THE "OSTRICH EFFECT" AND THE RELATIONSHIP BETWEEN THE LIQUIDITY AND THE YIELDS OF FINANCIAL ASSETS*

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Abstract

This paper documents that government T-bills provided a higher yield to maturity than an equally risky illiquid asset (bank deposits) in Israel. The difference between the return on the liquid asset relative to the illiquid asset is higher in periods of greater uncertainty. This cannot be attributed to taxes, risk or transaction costs. We suggest that the observed puzzle is due to the positive correlation between liquidity and the flow of market information. We use the term "Ostrich Effect", to describe investor behavior, since ostriches are believed to treat apparently risky situations by pretending they do not exist.

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I. Introduction

The liquidity of financial assets occupies center stage in the literature of market microstructure. Several recent studies that deal with the impact of liquidity on the prices of financial assets attest to the positive correlation between liquidity and prices. The main finding of this literature is that illiquidity has an adverse effect on asset value. This finding is consistent with the rational pricing of financial assets. When compared with an otherwise-identical illiquid asset, a liquid asset should have a lower yield to maturity, given the opportunity to liquidate the position at any time and the possibility (albeit remote) to realize even a larger return in the market without risking the locked-in return if held to maturity.

Amihud and Mendelson [1991], for example, demonstrate that less liquid T-notes carry a higher return to maturity (or lower price) than more liquid T-bills with the same maturity. Silber [1991] shows that letter stocks (restricted stocks) are typically placed privately at 30-35% discount on otherwise identical stocks. Kadlec and McConnell [1994] document the liquidity effect with respect to exchange listings. Amihud, Mendelson and Lauterbach [1997] document the liquidity effect with respect to the trading systems, and Brenner, Eldor and Hauser [2001] document that non-negotiable options are priced some 21% lower than publicly-traded options. We can conclude that all the above-mentioned studies indicate that investors demand compensation for illiquidity.

Behavioral financial economics is an emerging field of research.[1] Behavioral finance claims that some financial and economic phenomena can be plausibly understood, even when certain agents are not fully rational. Thaler [1999] defines mental accounting as the set of cognitive operations used by individuals and

[1] For a survey of the literature see Barberis and Thaler [2002].

households to organize, evaluate, and track financial activities. One well- documented phenomenon related to mental accounting and financial markets is the disposition effect i.e. the reluctance of people to sell securities that have declined in value.[2] One of the three components of mental accounting relates to the frequency with which accounts are evaluated. Within this literature we focus on Myopic Loss Aversion.

Myopic Loss Aversion (MLA) as described in Benartzi and Thaler [1995] describes the process of mental accounting as it relates to the flow of information with the tendency of individuals to be more sensitive to reduction in their levels of well-being than to increases (loss aversion).

MLA predicts that the dynamic aggregation rules of investors influence their attitude toward risk. In particular, the frequency by which the information is presented, can affect an investor's appetite for risk. Too frequent reporting leads to the choice of less risky portfolios. Thaler, Schwartz, Kahneman, and Tversky [1997] and Gneezy and Potters [1997] document the findings of experiments that affirm that participants who receive the most frequent feedback (and thus the most information) tend to take the least risky positions and earn the least amount of money. Benartzi and Thaler [1999], report that pension fund members who are shown multi-annual distributions rather than annual information are willing to undertake greater risk. An experimental paper by Gneezy, Kapteyn and Potters [2003] documents that market prices of risky assets are significantly higher if feedback frequency and decision flexibility are reduced.

We add to the existing literature on the liquidity and the pricing of financial assets as well as to the literature on behavioral financial economics, and myopic loss aversion by providing field data indicating that investors prefer to hold illiquid asset

[2] See for example Shefrin and Statman [1987] and Odean [1998]. Shapira and Venezia [2000] document the existence of the disposition effect in Israel.

and are willing to pay premium for them. We attribute this seemingly anomalous behavior to aversion to receiving information on potential interim losses.

We empirically examine the relationship between the interest rate on one-year treasury bills ("*Makam*"), that are traded on the Tel Aviv Stock Exchange, and interest rates on one-year time deposits (the illiquid asset) offered by commercial banks in Israel.[3] It is important to note that the "*Makam*" is considered the most liquid financial asset in Israel, while the one-year time deposits cannot be withdrawn prior to maturity without substantial penalty.[4] Our research was conducted during the period February 2, 1999 to November 8, 2002 (182 weekly observations), and is based on data compiled from the Bank of Israel, Ministry of Finance and two large commercial banks. [5]

We find that one-year deposits during the study period offered lower interest rates than the more liquid one-year treasury bills.[6] The rate differential between the two equivalent instruments is statistically significant. This continues to hold even when we take into account a reasonable level of transaction costs related to the

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[3]Treasury bills *("Makam")* are government securities issued by the Bank of Israel. They constitute one of the instruments whereby the Bank implements monetary policy in order to attain the long - term inflation targets set by the government. Treasury bills are non-linked zero-coupon bonds issued for periods of up to a year. They are sold and traded at discount and redeemed at par value. Capital gains on *"Makam"* investments were tax-exempt for individual investors during the research period.

[4]We have discussed the penalties attributed to premature withdrawal of time deposits with bank officials. One official informed us that it is up to the bank's discretion to decide whether to approve early withdrawal. Usually, if there were no major changes in the interest rates since the initial deposit was made, the bank will allow withdrawal of the deposit. In case of substantial changes in the interest rates since initial deposit, the bank will be willing to provide a loan to the deposit holder until the maturity of the deposit. Another official from another commercial bank informed us that the bank uses a computer program to calculate the level of the penalty, taking into account market conditions, time to maturity and deposit rates. In either case, the deposit holder may lose part of the principal as a result of early withdrawal.

