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The Effects of Taxation of Capital Gains on the Pricing of Financial Assets[1]

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The effects of taxation of capital gains on the pricing of financial assets

Roy Stein

Abstract

The capital gains taxation structure in its current format was applied gradually in the beginning of 2003, following the Rabinovich Committee Report. That was the first time that individuals in Israel were obligated to pay tax on capital gains. Since then, tax rates have been increased twice. The most recent increase during the sample period (2000–14) was at the end of 2011. The main feature of such taxation in Israel is a distinction in taxation tracks, between nominal and real assets. Since tax considerations are one of the components that impact on investors' economic and financial decisions, it is important to estimate the tax effect on both financial asset pricing and on the worthwhileness of holding such assets. As such, this research studies several issues in the Israeli capital market's taxation system, and attempts to assess the bias in the pricing and the holdings structure of financial assets due to tax considerations. Among other things, this paper will focus on possible biases incorporated in the pricing and the holding of bonds with various indexation bases. The results indicate that the dual-track tax method implemented in Israel affects asset pricing and serves as a significant consideration in investment decisions regarding various financial assets. The results also indicate that the increase in the tax rate had a significant effect on the size and composition of the financial asset portfolio in Israel.

ההשפעות של מיסוי רווחי ההון על תמחור הנכסים הפיננסיים

רועי שטיין

תקציר

מבנה המיסוי על רווחי הון במתכונתו הנוכחית הוחל בהדרגה בתחילת 2003, לאחר דוח ועדת רבינוביץ'. אז, לראשונה, חויבו יחידים במס על רווחי הון. שיעורי המיסוי הועלו פעמיים במרוצת השנים, והעלייה האחרונה בתקופת המדגם (2000–2014) הייתה בסוף 2011. המאפיין העיקרי של המיסוי בישראל הוא הפרדה בין מסלולי מיסוי – לנכסים נומינליים ונכסים ריאליים. כיוון ששיקולי המיסוי הם אחד הרכיבים המשפיעים על ההחלטות הכלכליות והמימוניות של המשקיעים, חשוב לאמוד את השפעת המיסוי הן על תמחור הנכסים הפיננסיים והן על כדאיות החזקתם. על כן דנתי בעבודה זו במספר סוגיות הקשורות למערכת המיסוי של שוק ההון בישראל, וניסיתי להעריך את ההטיה הנגרמת בתמחור הנכסים הפיננסיים ובהרכב ההחזקות בהם בגלל שיקולי מיסוי. בין היתר, התמקדתי בהטיות אפשריות הכרוכות בתמחור ובהחזקה של איגרות חוב בעלות מאפייני הצמדה שונים. מהתוצאות עולה כי השיטה של שני מסלולי מס משפיעה על תמחור הנכסים ומהווה שיקול משמעותי בהחלטות ההשקעה בנכסים הפיננסיים השונים. עוד עולה מהתוצאות כי העלאת שיעורי המס השפיעה באופן מובהק על הרכבו של תיק הנכסים הכספיים בישראל ועל היקפו.

1. Background

Tax considerations, as one of the components that have the greatest effect on investors' economic and financial decisions, affect capital allocation in the economy, the state's revenues, and even the economy's long-term growth. The higher the tax rate is, the greater part the component will play in investment decisions. The rise in tax rates on capital gains in recent years increases the significance of evaluating this tax's effect on economic and financial decisions. The capital gains tax's main effect is through the following channels:

1. The tax rate on capital gains impacts economic activity through decisions on capital investments and, as a result, on productivity and wages. The higher the tax rate on capital gains is, the more the public will prefer to increase consumption and reduce its investments and savings. Reducing the percentage of domestic savings to below its optimal percentage may decrease the real investments in the economy, thus slowing down growth.[1]
2. Furthermore, the public will transfer part of its assets and savings to tax-exempt investment channels through institutional investors, and divert investments to other channels with lower tax rates, such as real estate. The tax rate also affects the public's efforts to seek tax refunds. These circumstances reduce the tax base beyond the economic effect described in the previous section. As a result, government revenues from increasing taxes beyond a certain rate may decline.
3. The tax rate impacts investors' decisions in terms of timing—when to realize financial gains. This impact is reflected primarily in the development of revenues over time. Another possible implication of these investment decisions may be a decline in trading turnover and, as a result, a higher liquidity premium on financial assets.

