purchased within the arbitrage is similar to the risk-level of the stocks sold short, the cyclic transactions protects the trader from positive or negative market trends

Assume for example that the arbitrage-trader (ARB henceforth) has purchased stock A while shorting stock B

Assume the two stocks are “similar”; e.g., two moderate size textile-industry stocks (just for illustration)

Obviously, ARB believes that A is traded in more attractive prices than B

Consider the outcome of the arbitrage in two difference scenarios:

Case A:

Suppose the textile index rises along the arbitrage period. ARB’s expectations turn true and stock A rises more steeply than stock B. Assume specifically that A gains 300 NIS while B increases by only 100 NIS. In this case, ARB gains 300 on holding A while losing 100 in closing the short-position on B. The net gain from the arbitrage is therefore 200.

Case B:

Suppose alternatively the textile index declines along the arbitrage period. ARB’s expectations however regarding the under-pricing of stock A turn true and stock A decreases less steeply than stock B. Assume specifically that A losses 100 NIS while B decreases by 300 NIS. In this case, ARB losses 100 on holding A while gaining 300 when closing the short-position on B. The net gain from the arbitrage is therefore 200.

We have demonstrated that the purchase and sale of similar stocks (e.g., similar stocks from the same industry) protects the trader from industry specific trends; the trader enjoys the profit from buying the better stock while selling the worse stock – independently of specific market conditions!

When the stocks purchased in the arbitrage are riskier or less risky than the stocks sold, it is possible to adjust risk levels by investing funds in deposits or borrowing funds in risk-free interest. If stock A for instance is more risky than stock B, we may sell 1000 NIS of stock B, purchase A at the amount of 600 and invest the remaining 400 in risk-free deposit, to “adjust risk levels”.

Interested in more details? See the discussion in William Goetzmann Internet chapter:

<http://viking.som.yale.edu/will/finman540/classnotes/class6.html>

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Outline of the Experiment

{We omit the paragraphs dealing with the long-run arbitrage which will be discussed in a subsequent paper}

In the experiment, you will be asked to submit 2 arbitrage portfolios on leading stocks from the Israeli market

The first arbitrage portfolio is for 3 months. That is, the arbitrage “positions” that you would submit along the experiment would be closed after 3 months (approximately) to calculate the gains or losses from the arbitrage. Clearly, in this case you would prefer to purchase stocks that seem as a relatively attractive investment for the next quarter while shorting stocks that seem less attractive for such short-run investment.

The experiment organizers would calculate the gains/losses from the arbitrage (as illustrated above) and the results would be reported at the of arbitrage period. The experimental process would therefore end in more than one year from today. Still, the results for the short-run arbitrage for 3 months would be reported about 3 months after closing the experiment.

The reports that would be distributed at the end of each phase would let you compare your won payoff with the payoff of all other participants. Participants would be only identified by id numbers to preserve anonymity.

In addition, we would pay to 100 of the participants in the experiment “real” monetary prizes. The identity of real-prize winners would be randomly determined using random number generation. The payoff, in check, would be sent to the address that you would provide in the last page of the experiment. The actual payment would increase with the gains from the arbitrage. Participants that ended-up with larger arbitrage gains (or smaller losses) would receive larger payments than participants with weaker results. The id numbers of the participants that were selected for real-payment and the amount paid to each of these participants would be disclosed by email at the end of the corresponding phase of the experiment. More details regarding the payment method would be disclosed in subsequent pages.

Please note that we guarantee your anonymity! Your private name, family name or other identifying details (except your id number) would not be published in the emails that we distribute or any other public reports regarding the experiment.

The fairness of the experimental procedure and the payment method is guaranteed!

Upon request, we will let subjects examine the complete result files at the end of the experiment – to let you control the process. The experiment is run for academic research. We ask for your serious candid cooperation!

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More Details on the Experimental Arbitrage

The next table presents the specific format that would be used to collect your arbitrage portfolios:

Stock Purchase		Stock Sale	
Stock Name	Amount Purchased	Stock Name	Amount Sold
Total	1000	Total	1000

* You may choose stocks from the TA100 list (the 100 largest stocks in the market) or the TA YETER120 list (the next 120 largest stocks in the market). [The list of 220 available stocks](#) would be presented – together with links to updated information regarding these stocks – in the page where you would be asked to deliver your arbitrage.

* In addition to selecting stocks from the list, you would be permitted to deposit funds or borrow funds in fixed 3-months interest rate of 2%. In case you decide to deposit funds in such risk-free interest for 3-months, write “DEPOSIT” instead of providing a

specific stock name in the stock purchase column. In case you decide to borrow funds in the risk-free interest-rate, write “LOAN” in the stock sale column.