[5] Gneezy, Kapteyn and Potters [2003] emphasize the importance of providing such evidence; " If this finding is replicated in other experiments and by research based on real data, it may have profound implications for the way we model prices in financial markets"

[6] We provide an example showing that the gap in the returns as described in Israel, can also be exhibited in the U.S. On a randomly selected day (21) of February 2005, the rates for one year and 6 month time deposits offered over the internet by 6 different US banks (Bank One ,Bank of America, Citibank, Wells Fargo, Zion and Chase Manhattan) for deposits of $50,000 were all below the T-bills rates quoted by Pamco that day for the same relevant maturity.

acquisition and holding of the treasury bills. We cannot attribute these findings to tax explanations since, during the period under investigation, investors in both financial instruments paid the same tax rate on both investments. Nor can, risk explain the anomaly, since bank deposits are, if anything, riskier than the short-term government bills. Instead, we relate the difference in rates to Myopic Loss Aversion, and name the observed behavior "The Ostrich Effect". According to legend, ostriches avoid risky situation by burying its head in the sand, pretending that the hazard does not exist if it does not see it.

In the context of this paper, the "Ostrich Effect" is defined as avoiding apparently risky financial situations by pretending they do not exist. This explanation suggests, that since deposits are not marked to market, loss averse investors are able to ignore the market information, which suggests risk, even though the perceived risk is misleading. Thaler [1999] uses an example of a poker player who never counts his money while sitting at the table. By so doing, interim information regarding performance will not affect the gambler's desire to continue.

The documented difference in returns suggests that when faced with uncertain investments, some individuals prefer investments where the risk is unreported, over similar investments (from the standpoint of risk-return) where the risks are frequently reported. In more concrete terms: if an investor is faced by an investment opportunity in a publicly traded government bill, for which the price is reported on a daily basis, or alternatively, to invest in a bank deposit (whose outcome is not marked to market), the myopic loss averse investor may prefer the bank deposit.

Unlike the documented literature that compares the choices between high and low risk investments, we compare investments with a similar level of risk. According to our findings, investors show preferences (even at cost) to investments with

performance which is less frequency reported and, when reported, is not marked to market.

Alternatively, or in addition to the "Ostrich Effect" suggested here, one may argue that the difference between returns on treasury bills and deposits is not driven by behavioral explanation but rather can be explained by the additional services clients receive from the bank. One may argue that this puzzle is due to the banks' marketing efforts, or that the participation in the financial markets involves high learning costs for small investors.

These alternative explanations should be impervious to financial market developments. The difference between the two rates would remain constant over time, regardless of the level of uncertainty in financial markets. In contrast the "Ostrich Effect, would be more prevalent as uncertainty in the market grows, since "myopic loss averse" investors, who prefer not to be exposed to unpleasant market information, would increase their demand for the non-negotiable asset. The loss averse investor would prefer to see the deposit notices that are always reported as gains, and can easily ignore the implications of alternative market returns, or the mark- to- market value of his deposits since these are not directly reported on account statements.

In order to support the behavioral explanation, we show not only that deposits offer lower interest rates in general, but also, that the difference between these and T-bill rates is larger during times of greater uncertainty. We adopt several proxies for financial market uncertainty: 1) estimates of expected inflation, as calculated by the Bank of Israel from bonds traded on the Tel Aviv Stock Exchange, 2) the implied volatility on exchange rate options, 3) the implied volatility of the TA-25 stock

market index [7], 4) and the level of annualized Yield to Maturities of the "*Makam*" T-Bills. We found that the differential between interest rates on illiquid bank deposits and the yield to maturity on T-Bills did vary over time in a manner consistent with the Ostrich Effect.

We cannot reject the null hypothesis that the level and changes of the difference, between the rate of return on the "*Makam*" and bank deposit rates is Granger caused by different proxies of uncertainty.[8] We also find that changes in the various proxies of uncertainty are positively related to changes in the difference between the T-bill rates and the deposits rates[9] and their explanatory power is relatively high (very significant F value, and, Adj R^2 of 0.4).

It is important to note that the aim of our paper is not to challenge the relationship between low liquidity and higher return premiums in general, but, rather to reconcile a specific case in which this widely- documented relationship does not hold with existing knowledge on the subject. Furthermore, we do not claim that the explanation presented here constitutes the sole explanation to the phenomena. The alternative explanations are not mutually exclusive, and it is highly plausible that several factors come into play. Our findings indicate, however, that investor reaction to uncertainty seems to play a significant role in explaining the enigmatic

[7] The TA-25, (previously referred to as the Maof index), the Tel Aviv Stock Exchange's most closely-tracked index, comprises the 25 largest companies, measured by market capitalization. It is a weighted index with certain adjustments. The weights of the largest shares are capped at 9.5%, and the relative weights of the remaining shares are adjusted accordingly. TA- 25 companies account for more than 50% of the Exchange's total market capitalization.

[8] We also find that we cannot reject the hypothesis that the interest rates (on the two different sizes of deposits) are Granger caused (estimated at 4 lags) by the "*Makam"* returns at 5% level. The opposite relationship (the "*Makam"* rate is Granger caused by the deposits rates) is not statistically significant at 5% level.

[9] The estimated coefficients of the percentage changes in the per annum yield on the *"Makam"* and the inflation expectations of the Monetary Department significantly differ from zero at a 5% level. Changes in the implied volatility of the stock market (TA-25) are statistically significant only at a 10% significance level.

phenomenon of higher returns for negotiable government bills compared with the non-negotiable bank deposits.

In section 2 of the paper we outline the data. Section 3 is dedicated to documenting the respective returns for treasury bills and time deposits. Description of the "Ostrich Effect" including supportive evidence is presented in section 4. Section 5 concludes the paper with a discussion of our findings.

II. Description of Data

Our study is based on financial data from Israel's capital market. The period examined, February 2, 1999 to November 8, 2002 includes 182 weekly observations. Data on the rates of the illiquid asset, the one-year deposit, were obtained directly from two of the three largest commercial banks in Israel.[10] These rates are quoted on a weekly basis relate to two levels of deposits sizes: NIS 50,000 – 100,000 and NIS 100,000-500,000.[11] The data series is a simple average of the two offered deposit rates for each date and each type of deposit size (Figure I). The mean of the NIS 50,000-100,000 deposit rate series during the period of investigation is 7.44% with a standard deviation (STD) of 2.37%. The mean of the NIS 100,000-500,000 Shekels deposit rate series during the period under investigation is 7.73% with STD equal to 2.29%.