   Initial studies on this topic supported zero tax on capital gains, but such studies examined relatively simple real world situations (without reference to overlapping generations and heterogeneity among workers).[2] The literature's main argument against taxing capital gains is that the tax may distort the

[1] This effect on economic activity decreases if the economy has foreign investments, and if there are tax-exempt investment tracks in the capital market (such as institutional investors), which serve as an appropriate alternative for the taxable direct investments.

[2] Among the leading papers were: Chamley (1986); Kenneth (1985); Atkinson and Stiglitz (1976).

public's choice between current consumption and savings to fund future consumption. Recent research has developed the basic models, enhanced the real-world situations, and found that zero tax on capital gains was not optimal.

There are four key arguments that justify capital gains tax:

1. According to a model which takes into account overlapping generations in the economy—where there are liquidity constraints, and individuals require loans against future labor income—imposing a tax on capital gains facilitates a lower tax on income, thereby increasing financial well-being in the economy (Bernheim, 2002). However, this is the outcome only if the public assumes that the government will apply the most appropriate tax policy at any given time over the long term. This assumption is critical to the outcome. As a result, research studies have proposed imposing various limits on tax-related government decisions.
2. If there is no certainty regarding the public's future wages, and tax is imposed on capital gains, thereby reducing income from investments and savings, the labor supply will increase.
3. The distinction between tax on labor income and on income from capital gains is problematic: Since companies and individuals can both, to some extent, divert their income between these two tracks, imposing a tax on labor alone without taxing capital gains could increase financial activity in the economy at the expense of productive activity.
4. The correlation coefficient between profit/income and the tendency to save (income elasticity of savings) tends to be positive, but according to the studies in this field, its estimation is unstable since individuals' savings preferences are highly varied.[3] Therefore, imposing a capital gains tax may result in an increase in savings, in order to preserve future purchasing power. The main difficulty in determining the optimal tax rate lies in the wide range of the assessments of income and future income elasticities of savings.

In recent years, there has generally been a consensus in the literature on the value added of a capital gains tax, but not on its rate and ideal structure, and there is no

[3] Numerous empirical studies have shown that savings decisions are not only impacted by many economic parameters, but by psychological factors (such as self-control).

accepted structural model. This is evidenced by the numerous differences between the capital gains tax rates in various countries, as well as in exemptions: some countries allow a certain decrease in tax rates on long-term holdings, while others grant exemptions up to a specific amount. It is therefore difficult to compare the tax rates in different countries.[4] Generally speaking, most countries do not charge capital tax gains on financial assets, while others charge tax ranging from 10 percent to 40 percent. In 2011, the average rate in OECD member countries was 17.8 percent.[5]

In this paper, I discuss several issues related to the Israeli capital market's taxation system, and attempt to estimate the bias in financial-asset pricing and holdings composition due to tax considerations. I also empirically examine capital market taxation's effects on the public's direct holdings in financial assets—the tax base—and on the effective tax rate charged in an asset aggregate.[6] Both examinations provide an indication of the effects of tax increases on tax revenues, as well as where the capital-gains tax system is located on the Laffer curve (Wanniski, 1978).

Following are the paper's conclusions. (1) The dual track—nominal and real—tax system impacts the pricing of assets and serves as a major consideration in decisions to invest in the various financial assets. (2) The increase in tax rates has had a significant effect on the composition and size of the financial asset portfolio in Israel. (3) An analysis of the effect on the tax base and effective tax rates indicates that there has been a decrease in the public's holding of taxable financial assets and only a moderate increase in the effective tax rate. These findings indicate that the current tax rates are at a point where increasing them will reduce tax revenues.