* The number of stocks that may be purchased in the arbitrage and the number of stocks that may be sold in the arbitrage is limited to 3. The arbitrage table therefore includes only 3 lines in each panel. Deposits and loans however are considered stock purchase and sale correspondingly. The maximal number of stocks purchased (or sold) therefore decreases to 2 in case you decide to deposit (or borrow) funds in risk-free interest.

* The next page provides some arbitrary example to the type of arbitrage portfolios that may be submitted:

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Examples

This page presents 3 examples to possible arbitrage transactions. The stocks for each transaction were selected in alphabetic order from the list of stocks traded in the Tel-Aviv exchange.

Example 1:

Stock Purchase		Stock Sale	
Stock Name	Amount Purchased	Stock Name	Amount Sold
AAORA	1000	ABGOL	1000
Total	1000	Total	1000

The investor in example 1 believes that AAORA is traded in attractive prices while ABGOL is overpriced (we ignore the risk aspects for these technical examples). The investor therefore constructs a simple arbitrage portfolio with only one stock in each side of the table. Similarly, it is possible to construct other portfolios where the investor buys 1-3 stocks from the list and sells 1-3 stocks from the list – with no

investing in deposit or borrowing by loans. The number of stocks purchased in the arbitrage may be different from the number of stocks sold. You are permitted, for example, to buy 1 stock while selling 3 stocks etc..

Example 2:

Stock Purchase		Stock Sale	
Stock Name	Amount Purchased	Stock Name	Amount Sold
AVNER Y	600	LOAN	1000
IGOD	400		
Total	1000	Total	1000

In example 2, the investor believes that AVNER Y and IGOD are attractive for purchase but she hesitates on choosing stocks suitable for sale. She therefore chooses to borrow the arbitrage funds (1000 NIS) in risk-free interest rate instead of selling stocks short. If the investment in AVNER Y and IGOD indeed turn profitable we would subtract the interest on the loan of 1000 (2%) to calculate the final gain from the arbitrage.

Example 3:

Stock Purchase		Stock Sale	
Stock Name	Amount Purchased	Stock Name	Amount Sold
AGARI	500	ELDAR	100
EDGAR	200	O.R.T	400
DEPOSIT	300	AUDICODES	500
Total	1000	Total	1000

In example 3, the investor believes that ELDAR, O.R.T, and AUDICODES are relatively “weak” stocks compared to AGARI and EDGAR and therefore sells the

first 3 stocks while the buying the last 2 stocks in the proportions provided in the table. The investor also chooses to invest 300 NIS in risk-free interest to decrease the risk on long-side transactions.

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More Details on the Experimental Method

In reality, arbitrage transactions are clearly more complicated. The purchase of given stocks and short sale of other stocks might affect market prices and transaction costs arise and may turn the gain from skillful selection of stocks long and short into net losses. To import this complexity into the experiment we take the following measures:

1. The buying or selling price of the stocks that you selected would be determined by the market price 1-5 days after the date where your arbitrage transactions was delivered. The exact date would be randomly determined by the program of the experiment. For example, if your portfolio was sent in 4/4/2008 then your buying and selling prices would be randomly selected for one of the days between 4/5/2008 and 4/9/2008.
2. The exact arbitrage period would also be randomly determined. The arbitrage positions (long and short) would be closed after 87-93 days – where the exact length would be randomly determined for each participant
3. An amount of 20 NIS would be subtracted from your arbitrage gain (or added to your arbitrage loss) to represent transaction costs and fees

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Actual Payment Method

At the end of the experiment we would randomly select 100 participants (henceforth: “the selected winners”) that would receive an actual payment depending on the results of their arbitrage.

Each selected winner would be randomly assigned to one of the 2 major experimental tasks: the 3 months arbitrage or the long-run arbitrage (henceforth: “the selected task”)

The payment to “selected winners” would depend on the result of the selected task. The actual payment may even exceed 200 NIS!

The complete list of participants marking the 100 “selected winners” and the type of “selected task” for each selected winner would be distributed by email at the end of the experiment – to let you control the experimental process!

The selected winners would be identified by their id numbers to preserve anonymity

The exact payment method is disclosed in the box below:

If the selected task is the 3 months arbitrage then we multiply the gain or loss from the arbitrage by 4 (to annualize the payoffs) and add or subtract the product from an initial balance of 200 NIS. Your actual payout would be equal to 0.5 of the resulting balance.

For example, if your arbitrage has produced a gain of 21 NIS, your final balance is 284 ($200+21*4$) so your check would be 142 NIS. If, on the other hand, your arbitrage was closed in a loss of 15 NIS, then your final balance is $200-4*15=140$, so your payoff for participation would be 70 NIS

Questions to the experiment-organizers?