The liquid asset is represented by the yield to maturity on one-year Israeli government treasury bills – "*Makam*" (Figure I). The data were obtained from the Bank of Israel, Israel's central bank. The "*Makam*" is considered the most liquid asset issued by the Israeli government.[12] There is no effective size limitations that prohibit small investors from participating in this market. The mean of the *"Makam*" yields to maturity during the study period is 8.47% with STD equals to 2.13%.

[10] The banking system in Israel is relatively highly concentrated (the H-index of the total balance sheet was 0.226 at the end of 2001.) Most of the banking activity is conducted among three large banks. (For elaborated description of the banking industry in Israel during the period of investigation, see the Bank of Israel *Report on the Banking System 2001*.).

[11] The New Israeli Shekel (NIS) is the Israeli currency. During the period of investigation, on average $1 was roughly equivalent to 4.5 NIS.

[12] According to the TASE the daily turnover of "*Makam"* treasury bills averaged $78 million in 2002, while total bond volume came to $159 million and total shares and convertible securities amounted to $51 million.

[Figure I]

[The Relationship between the "Makam" Rates, the 50,000-100,000 and the 100,000-500,000 Quoted Deposit Rates]

We find that we cannot reject the hypotheses that the deposits annual rates Rs_t or Rl_t (or the percentage changes of Rs_t and Rl_t, where, subscripts s and l denote small and large accounts, respectively) are Granger caused (estimated at 4 lags) by the "*Makam"* yearly returns (or the percentage change of Rm_t) at 5% level (P values less than 0.000 for all cases). Yet, the opposite relationship of causality between the "*Makam*" and deposit rates, is not statistically significant at a 5% level (P values of 0.08, 0.27 and 0.62, 0.98 respectively). Hence, we cannot reject the hypothesis that the market-based T-bill rate, leads the bank rate on a 1-year deposit.

As proxies for uncertainty we have chosen several time series. First, we use the changes in the expected annual inflation as calculated by the Bank of Israel, derived from market prices of notes and bonds traded on the Tel Aviv Stock Exchange. In addition, we employ two estimators of implied volatility of the exchange rate between the Israeli shekel and the U.S dollar, and one estimator of the implied volatility of the stock market (the "TA-25" index). Since the fluctuations of T-bill rates also reflects uncertainties stemming from the inflation rate and the monetary policy of the Bank of Israel, we use the change and the level of the one-year "*Makam*" yield to maturity as another proxy for uncertainty.

The indicator of expected inflation is calculated by the Bank of Israel's Research Department. The inflation indicators are derived from information concerning relative interest rates on non-linked and CPI-linked bonds traded on the

Tel Aviv Stock Exchange.[13] The implied volatility of options on the TA-25 stock index is calculated by the research department of one of Israel's large commercial bank. It is the average of the implied volatilities derived from the Black-Scholes option pricing model for all index calls and puts traded on the Tel Aviv Stock Exchange at the date of the calculation.

The implied volatility series of call options on NIS-dollar exchange rates was calculated by the Foreign Currency Department at the Bank of Israel.[14] The first volatility indicator is the average of the implied volatilities of all the call contracts that were traded on the day examined, while the second represents the implied volatility of the "closest- to- the- money" call series. Due to the high correlation between the two measures (0.77) we will report the results using one of the measures.

[13] The calculation methods are based on the Fisher model, in which expected inflation is approximately equal to the difference between nominal and real interest rates. Here the expected inflation rate is calculated from the difference between returns on non-linked T-bill and CPI-linked bonds for the same time to maturity with additional modifications. The calculation is described in Yariv [1995] and Amir [1995]. To check robustness , we use an additional estimator provided by the Research Department of the Bank of Israel. There are slight differences between the two estimators, yet, they are highly correlated (0.97), and the empirical results remain unaffected.

[14] For a more detailed discussion on the calculation of implied volatility, see Galai and Schreiber [2003].

III. The Observed Phenomenon: Anomalous Higher Yields on Liquid Assets

Figure I illustrates interest rate fluctuations for both small and large bank time deposits (Rs and R1) and for "*Makam"* treasury bills. The graph clearly indicates that with rare exception, the yield to maturity on the "*Makam"* (Rm) exceeded quoted rates for non-negotiable bank deposits, (large and small) throughout the entire study period. To examine the statistical significance of this difference we analyzed the difference between the "*Makam*" and the deposit rates based on weekly data.

We define the difference Di, (i=s,l) as follows:

$Ds_t = Rm_t - Rs_t$

$Dl_t = Rm_t - Rl_t$

We find that the mean of Ds_t is 1.02% and is significantly different from zero (t=24.8). Moreover, it was never negative during the entire investigated period. The mean of Dl_t is 0.73% and it is significantly different from zero as well (t=22.5). As a result we can conclude that the return on the "*Makam"* is significantly higher than the quoted return on the banks' deposits. Hence, while apparently anomalous, this phenomenon is not spurious and has persisted in the Israeli market for almost four years. The series of $Di,_t$ i=s,l are presented in Figure II.

[Figure II]

[The Difference between Yields on the Liquid Asset and the Illiquid Asset]

The above analysis ignores the fact that as traded securities, the investment in the "*Makam"* treasury bills is subject to broker commissions and fees. In Israel the transaction costs for buying and holding the "*Makam"* are:

1. Commission at purchase – this transaction cost is calculated as a specific percentage of the size of the executed order. During the study period, commissions for purchasing "*Makam"* were 0.05%-0.15%, depending on the size of the transaction and the bargaining power of the buyer.[15]
2. Custodial fees – this transaction cost is calculated as a percentage of the value of the portfolio and is charged on a quarterly basis, based on the average market value of the portfolio. During the period under investigation, the going rate ranged between 0%-0.5% per annum for portfolios exceeding NIS 50,000.
3. Maturity fees – This transaction cost is calculated upon expiration of the "*Makam"* as a percentage of the "*Makam"* value. During the period being examined, these fees were approximately 0.0%-0.1%.