The remainder of the paper is structured as follows: Section 2 reviews the developments in capital gains taxation in Israel; Section 3 outlines the sample and data; Section 4 econometrically examines the effect of the changes in capital market taxation on tax revenues, as well as on the size and composition of the public's financial assets portfolio, discussing key issues arising from the estimation results;

[4] In addition, it is important to note that some countries allow offsetting capital gains against capital repayments of loans and mortgages, so a simple comparison of tax rates may even be misleading.

[5] Robert Carroll and Gerald Prante, "Corporate Dividend and Capital Gains Taxation: A Comparison of the United States to Other Developed Nations", Ernst & Young, February 2012.

[6] Since the revenue data (outlined in Chapter 3) do not provide sufficient detail by asset class, it is impossible to estimate the direct effect of taxes on tax revenues—total receipts—and thus directly estimate where the tax system is located on the Laffer Curve.

Section 5 examines several issues regarding the effect of the taxation on asset pricing; and Section 6 concludes.

2. The development of capital gains taxation in Israel

The current capital-gains taxation structure was applied gradually since the beginning of 2003, following the Rabinovich Committee Report. It was the first time individuals in Israel were obligated to pay tax on capital gains. The tax on real financial assets (such as CPI-indexed bonds, equities, foreign currency securities and options) was set at 15 percent, and nominal assets (such as unindexed bonds and bank deposits) at 10 percent.[7] The reform imposed personal, world-wide taxation, so that an Israeli resident who has earned capital gains in any other country is obliged to pay the rates imposed in Israel. (The tax rate on assets denominated in foreign currency is the same as the tax rate on the real assets less exchange rate differences). Therefore, as far as an Israeli resident (or Israeli company) is concerned, there is no difference between capital gains generated in Israel and abroad. It is, however, important to understand that foreign securities investments are taxed according to the gains in the investment currency, so the tax calculation does not take into account a profit or loss generated as a result of the investment currency's strengthening or weakening. In 2006, the tax rates on capital and interest gains were raised—the tax on real assets was raised to 20 percent, and the tax rate on nominal ones was raised to 15 percent. In January 2012, following the Trajtenberg Committee report, the tax rate on capital gains from real assets was raised to 25 percent, while the tax rate on nominal assets remained the same, at 15 percent. Assuming a real interest rate of 3 percent and an annual inflation rate of 2 percent, the tax on nominal assets before the change was 25 percent higher than the tax rate on real assets. Following the change, the tax rates for both asset classes would be almost identical (under the Committee's assumptions regarding the real interest rate and inflation rate).

[7] The tax rates of the different instruments were set so that the tax rates on all instruments would be identical, assuming a 2% inflation rate and a real interest rate of 4%. *Makam* and unindexed bonds series were tax-exempt in 2003.

Table 1
Development of tax rates on individuals' capital gains, 2003–14
(percent)

Taxpayer	Tax event	2003–05	2006–11	2012 and onward
Household	Interest payment / asset sale in nominal channel	10	15	15
	Interest payment / asset sale in real channel	15	20	25
	Interest payment / asset sale in foreign channel	35*	20	25
	Dividend	25	20	25
Material **shareholder	Dividend	25	25	30

*Until December 31, 2004. Subsequently, this rate was reduced to the capital gains tax rate.
** Material shareholders complement their paid tax, bringing it to the prescribed rate at the end of the year, as part of their annual financial statements.

In the context of taxation, two other types of taxpayer can be defined, in addition to those in Table 1: companies—which pay a uniform tax (corporate tax) on all their income, including their income from capital, and institutional investors—particularly pension funds, provident funds and advanced training funds—which are exempt from capital gains tax for their customers. The changes introduced in recent years in the tax regime affected the public's holdings in financial assets, but did not affect other capital market investors. Thus, their effect on the economy's overall financial asset portfolio is partial. Moreover, the tax reform has effectively made contributions for long-term investment instruments more attractive. This is because not only the contributions are tax exempt—the capital gains on these instruments are tax exempt as well.