Don't hesitate. Email NISSOY@GMAIL.COM

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Final Remarks Before Experimental Assignments

*You may retrieve detailed information on each of the stocks in the following sites:

[The Tel-Aviv Stock Exchange](#)

(link to <http://www.tase.co.il/TASE/MarketData/Stocks/MarketData/>)

[Bizportal](#)

(link to http://www.bizportal.co.il/shukhahon/sh_rezef.shtml)

[The Marker](#)

(link to <http://finance.themarker.com/>)

*The links to the 3 databases would be also available at the main page where you submit the arbitrage portfolio

* The experimental results (anonymous; identifying subjects only through their social security numbers) would be distributed by email at the end of each phase. The 3 months arbitrage results would be distributed approximately 3 months after we close the experiment for further participation. The email would provide details on the specific arbitrage selected by each participant; the gain or loss from the selected arbitrage portfolio and the actual payment to "selected winners".

* We can now proceed to the experiment itself!. The experiment consists of 4 pages. The 2 first pages are introductory task where we first attempt to characterize your level of familiarity with the Israeli market and then try to characterize your risk preferences. The final 2 pages ask you to submit your arbitrage portfolios.

*Good luck!

Task 1: Familiarity Quiz

This page presents 3 multiple-choice problems regarding the performance of the Israeli stock market over the last calendar year

In each problem, please mark the option that seems most appropriate

You have 3 minutes to complete the assignment.

The program would automatically proceed to the next phase after 180 seconds.

{The 3 problems were randomly selected by the experiment program for each participant. Each problem was randomly selected from a pool of 25 problems of similar level of difficulty; the first problem was meant to be easiest and the last one most difficult. We present one of the problems in the easiest category for illustration:

Which of the following indices earned the lowest return in 2007?

1. TA DIV20
 2. TA TECH 15
 3. TA100
 4. TA25
-

Task 2: Personal Risk Preferences

In this page we ask you to mark your choices (A or B) in 6 distinct binary choice problems

In each problem, option A represents a binary lottery – paying 2 distinct prizes with equal chances 50% for each prize. In some cases, one of the prizes is negative so the lottery may result in a loss rather than paying a positive prize. Option B, on the other

hand, always represents a given (certain) amount. We ask you to choose between option A (the lottery) and option B (the certain amount), in each of the 6 problems.

Please submit your candid choices!

Clearly, the choice between lotteries and risk-less prizes depends on the personal tastes of the decision-maker and does not admit a unique solution.

Actual Payment: At the end of the experiment we will randomly select 6 participants – one participant for each of the 6 problems and pay each of these participants a cash prize according to the choices he made in the corresponding problem. More details on the exact payment method can be found in the next link

[Link for more explanations the payment method](#)

Your actual payment would be derived from your choice between options A and B. If you selected option A, we would randomly draw the outcome of the lottery and pay you the corresponding outcome + 60 NIS. If you selected option B, your payoff would be equal to the amount stipulated in option B + 60 NIS. Consider for instance the first choice problem 1. If you have selected option A and the outcome of the lottery (which would be randomly determined by the computer) would be 200, then you would receive 260 NIS. If on the other hand, the outcome of the lottery would be 50, then your check will be for 110 NIS. If however you selected option B, your payment would be 215 NIS. Please note again that only 6 participants (one participant for each problem) – would actually be paid for the choice assignments.

Choice Problem 1:

- Option A1: (9%)

Probability	NIS
50%	200
50%	50

- Option B1: (91%)

Probability	NIS
100%	165

Choice Problem 2:

- Option A2: (30%)

Probability	NIS
50%	200
50%	50

- Option B2: (70%)

Probability	NIS
100%	125

Choice Problem 3:

- Option 3A: (93%)

Probability	NIS
50%	200
50%	50

- Option 3B: (7%)

Probability	NIS
100%	85

Choice Problem 4:

- Option A4: (12%)

Probability	NIS
50%	200
50%	-50

- Option B4: (78%)

Probability	NIS
100%	105

Choice Problem 5:

- Option A5: (37.5%)

Probability	NIS
50%	200
50%	-50

- Option B5: (62.5%)

Probability	NIS
100%	75

Choice Problem 6:

- Option A6: (90%)

Probability	NIS
50%	200
50%	-50

- Option B6: (10%)

Probability	NIS
100%	45

Task 3: Annual Arbitrage

You may now select the arbitrage portfolio for 1 calendar year:

The following databases may help your decision:

[The Tel-Aviv Stock Exchange](#)

(link to <http://www.tase.co.il/TASE/MarketData/Stocks/MarketData/>)

[Bizportal](#)

(link to http://www.bizportal.co.il/shukhahon/sh_rezef.shtml)

[The Marker](#)

(link to <http://finance.themarker.com/>)

*To reexamine the list of 220 stocks that can be selected

for the arbitrage click here:

[List of Available Stocks](#)

* Please recall that you may also deposit amounts in risk-free annual interest rate of 8%. To invest funds in risk-free interest select "DEPOSIT" in the "Stock Purchase" panel in the table below. Alternatively, you may borrow funds at the risk-free interest rate of 8%. To borrow funds please select "LOAN" in the "Stock Sell" panel in the table below.