In order to check if transaction costs explain the gap between Rm_t and Ri_t, i=s,l we loaded 0.6% total transaction cost.[16]

Specifically:

$Es_t = [Rm_t - 0.6\%] - Rs_t$

$El_t = [Rm_t - 0.6\%] - Rl_t$

[15] The cost associated with the bid-ask spread is negligible.

[16] Savvy clients can get interest rates quotes on deposits that are higher than publicly quoted rates, but these same investors will also likely receive discounts on *"Makam"* transaction costs. Also, it should be noted, that the Bank of Israel, in its studies of the "*Makam"* rate, assumes total commissions of 0.5%.

We find that the mean of Es_t is 0.43% and significantly differs from zero (t=10.34).[17] The mean of El_t is 0.13% and it is significantly differs from zero as well (t=4.11).

[17] We can assume 0.9% transaction cost and still receive a statistically significant differential (t=3.12).

IV. The Ostrich Effect

Having documented the seeming preference for the less liquid asset, controlling for potential transaction costs, we now turn to identifying the factors that affect the size of the yield differential on the two money market instruments. We cannot attribute our findings to tax explanations, since both financial instruments are taxed at the same rate. Individual investors were exempt from taxes on both the bills and the bank deposits. Risk cannot explain this either, since, if anything, bank deposits are riskier than government T-bills.

4.1 The Ostrich Effect and Uncertainty in Financial Markets

Drawing on insights from behavioral finance, more specifically, to the mental accounting literature, we provide an explanation for the observed anomaly, which we call: "The Ostrich Effect". We define the "Ostrich Effect" as avoiding apparently risky situations by pretending they do not exist. It is observed that certain individuals, when faced with uncertain investments, prefer investments for which the risk is unreported, over a similar investment (as far as risk and return are concerned) for which the risks are frequently reported. In more concrete terms: if a "loss-averse" investor is faced by an investment opportunity in a traded government bond, where the price is reported on a daily basis, or alternatively, to invest in a non-negotiable bank deposit for the same term, the "Ostrich Effect" predicts that he/she will tend to prefer the bank deposit, especially during periods of increased uncertainty.

In order to support this explanation we investigate if there is a Granger causality between the illiquidity premium and the degree of market uncertainty during

the sample period.[18] We employ several proxies for uncertainty: an estimator of expected inflation (Inf_m), the annual return of the "*Makam"*[19], two indicators of implied volatility derived from exchange rate options (ISD_A and ISD_4), and finally, the implied volatility of the stock market (ISD_M).

[Figure III A and B]

[3-A Granger Causality of the Differential between the "*Makam"* and the Deposits Quoted Rates]

[3-B Granger Causality of the Differential between the "*Makam"* and the Deposits Quoted Rates]

The evidence indicates that we cannot reject that the negative illiquidity premium is granger caused by some of the proxies for financial uncertainty. We cannot reject (see Figure III-A) that Dl_t and Ds_t are Granger caused by the Rm_t and by the expected inflation rate at a 5% level. Graphical description of the *"Makam"* series and the Dl_t series is presented in Figure IV. We reject that Dl_t and Ds_t are Granger caused by the implied volatility of either the stock market or the exchange rate. We cannot reject (see Figure III-B) that the percentage changes of Dl_t and Ds_t (ΔDl_t and ΔDs_t) are Granger caused by the percentage changes of the *"Makam"* return (ΔRm_t), by the percentage changes of the expected inflation rate (ΔInf_m_t) and by the percentage changes of the implied volatility of the exchange rate (ΔISD_A_t) at 10% level. We reject that they are caused by the implied volatility of the stock market (ΔISD_M_t) and additional measure of implied volatility of the exchange rate (ΔISD_4_t).

[18] Israel is a well suited for studies on the effects of uncertainty since, given its specific characteristics, uncertainty measures exhibit variation even in a relatively short period of time.

[19] To check robustness, we also use the interest on the monetary loans that the Bank of Israel provides the banking industry. The key findings of the Granger Causality test remain unchanged.

[Figure IV]

["*Makam*" Yields versus the Liquid and Illiquid Asset Returns Differentials]

We estimate the linear regression:

$$\Delta Ds_t = \alpha + \beta_1 \Delta Rm_t + \beta_2 \Delta Inf\_M_t + \beta_3 \Delta ISD\_A_t \text{ (or } \Delta ISD\_4) + \beta_4 \Delta ISD\_M_t + \mu$$

We find support for the hypothesis that the differential between yields on the liquid and illiquid asset is positively correlated to changes in market uncertainty. Regardless of the specific choice of the parameters, the estimated multivariate model is statistically significant and explains about 40% of the change in the ΔDs_t. All variables are positively correlated to ΔDs_t and the ΔRm_t and Δinf_m_t are statistically significant at 5% level.[20],[21]

We find a very strong, positive relationship between ΔDs_t and the change in the "*Makam"* rate (see Figure IV). An example that demonstrates the relationship between changes in the "*Makam"* rate and the difference between "*Makam"* YTMs and interest rates on term deposits, can be found in mid-June, 2002. The "*Makam"* rate increased sharply in one week from 8.56% to 9.85%. During this period interest on deposits climbed from 5.825% to 6.6%, an absolute and relative change that is significantly smaller than the change in the "*Makam"* rate. During this period the percentage change in both the "*Makam"* rate and the difference between the "*Makam"* and the deposit rate were positive

The change in the inflation and the implied volatility of the stock market also contributes to explaining ΔDs_t. Findings for implied volatility of the exchange rate

[20] The coefficient of the changes in the implied volatility of the stock market (TA-25) is significantly different from zero at about 10% level.