The marginal investor in the market is defined as one who is the dominant factor in determining financial asset prices, and according to whose tax considerations the relevant information can be extracted from the asset prices. In 2003, the Bank of Israel changed the calculation of yield to maturity on bonds from relative gross to

gross[8], based on empirical findings[9] showing that investors who were exempt from at-source taxation (banks, corporations, provident funds that had purchased the bonds originally or had purchased them before the current interest period) were the ones to determine the market prices. The market structure may have changed drastically as a result of changes in tax rates or in the public's asset portfolio; there is thus room to re-examine who the marginal investor is and what his or her tax considerations are. An initial attempt to determine the identity of the marginal investor is presented in Appendix 1.

3. The data and sample

Data on revenues from taxes on capital market gains are on a monthly basis in the sample, which begins January 2004 and ends February 2014. The data in the sample are divided into three main sections:[10]

1. Revenues from tax on interest payments - for all types of deposits and savings in the economy, from coupon payments as well as bonds sold at discount (zero-coupon or a coupon with a lower rate than the market rate).
2. Revenue from tax on capital gains - for all types of securities, including equities, bonds, derivatives, ETNs and mutual funds.
3. Revenue from tax on dividend payments - on payments to ordinary shareholders and material shareholders (the latter pay a higher tax rate).

[8] The relative gross yield to maturity is based on calculating the yield from the point of view of an investor who is exempt from tax on capital gains but not on the interest accrued prior to purchasing the bonds.

[9] An internal paper by Noa Getz, "Who are the investors who determine the yields in the indexed bond market", Monetary Outlook 8/2000. The empirical tests in this and other, unpublished papers were based on a comparison of yields to maturity of CPI-indexed bond series which have different coupon levels, but are similar in term to maturity.

[10] A request was submitted to the Israel Tax Authority for a breakdown of revenues by asset type (CPI-indexed bonds and deposits /savings, unindexed bonds and deposits, stocks, mutual funds, etc.). The request has yet to be met.

Figure 1
Revenues from taxes on capital market gains, 12/2002–02/2014, monthly data, natural log in NIS million