* Please submit you transaction through the following table as demonstrated in preceding examples

[To Reexamine the Examples Click Here](#)

Stock Purchase		Stock Sale	
Stock Name	Amount Purchased	Stock Name	Amount Sold
Total	1000	Total	1000

*please recall that you may logoff the experiment and reenter later successively with no limitations

* Questions to the experiment organizers?

Email NISSOY@GMAIL.COM and we'll get back to you asap.

{ a similar separate screen was used for the 3-months arbitrage }

Final Page

Thanks you for taking part in the arbitrage experiment of the college of Management!

Few final questions to conclude the experiment:

*Could you specify the criteria that you have used to select stocks for the annual arbitrage? (mark the most appropriate box)

_____ Fundamental (economic) analysis

_____ Technical analysis

_____ Private information

_____ others?

Please explain _____

*Please estimate the chances that the arbitrage portfolio that you have constructed would generate positive payoff:

The chances – in my opinion – that the annual arbitrage would earn positive return are _____%

{ The last 2 questions were repeated, addressing the 3-months arbitrage }

*Please provide us a valid address for the next 14 months – for distributing the cash prizes

Name: _____

Street and number: _____

City: _____

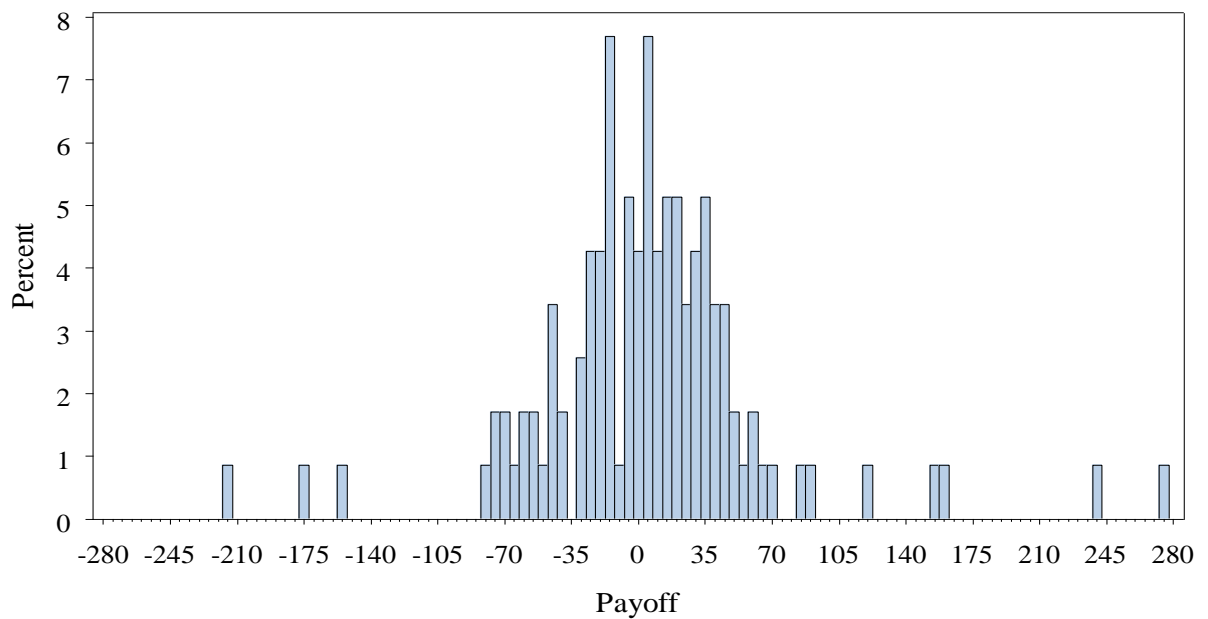
Zip code: _____

*Please write down our email address for future inquiries: NISSOY@GMAIL.COM

Thanks again for your cooperation!

Supplement A: Payoff Distribution (on 1000 NIS arbitrage)

Return on Annual Arbitrage



Supplement B:

List of Main Explanatory Variables Tested in Model Selections

TA_220 – the change in TA220 index along the annual arbitrage

DATE- Participation date (in SAS numeric representation)

AGE

GENDER- 1 for male

EXPERIENCE- years of experience holding a money-management or consulting job in the financial industry

FAMILIARITY- subjective ranking of “familiarity with the Israeli stock market (prices, returns etc)” in 1-7 scale

THEORY- subjective ranking of “theoretical knowledge in finance (academic courses, literature etc)” in 1-7 scale

EDU- Years at school (including current academic year; 12 years represent standard high-school education)

MBA- Indicator for having or pursuing MBA degree

HIGH_EDU- Indicator for $EDU \geq 16$

T(ARB)- Time spent on the 3-mon arbitrage screen (the screen where subjects submitted their transaction)