[21] The major findings of our investigation remain unchanged when we replace the changes of the *"Makam"* yield variable with the changes of the rate on the monetary loans. The coefficient of the rate of the monetary loans is highly significant different from zero. The model is highly significant (F=9.45), yet, the Adj R^2 is lower (0.16).

were statistically insignificant. Our findings are summarized in Table 1, below. We can conclude that during periods of greater uncertainty, the differential is greater and "loss averse" investors appear to be paying a higher premium to ignore risk.

[Table 1]

[Linear Regression – Do Uncertainty Proxies Affect the Percentage Changes in the level of Ds?]

4.2 Evaluating Alternative Potential Explanations

In this section we evaluate additional potential explanations for the higher return on the "*Makam"* compared with the yearly time deposit rate. We do not claim that the Ostrich Effect is the sole explanation for this difference. Yet, it is the only explanation that we are aware of, that is consistent with the finding of a positive correlation between the negative liquidity premium and financial market uncertainty.

Alternative possible explanations include:

The first claim is that holding sufficiently large sums of money with the bank qualifies one for fee waivers for many of the bank services. Thus the services may be "priced in" by the banks in to the yield differential. However, although large deposit customers in Israel receive discounts on other services, holders of large securities accounts qualify for similar type of discounts.[22] In addition, these discounts should not be greater when the level of uncertainty in the financial markets is higher.

The second claim has to do with the notion of convenience. To hold T-bills one presumably needs an account with a brokerage firm. If the person does not have an account already, then, there are some fixed costs to open such an account. For customers with relatively small holdings of time deposits, it may be simply a matter

[22] The large commercial banks in Israel are also the major brokers, and most of the accounts with T-bills are held in bank accounts.

of convenience to go with the bank where they already have a current account. Knowing this, banks may charge a "convenience" yield differential. It is important to note that most of the brokerage activities are conducted in Israel through banks. Many of the customers with current accounts, have securities accounts with the same banks as well. In addition, we focus on time deposits at sizes between $10,000 and over $100,000. Hence, it is more likely that for these customers the initiation costs are small compared with the additional return that they may earn. Moreover, it is unlikely that this cost is substantially higher when the uncertainty in financial markets is greater.

A third possible claim is that banks are marketing aggressively their time deposits to clients rather than the T-bills. This may be true for small clients. Yet, this claim is less appropriate for medium - to - large clients. The T-bills are traded daily at relatively large volume and their returns appear in the daily newspapers. Once again, however, this claim is inconsistent with the observed changes in premiums apparently linked to market uncertainty.

A fourth explanation is the behavioral explanation of "framing", namely the labels that are used to describe a financial product can make a big difference. The names (in Hebrew) of the two financial products, the time deposit and the T-bills, are known by their initials (*"Pakam"* and *"Makam*" respectively) and therefore their labels do not provide any additional indication that one is safer than the other. Furthermore, the claim is inconsistent with the observed changes in the premiums over time, which is correlated to market uncertainty.

To sum, these are indeed potential relevant explanations to the returns differential but we believe that their explanatory power is limited and they cannot explain fluctuations in the premiums investors appear willing to pay for illiquid

investments. Hence, we view these explanations as complementing rather than supplementing the behavioral explanation suggested here.

4.3 Additional Supportive Evidence

The "Ostrich Effect" consists of two components. The first is the tendency of investors to avoid unpleasant information, and the second, is the effect of such behavior on prices in the financial markets. In this section we provide and cite supportive complementary evidence regarding the "Ostrich Effect" from other countries and other financial assets.

Support for the "Ostrich Effect" behavior can be found in different types of financial markets and countries as demonstrated in the work of Karlsson, Loewenstein and Seppi (2004) that use Scandinavian data (three different sources) to investigate the frequency that investors check their portfolio value. They documented that investors check their portfolio value more frequently in "bull" markets than in falling "bear" markets. Czarnitzki and Stastmann, (2005) documented that during 1996-2002, the sales of "Boerse Online", the leading German investor magazine were positively correlated with the German DAX index.[23] Consistent with the "Ostrich Effect", these findings document that investors prefer to avoid potential unpleasant financial information. Yet, these findings do not document the effect of such behavior on the price dynamics observed in the financial market, which is the focus of the investigation of the returns gap.

For robustness, we also provide an example that the gap in the returns that was described in Israel can be observed in the U.S as well. We randomly selected a

[23] We find that during the period January to June 2004 the daily average percentage change in the amount of entries, to one of the leading Israeli financial portals was on average positive on days that the leading Tel-Aviv Stock Exchange equity index, "the Maof", increased and on average negative on the days that the "Maof" decreased, yet, the difference was not statistically significant.

business working day during February 2005 and six different well known U.S banks (Bank One, Bank of America, Citibank, Wells Fargo, Zion and Chase Manhattan).[24] Via the internet, we checked what rates these banks offer to investors willing to invest $50,000 in fixed rate, time deposits for 6 months and for one year. At the same time, via the internet, we also checked the T-bills rates at the secondary market quoted by Pamco[25] for the relevant time to maturity (6 months and one year respectively). We also called e-trade and Charles Schwab to learn about potential transaction costs associated with the purchase of T-bills in the secondary markets.[26] We found that all the deposit rates offered by the banks examined were below the equivalent T-bill rate on that date[27]. The minimum gap was 0.64% (0.28%) for the 6 months (one year) to maturity and the maximum gap was 1.13% (0.91%) for the 6 months (one year) to maturity.[28],[29]

Last, we would like to note that we had many informal discussions with participants in the financial markets in Israel that confirmed the "Ostrich Effect behavior.

[24] Some of the banks' hompages required us to choose specific state or location. For Bank One, we choose Rochester NY, for Wells Fargo, the state of Utah, for Bank of America, the state of Florida and for Chase Manhattan we choose Manhattan.
[25] http://www.treasuries.com/
[26] Taxes will not negatively affect our results.
[27] Even after controlling for T-bills potential purchasing costs.
[28] Following the first check, we repeated this exercise for two more business days during the second part of February and the qualitative results remained unchanged. The return-to-maturity of the T-bills was higher than all the rates that were offered by all 6 banks examined.
[29] We acknowledge that the documented gap in the U.S can be consistent with additional potential explanations. Since in the U.S there is institutional separation between bank deposits and securities accounts, investors maybe willing to invest in inferior bank deposits for different reasons such as convenience and loyalty.