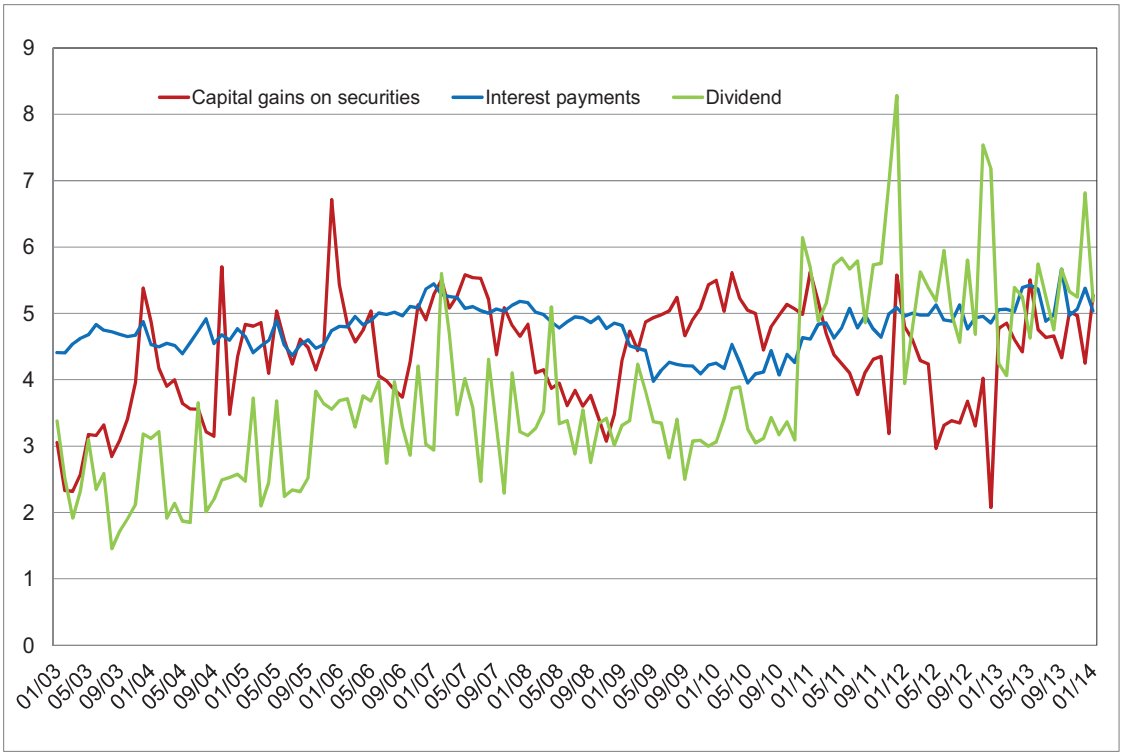

Figure 1 indicates that despite the increase in tax rate during the sample period, there was no increase in tax revenues, both on interest payments—for which tax revenues are relatively stable and dependent on the interest rate, and on capital gains, whose revenues are quite volatile and dependent on numerous macroeconomic factors.[11] Economic developments and expectations thereof, against the backdrop of the global crisis, had a significant effect on the development of tax revenues. The financial crisis, which began in late 2007 and worsened towards the end of 2008, had numerous ramifications for economic activity in Israel. One was a sharp decline in nominal and real interest rates and economic activity, against the backdrop of the government debt crisis worldwide and the corporate bond crisis in Israel. In a quick reaction, investors adjusted their portfolios to mitigate the risk of holding securities. In 2009, and even more so in 2010, Israel made a relatively rapid recovery, which came to a halt in 2011, with the deterioration of the sovereign debt crisis in Europe. This period was thus characterized by marked fluctuations both in economic activity and capital

[11]Tax receipts for dividend payments grew during the sample period - as a direct result of the tax increase on capital gains, which brought it closer to the tax rate on dividend payments, thus reducing the previous market distortion. This topic is beyond the scope of the current paper.

markets, which significantly affected tax revenues. In addition, during the sample period, significant regulatory changes were introduced in institutional savings. The main changes were as follows:

1. A prohibition on withdrawing funds from provident funds after 15 years, on contributions beginning in January 2006.
2. A prohibition on withdrawing funds from provident funds in lump sum. As of January 2008, withdrawal is allowed only as annuity.
3. The Mandatory Pension Law, which came into effect in January 2008.

   The significant monetary and financial developments and the numerous regulatory changes that have taken place in Israel have greatly affected the public's assets portfolio. The estimated effect of the changes in tax rates during this period on total tax revenues and the asset portfolio composition is thus difficult to identify.

4. Examining the effect of the taxation

The effect of tax rates on tax revenues will be assessed in two stages: 1. Assessment of the effect of the changes introduced in the tax rates on the composition of the public's financial asset portfolio and, as a result - on the tax base (Section 4.3); 2. Given the tax base, assessment of the effect of the changes in the statutory tax rates on the effective tax rates (Section 4.4). Before examining these effects, I will describe the methodological framework of the estimation equations (Section 4.1) and the econometric method used to assess the effects (Section 4.2).

4.1 The methodological framework

Beyond the tax rate, total tax revenues on gains from the public's deposits and savings depend on two basic factors: total funds accruing interest (the tax base) and the interest rate paid (the gains relative to the tax base). In contrast, total tax revenues on profits from the realization of financial assets depends not only on the tax base and the rate of increase in the prices of assets included in the public's asset portfolio, but also on the degree to which the asset is realized (sale or notional sale). If the tax base were to rise as a result of a change in asset prices, but the public does not realize these gains, the effect of the price increase will not be reflected in tax revenues. Moreover, the tax base (the value of the public's direct holdings) changes not only as a result of the changes in financial asset prices, but also due to the change in the assets' total par value (for example, when issuing stocks and bonds). It should be noted that a change

in the value of the public's holdings as a result of public offerings does not increase tax revenues immediately, but rather, the expanding of the tax base increases potential future tax revenues. In sum, the correlation between the scope of the public's holdings and capital gains tax revenues is not clear cut—it is affected by various factors, including the worthwhileness of realizing accrued gains.