T(INTRO) – Time spent on the introductory pages 2 and 3 introducing the concept of arbitrage in expectations (we omit the other time counters that did not show significance)

TA100 – Expected change in TA100 along the annual arbitrage: **1**=increase of 20% and more **2**=increase of 10% to 20% **3**. Increase of 0 to 10% **4**. Decrease of less than 10% **5**. Decrease of 10% and more

#LOGINS – Number of logins to complete the experiment: taking the values 1 to 4 (truncated at 4)

QUIZ – Number of correct answers minus number of wrong answers in the trivia familiarity quiz (unanswered questions are counted as 0)

CONF – subjective assessment of the probability that the selected arbitrage portfolio would earn a positive payoff (separately elicited for the quarterly and annual portfolios; the current paper focuses on the annual CONF)

RISK_AVERSE – Three binary choice problems are used to assess individual risk aversion in gains domain. In Problem 1 subjects are asked to choose between a lottery paying 200 or 50 NIS with equal 50% chances and a certain payoff of 155; in the second problem the certain alternative decreased to 125; in the third problem the certain alternative decreased to 95. RISK_AVERSE denotes the number of problems where the subject preferred the lottery over the certain payoff.

LOSS_AVERSE – Three binary choice problems are used to assess individual risk/loss aversion when losses are possible. In Problem 1 subjects are asked to choose between a lottery paying +200 or -50 NIS with equal 50% chances and a certain payoff of 95; in the second problem the certain alternative decreased to 75; in the third problem the certain alternative decreased to 55. LOSS_AVERSE denotes the number of problems where the subject preferred the lottery over the certain payoff.

DEPOSIT – Amount invested in Deposit (annual arbitrage)

LOAN – Amount of loan (annual arbitrage)

IND_DEPOSIT- Indicator for investing in deposit

IND_LOAN – Indicator for borrowing funds by loan

The next table presents the mean, median and standard deviation of each variable and summarizes the results of preliminary linear (logistic) regressions on the complete list of variables specified above. The maximal level of correlation (in absolute value) between the explanatory variables included in the analysis is 0.65 – which is the correlation between “FAMILIARITY” and “THEORY”. The dependent variable in the linear regression is the return on the arbitrage in percentile form (R). The table also presents the results of the linear/logistic estimations after applying iterated backward removal of the insignificant coefficients up to the step where the all

remaining variables are statistically significant at $p < 0.1$. In the logistic regressions, negative coefficients represent a decrease in the probability of positive arbitrage return.

Variable	Mean/ Median (STD)	Preliminary Regression
TA_220	11 / 2 (32)	28.6* (20.6)
DATE	21 AUG / 3 SEP (64.3)	-0.003 (0.004)
AGE	32 / 30 (8.5)	-0.008 (0.87)
GENDER (male=1)	86% male	5.1 (18.6)
EXPERIENCE	1.95/0 (3.3)	-0.88 (2.2)
FAMILIARITY	4.5/5 (1.3)	-1.8 (6.9)
THEORY	4.5/5 (1.3)	8.2 (7.4)
EDU	16.5/17 (1.95)	1.2 (3.7)
MBA	60%	-4.5 (14.2)
T(INTRO) (in seconds)	273/180 (265)	-0.01 (0.02)
T(ARB) (in seconds)	250/119 (625)	-0.012 (0.01)
TA100	3.03/3 (1.2)	-1.5 (5.7)
# LOGINS	2.3/2 (0.99)	-0.81 (6.3)
QUIZ	-0.7/-1 (1.55)	-0.04 (4.1)
CONF	57/60 (25)	0.39* (0.26)
RISK_ AVERSION	1.3/1 (.61)	0.76 (11.2)
LOSS_ AVERSION	1.4/1 (.75)	-8.7 (9.3)
IND(DEPOSIT)	16%	-4.1 (18.2)
IND(LOAN)	22%	24.6* (17.0)
DEPOSIT	94 (262)	
LOAN	197 (384)	
R²	—	0.13

Supplement C: Measuring risk factors at the level of arbitrage portfolios

To compare risk-taking long vs. short at the level of individual portfolios we calculate a weighted average of the risk factors of stocks purchased and sold. The risk-factors on long-side purchases and short-side sales are weighted by the volume of purchase or sale correspondingly. Deposits and loans are ignored in the calculation of all weighted factors except BETA. In addition we ignore stocks with negative book-equity in the comparison of BTM and stocks with non-positive EPS in the comparison of MLP. The weighting method is illustrated by a hypothetical example: Assume the participant purchased stock X in 600 NIS and deposited the remaining 400 NIS, while selling 600 NIS of stock Y and 400 NIS of stock Z. The 4 leftmost columns of the next table provide the assumed risk factors (at the arbitrage date) for each of the 3 selected stocks. The symbol "—" is used where the risk factor is undefined for the corresponding stock/deposit (e.g., MLP is undefined when $EPS \leq 0$).