V. Conclusions

In this paper we document a rather puzzling phenomena in which the yield-to-maturity on T-bills liquid asset were consistently higher than the quoted interest rate on illiquid one year bank time deposits . Drawing on insights from behavioral finance (MLA), we suggest a potential explanation, which we call “Ostrich Effect”. We suggest that the observed phenomenon is due to the positive relationship between liquidity and the preponderance of market information. Individuals, who are faced with uncertain investments, prefer an investment where the risk is unreported, over an investment with a similar risk-return profile for which the risks are frequently reported. We document that the positive differential between the "*Makam"* yields and the quoted interest rates on bank deposits is correlated with market uncertainty. Using several proxies for financial market uncertainty, we find that as uncertainty increases, so increases the premium investors are willing to pay for ‘the bliss of ignorance’. Our results are consistent with the previous MLA literature, which documents the affects of ‘loss aversion’ on the investment decision making process under uncertainty. We provide and cite additional supportive evidence for the existence of the “Ostrich Effect”.

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Table 1

Linear Regression – Do Uncertainty Proxies Affect the Percentage Changes in the level of Ds?

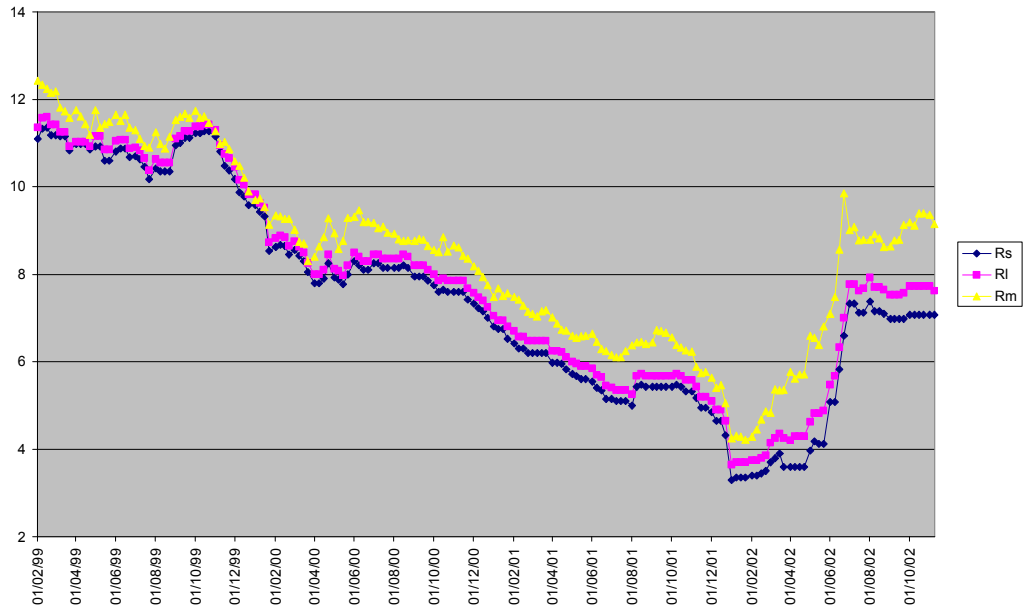
We present two different OLS estimates of the correlation between the percentage change of the differential between the yields of liquid and the illiquid assets and the changes in the proxies for uncertainty. THE DEPENDENT VARIABLES: During the period February 2, 1999 to November 8, 2002 (182 observations) for each weekly observation (t), we calculated the values of Ds that is defined as the difference between the "Makam" (liquid asset) yearly rates and the and the yearly 50,000-100,000 deposit size quoted (illiquid asset) rates. Then we calculated the percentage change from t to t-1. THE INDEPENDENT VARIABLES (proxies for uncertainty): ΔRm is the percentage changes in the Makam yearly rate of return, , ΔINF_M is the percentage change in the yearly expected inflation rate as calculated by the Monetary Department of the Bank of Israel, ΔISD_A is the percentage changes in the average of the implied volatility of all the call options on the exchange rate that were traded at the Tel-Aviv Stock Exchange at time t, ΔISD_4 percentage changes in the average of the implied volatility of the four options on the exchange rate that are the closest to be at the money that were traded at the Tel-Aviv Stock Exchange at time t, The implied volatility of the option on the TA-25 (stock index), ΔISD_M, is calculated by the research department of a large commercial bank in Israel. It is the average of the implied volatilities for all Calls and Puts traded on the Tel Aviv Stock Exchange at the date of the calculation. The t-values are presented in parenthesis. We also present the adjusted R squared (Adj R^2), the Durbin-Watson statistics the values of the F test with the respective P values.

Coefficient of	1	2
C	0.014 (t=1.101)	0.014 (t=1.103)
ΔRm	0.496 (t=9.192)	0.498 (t=9.212)
ΔINF_M	0.043 (t=2.009)	0.048 (t=2.312)
ΔISD_A	----	0.324 (t=0.248)
ΔISD_4	0.973 (t=0.901)	
ΔISD_M	0.008 (t=1.618)	0.007 (t=1.573)
Adj R^2	0.412	0.409
Durbin-Watson stat	2.248	2.243
F-statistic	32.480	32.155
Prob(F-statistic)	0.000	0.000

Figure I

The Relationship between the "Makam" Rates, the 50,000-100,000 and the 100,000-500,000 Quoted Deposit Rates

This figure shows the level of the (Rm) annualized Yield to Maturity (in percentage) on one-year *Makam T-bills*, quoted interest rates for NIS 50,000-100,000 bank deposits (Rs) and NIS 100,000-500,000 deposits (Rl) for the period February 2, 1999 to November 8, 2002 (182 weekly observations). The table below describes the mean, minimum, maximum and standard deviation of each of these series.



Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation
Rs	3.3	11.4	7.437	2.3680
Rl	3.65	11.60	7.7328	2.2898
Rm	4.22	12.44	8.4669	2.1344

Figure II

The Difference between Yields on the Liquid Asset and the Illiquid Asset

This figure shows the level of the differential (in percentage) between the yield on *Makam* (liquid) and the annual interest on NIS 50,000-100,000 deposits (illiquid) rates (Ds) and the differential (in percentage) between the yield on *Makam* rates and the interest on NIS 100,000-500,000 deposits (Dl) during the period February 2, 1999 to November 8, 2002 (182 weekly observations). The graph illustrate that Ds is always positive and Dl is mostly positive.

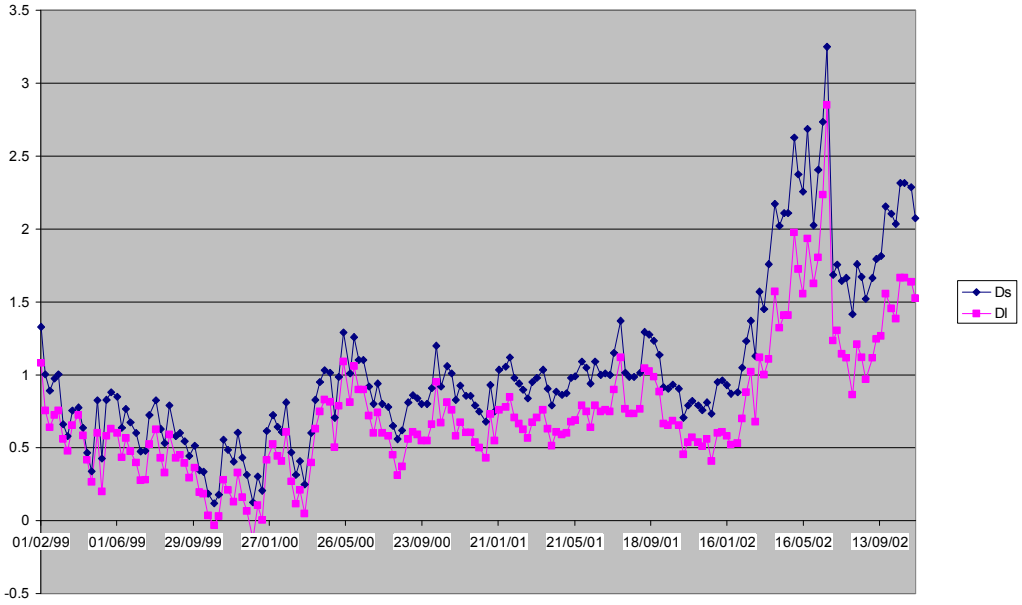
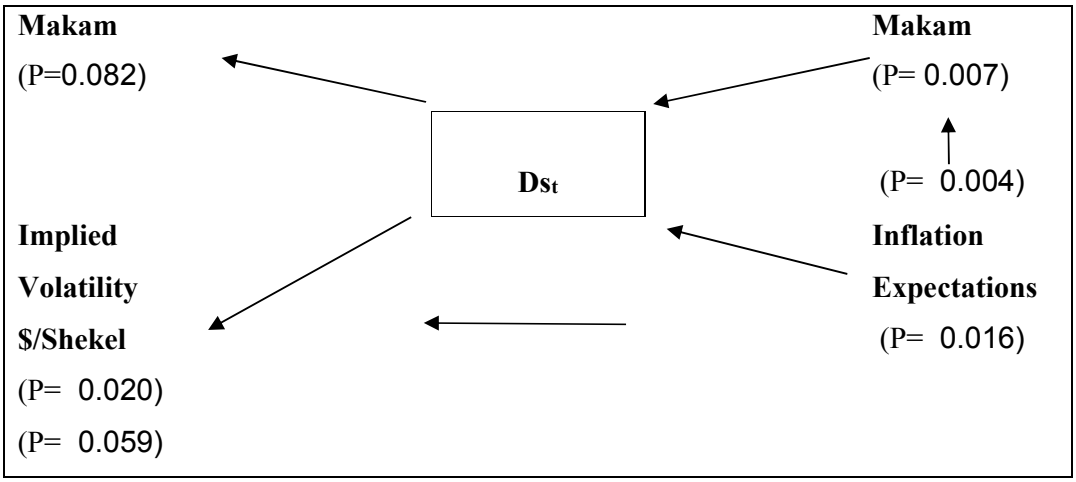
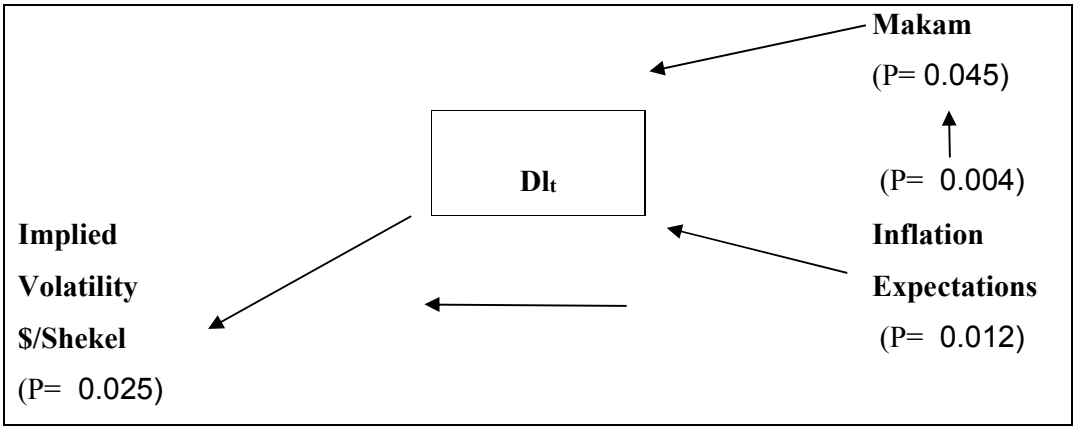