	Stock-Level Risk				Weighted Risk	
	X	Deposit	Y	Z	Long	Short
Amount invested (sold)	600	400	(600)	(400)	1000	(1000)
BETA	1.5	0	1.5	1.2	0.9	1.38
SIZE	1,000	—	2,000	800	1000	1,520
BTM	0.4	—	0.6	0.8	0.4	0.68
MLP	8	—	9	—	8	9
1[EPS<0]	0	—	0	1	0	0.4
PREV(3MON)	-5%	—	-10%	-20%	-5%	-14%

The weighted BETA long (short) is directly calculated as a volume-weighted average of the betas of stocks purchased or sold assuming BETA=0 for deposits and loans. Weighted BETA long (short) is accordingly equal to $0.6*1.5+0.4*0=0.9$ ($0.6*1.5+0.4*1.2=1.38$). The weighted SIZE factor long is 1,000 – the size of the only stock purchased by the participant.¹ The weighted SIZE short is $0.6*2,000+0.4*800=1,520$. The weighted BTM and PREV(3MON) are similarly calculated but the weighting of MLP in short-side transactions ignores stock Z which is assumed to have negative EPS. Weighted MLP long therefore equals 8 (the MLP of stock X) while weighted MLP short equals 9 (the MLP of stock Y). The proportion of negative-EPS stocks in long side transactions is 0 while the proportion of negative EPS stocks in short side transactions is $400/1000=0.4$. (The short-side weighted 1[EPS<0] would not change if the participants was borrowing 500 NIS; selling A in 300 NIS and selling B in 200 NIS, since loans and deposits are ignored throughout). The separate consideration of MLP in cases of positive EPS and 1[EPS] in cases where $EPS \leq 0$ follows the classic approach of Fama and French (1992).

¹ Weighting the SIZE of stock X by 0.6 (the proportion of total volume) is misleading. If SIZE is weighted by 0.6 the weighted SIZE factor long would be 600 while other participants that chose to buy the same stock X in 1000 NIS would show weighted SIZE long of 1000. The lower weighted SIZE of the former participant might suggest that risk-taking in terms of SIZE is stronger.

Supplement D: Example to the calculation of daily risk-premia

Consider the participant that submitted the arbitrage in MAY17.

To calculate the daily market-premia we first sort the stocks in TA220 in ascending order by their BETA for the arbitrage date MAY17.

The ids of the 6 stocks with largest and smallest BETA are disclosed at the next table where we also present the BETA (for MAY17), SIZE (for MAY17; rounded to nearest US\$) and daily return in MAY18 for each of the 6 stocks.

Long side of MARKET1- Buying the 3 stocks with highest MAY17 BETA (among TA220)				
Stock id	BETA (MAY17)	SIZE (MAY17)	MARKET1	MAY18 return
526012	3.14	113	+45%	-0.0142
434019	2.39	60	+24%	+0.0126
366013	2.34	78	+31%	-0.0168
Short side of MARKET1- Selling the 3 stocks with lowest MAY17 BETA (among TA220)				
Stock id	BETA (MAY17)	SIZE (MAY17)	MARKET1	MAY18 return
1082510	0.52	430	11%	-0.0238
1085182	0.52	27	1%	-0.0336
1101534	0.55	3358	88%	+0.00336

The relative SIZE of each stock determined the (fixed) weights of each stock in the MARKET1 arbitrage portfolio (see the column titled MARKET1). The MAY18 return on MARKET1 is then calculated directly as a SIZE-weighted average of the MAY18 returns on the stocks that composed the portfolio:

The weighted return on long-side purchases is:

$$0.45*(-0.0142\%) + 0.24*(0.0126\%) + 0.31*(-0.0168\%) = -0.086\%$$

The weighted return on short-side sales (return signs are reversed for sell-side transactions) is:

$$0.11*(0.0238\%) + 0.01*(0.0336\%) + 0.88*(-0.00336\%) = -0.000\%$$

The MAY18 weighted return on MARKET1 is therefore -0.086% (the sum of returns long and short)

The returns for the next trading days (MAY19, MAY20.. etc) are calculated similarly. Weekends and holidays where trade did not take place are ignored. The portfolios MARKET2-MARKET10 are similarly defined from the sorted TA220 list by BETA for MAY17. The (simple) average MAY18 return on the 10 portfolios MARKET1-MARKET10 is used to represent the daily market premia for the corresponding date. The daily premia for next days are calculated similarly using the same fixed

MARKET1-MARKET10 weights. The stocks in each portfolio and the weights however change with the specific DATE where each arbitrage was delivered.