Figure III

3-A Granger Causality of the Differential between the "*Makam*" and the Deposits Quoted Rates

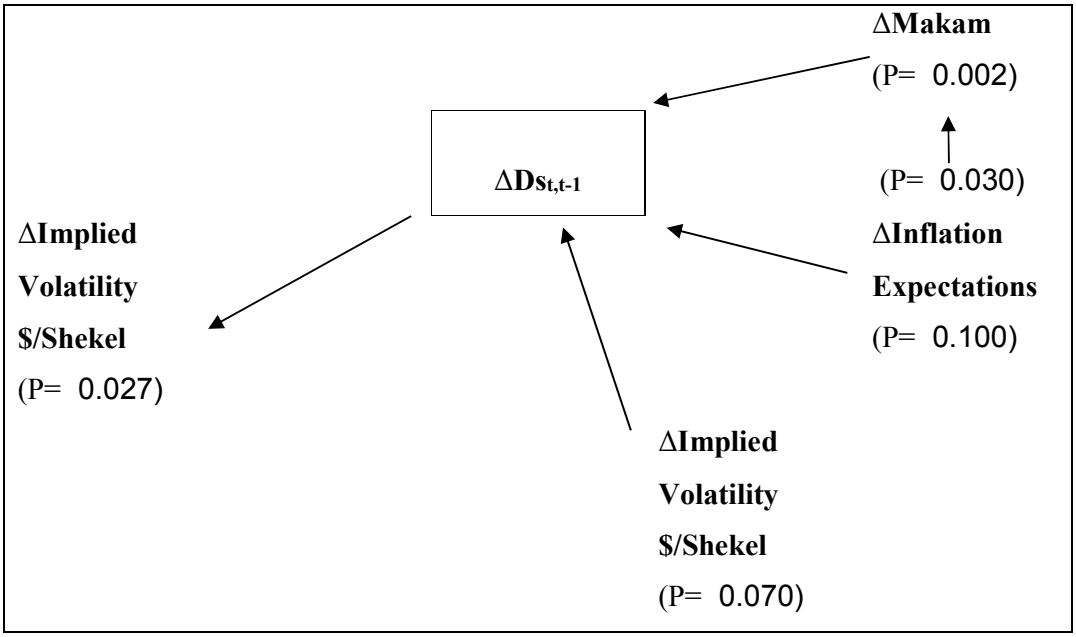
The flow chart illustrates the Granger Causality (estimated at 4 lags) between the following variables: the difference between per annum *Makam* yields and annual interest on NIS 50,000-100,000 deposits (Ds); the difference between the *Makam* yields and annual interest on NIS 100,000-500,000 deposits (D1) ,the per annum yield of the *Makam* bills (Makam), expected inflation (Inflation Expectations) derived by the Monetary and Research departments of the Bank of Israel, the two measures of exchange rate volatility (Implied Volatility $/Shekel) derived from exchange rate option prices. The period of investigation is February 2, 1999 to November 8, 2002 (182 weekly observations). The p values are presented in parentheses.





3-B Granger Causality of the Differential between the "*Makam*" and the Deposits Quoted Rates

The flow chart illustrates the Granger Causality (estimated at 4 lags) significant relationship between the percentage change from t to t-1 of the variables described in 3-A.



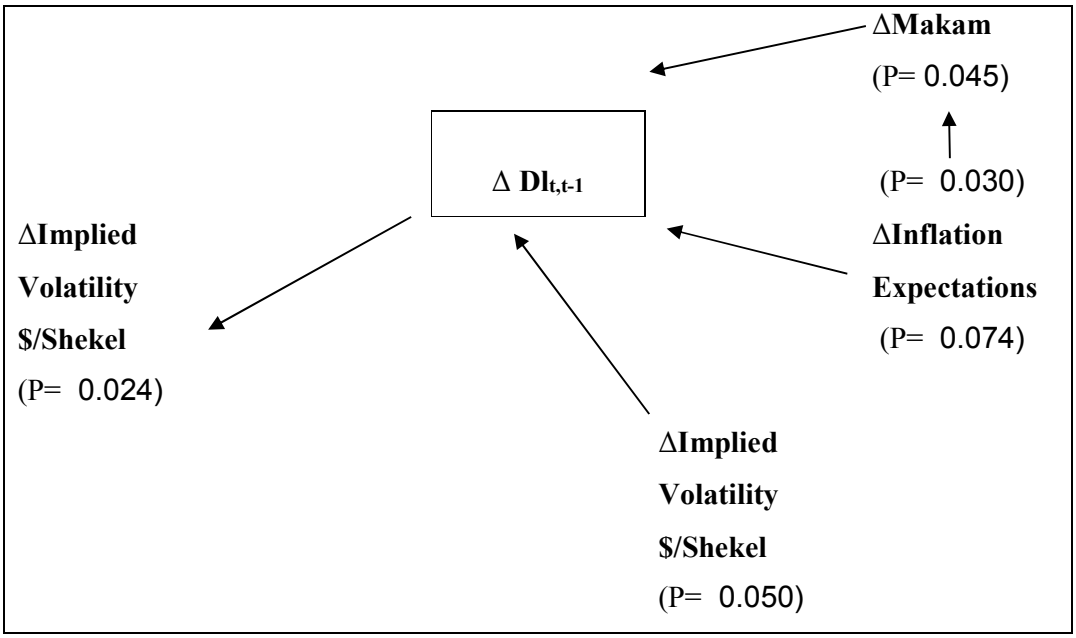


Figure IV

Makam Yields versus the Liquid and Illiquid Asset Returns Differentials

This graph shows the level of differences (in percentage) between the yearly *Makam* (liquid) rates, the and the yearly 50,000-100,000 deposit size quoted (illiquid) rates (Ds) and the per annum yields of the *Makam* (Rm) during the period February 2, 1999 to November 8, 2002 (182 weekly observations).