Supplement E: Correlation in annual and daily risk premia

Table E.1 provides the correlations in yearly premia for the 117 portfolios

Table E.1: Correlations in yearly premia

	SIZE	BTM	MOM
MARKET	0.76	-0.49	0.72
SIZE		-0.30	0.86
BTM			-0.43

Table E.2 examines the correlation in daily risk-premia. The Pearson coefficients of correlation were separately calculated for each portfolio from the 261-271 daily observations. The mean, median and standard deviation are presented at the table. The asterisks convention is used to mark cross-section significance (by Wilcoxon test)

Table E.2: Statistics for correlations in daily risk-premia

	SIZE	BTM	MOM
MARKET	-0.47 / -0.47^{**} (0.07)	0.41 / 0.40^{**} (0.23)	0.31 / 0.47^{**} (0.49)
SIZE		0.01 / 0.01^{**} (0.27)	0.15 / 0.19^{**} (0.44)
BTM			0.20 / 0.23^{**} (0.17)

Supplement F: Results of 3 factors estimations

Results of 3 factor estimations (ignoring momentum premia; all other details are similar to the Table VII in the paper).

	ALPHA	β_{MARKET}	β_{SIZE}	β_{BTM}	R^2
Mean	0.02 ^{**}	0.07	-0.16^{**}	-0.05 [*]	0.25
Median (Standard deviation)	0.04 (0.17)	0.05 (0.58)	-0.19 (0.37)	-0.07 (0.40)	0.18 (0.21)
Proportion positive	60%	53%	36%	44%	—
Sign-test significance	p=0.02	p=0.28	p<0.01	p=0.13	—
Coefficient positive and 10% significant	5%	43%	21%	19%	—
Coefficient negative and 10% significant	2%	34%	52%	27%	—

^a Asterisks mark significance by signed-rank Wilcoxon tests

Supplement G: Results of estimations where momentum portfolios are calculated from 180 histories (instead of 90 days histories)

	ALPHA	β_{MARKET}	β_{SIZE}	β_{BTM}	β_{MOM}	R^2
Mean	0.02 ^{**}	0.03	-0.12^{**}	-0.04	-0.0002	0.32
Median (Standard deviation)	0.02 (0.20)	0.04 (0.53)	-0.12 (0.41)	0.01 (0.40)	-0.0007 (0.004)	0.29 (0.21)
Proportion positive	59%	56%	40%	47%	48%	—
Sign-test significance	p=0.03	p=0.10	p=0.02	N.S.	N.S.	—
Coefficient positive and 10% significant	5%	40%	24%	19%	26%	—
Coefficient negative and 10% significant	1%	31%	49%	28%	26%	—

^a Asterisks mark significance by signed-rank Wilcoxon tests

Supplement H: Results of estimations where BTM portfolios are calculated from BTM ratios for 12/31/2007 (independently of the specific DATE of each arbitrage)

	ALPHA	β_{MARKET}	β_{SIZE}	β_{BTM}	β_{MOM}	R ²
Mean	0.02**	0.01	-0.13**	-0.01	-0.00009	0.37
Median	0.03	0.01	-0.13	-0.07	-0.003	0.31
(Standard deviation)	(0.20)	(0.55)	(0.39)	(0.41)	(0.19)	(0.19)
Proportion positive	62%	52%	38%	45%	50%	—
Sign-test significance	p<0.01	N.S.	p<0.01	N.S.	N.S	—
Coefficient positive and 10% significant	4%	38%	21%	19%	26%	—
Coefficient negative and 10% significant	4%	32%	47%	27%	29%	—

^a Asterisks mark significance by signed-rank Wilcoxon tests

Supplement I: Results of estimations where benchmark portfolios include 9 stocks on each side (instead of 3 stocks) thereby overall covering 180 of the 220 available stocks

	ALPHA	β_{MARKET}	β_{SIZE}	β_{BTM}	β_{MOM}	R ²
Mean	0.014 [*]	0.07	-0.10 ^{**}	-0.07	-0.03	0.29
Median (Standard deviation)	0.03 (0.15)	0.11 (0.78)	-0.10 (0.60)	0.01 (0.63)	0.05 (0.86)	0.24 (0.21)
Proportion positive	59%	55%	42%	50%	56%	—
Sign-test significance	p=0.03	N.S.	p=0.05	N.S.	N.S.	—
Coefficient positive and 10% significant	5%	38%	26%	18%	26%	—
Coefficient negative and 10% significant	2%	31%	38%	28%	33%	—

^a Asterisks mark significance by signed-rank Wilcoxon tests

Supplement J: Results of estimations where MARKET returns are approximated from the daily change in TA220

(the risk free interest is ignored since this was fixed in the experiment)

	ALPHA	β_{MARKET}	β_{SIZE}	β_{BTM}	β_{MOM}	R ²
Mean	0.011 [*]	0.07	-0.10 ^{**}	-0.04	-0.00	0.18
Median (Standard deviation)	0.012 (0.14)	0.01 (0.67)	-0.06 (0.41)	-0.04 (0.44)	-0.03 (0.50)	0.14 (0.21)
Proportion positive	59%	51%	40%	45%	48%	—
Sign-test significance	p=0.06	N.S.	p=0.04	N.S.	N.S.	—
Coefficient positive and 10% significant	2%	37%	19%	23%	22%	—
Coefficient negative and 10% significant	3%	31%	36%	28%	34%	—

^a Asterisks mark significance by signed-rank Wilcoxon tests

Supplement K: Regressions with model-selection on ALPHA

We provide the final regression equation after iterated removal of insignificant effects (standard deviations in brackets). The model selection procedure (using a backwards selection option) iteratively removes explanatory variables for insignificance. The least significant effect is removed in each round and the variables that were removed in preceding iterations are tested again so that effects may be removed and reenter the repeatedly.

$$\begin{array}{l} \text{ALPHA} = 0.063 * \Delta(\text{TA220}) + 0.034 * \text{LOSS_AVERSION} + 0.013 * \text{THEORY} \\ \quad (0.045) \qquad \qquad (0.019) \qquad \qquad (0.006) \\ \quad p=0.085 \qquad \qquad p=0.04 \qquad \qquad p=0.02 \end{array}$$

Supplement L: Cross-sample comparisons of factor-estimation results

	<i>Sub-sample</i>	<i>N</i>	<i>Return</i>	α	β_M	β_S	β_{BTM}	β_{MOM}	R^2
A.1	<i>CONF</i> ≤60%	54	-5.2%	0.01	-0.02	-0.14 **	-0.01	-0.19**	.26
A.2	<i>CONF</i> >60%	51	18.7%**	0.03**	0.09**	-0.10**	-0.08	0.12*	.29
A.3	<i>CONF</i> <50%	31	-2.8%	0.03	-0.01	-0.20**	0.02	-0.15**	.24
A.4	<i>CONF</i> >75%	29	26.2%**	0.06**	-0.06	-0.12*	-0.07	0.19**	.26
B.1	<i>T(Arb)</i> >116.5	58	-1.3%	0.01	0.06	-0.19 **	-0.03	-0.02	.26
B.2	<i>T(Arb)</i> ≤116.5	59	11.9%*	0.03**	-0.00	-0.06	-0.05	0.02	.28
C.1	<i>Loss Averse</i> -	44	2.6%	0.005	0.01	-0.02	-0.07	-0.09*	.27
C.2	<i>Loss Averse</i> +	73	6.8%	0.03**	0.04	-0.18 **	-0.02	0.05	.28
D.1	<i>Theory</i> ≤4	55	-1.5%	0.02*	0.02	-0.10**	-0.10**	-0.03	.26
D.2	<i>Theory</i> ≥5	62	11.2%	0.02*	0.03	-0.14 **	0.01	0.02	.29
E.1	<i>Familiarity</i> ≤4	53	1.8%	0.02*	-0.06	-0.10**	-0.08**	-0.09**	.28
E.2	<i>Familiarity</i> ≥5	64	8.1%	0.02	0.11**	-0.14 **	-0.01	0.08	.27
F.1	<i>Investment pro</i>	24	14.4%*	0.033	0.09	-0.24 **	0.14**	0.10	.24
F.2	<i>Others</i>	93	2.9%	0.016*	0.01	-0.09**	-0.09 **	-0.03	.28
G.1	<i>Fundamental</i>	56	9.8%	0.016	0.06	-0.14 **	-0.03	0.10*	.29
G.2	<i>Technical</i>	19	-2.4%	0.037	0.03	-0.14 *	-0.04	-0.09*	.32
H.1	<i>MBA</i>	70	7.7%	0.02*	-0.05	-0.10**	-0.06	-0.026	.30
H.2	<i>Others</i>	47	1.5%	0.02	0.15**	-0.15 **	-0.01	0.035	.24
J.1	<i>AGE</i> <30	56	5.0%	0.02*	0.05	-0.18 **	-0.08**	0.04	.29
J.2	<i>AGE</i> ≥30	61	5.5%	0.02	0.01	-0.07 **	-0.01	-0.04	.26
I.1	<i>TA220</i> ≥0	61	10.5%	0.03 **	0.06	-0.17 **	-0.07*	0.12**	.32
I.2	<i>TA220</i> <0	56	-0.5%	0.01	-0.01	-0.07	-0.01	-0.13 **	.22

Single asterisk * is used to denote significance at $0.05 < p \leq 0.1$; two asterisks ** denote significance at $p < 0.05$; bolded figures denote cases where $p < 0.01$. In each horizontal panel (A-I) dark shading is used to denote cases where a Pitman rejects the equality of statistics across the sample at $t < 0.05$; weak grey shading is used for cases where $0.05 < p < 0.1$.