Changes in the taxation structure may affect the composition of the public's financial assets portfolio. The relative worthwhileness of investing in various financial assets may change unevenly as a result of tax rate changes; thus, tax rate changes may significantly affect the asset portfolio's composition. Therefore, when examining the effect of changes in capital gains tax rates, it is important not only to look at the tax revenues but also at the scope and composition of the public's direct holdings in various financial assets.[12]

4.2 The econometric method

Following is an examination of the effect of increasing the tax rate on the developments in the public's financial asset portfolio and actual tax revenues. This effect will be examined using cointegration analysis, as the effects of the explanatory variables on the dependent variable are endogenous, and it was found that the variables themselves are not stationary.[13] First, I will examine whether there is cointegration between the variables in the model by examining the residuals of the estimation equation according to the method of Engle and Granger (1987). Second, the effect itself (i.e., the value of the parameters in the cointegration vector) will be estimated using the Dynamic-OLS (DOLS) method proposed by Saikkonen (1992) and by Stock and Watson (1993). This method is added to the static estimating equation, which estimated the differences between the lagged or leading explanatory variables in the first stage (in which all the variables are set at levels).[14] Given that there is indeed cointegration between the variables, the estimates obtained by applying the DOLS method are asymptotically effective. In addition, the estimates obtained are unbiased and have normal asymptotic distribution t values; this is also

[12]The tax changes also affect trading volumes—a direct result of their effect on the worthwhileness of holding the financial assets. This effect was not examined in this paper.

[13]According to unit root tests (ADF and PP), it is impossible to reject the hypothesis whereby the explanatory and dependent variables in the estimating equations are not stationary.

[14]The dummy variables representing the tax rate changes were entered into the estimating equation as deterministic variables (with no added lag or lead changes). It is thus possible to assess the statistical significance of the effect of tax rate changes on the dependent variable.

the case in the presence of endogeneity and serial correlation.[15] It is important to note that this method also solves the endogeneity problem in equations estimating the composition of an asset portfolio characterized by low volatility using high-volatility asset prices. The reason is that, in such a case, the differentials in the lagged or lead explanatory variables neutralize the endogeneity of the estimating equation.

4.3. The estimation equations—the composition of the public's financial asset portfolio[16]

The main question studied in this paper is what the effect is of changes in tax rates on the composition of the public's financial asset portfolio and, as a result, on government tax revenues. Tax revenues are determined not only by tax rates but also by the value of the public's holdings in taxable financial assets (i.e., the tax base). Therefore, the effect of tax rates applied in Israel on the tax base will be examined. The structure of the estimating equations for the public's direct holdings in various financial assets relative to the GDP estimate (the Composite Index) is as follows:

1)

$$\log(S_t / Y_t) = \alpha_1 + \alpha_2(@trend) + \beta_1 \log(madd\_b_t) + \beta_2 \log(madd\_s_t) + \beta_4 \Pi_t^{12} + \beta_5(Rib_t) + \beta_{6-9} D_t + \beta_{10-13}(@trend) D_t + \varepsilon_t$$

Where:

S - the public's direct holdings in asset S (including through mutual funds);

Madd_b - Index of prices of bonds traded on the stock exchange (government and corporate);

Madd_s - the General Shares Index;

Y - the Composite State of the Economy Index;

Rib - short-term real interest rate:

Π^{12} – the inflation rate in the past 12 months

@trend - the time trend;

D - dummy variable vector. Following are the dummy variables examined as deterministic variables in the estimation equation:

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[15]Under this method, the t values are calculated according to a standard deviation consistent with the heteroscedasticity-consistent standard errors.

[16]This paper includes an assessment of the effect of the tax rates on the public's financial asset portfolio rather than on the total asset portfolio (which includes, *inter alia*, real estate investments). Thus, there was no need to add the public's holdings in non-financial assets to the estimating equations.

D2003 – dummy variable that is attributed the value 1 for the months in 2003, the period in which the tax rate was gradually imposed on financial assets

D15- a dummy variable that is attributed the value 1 for the period beginning in January 2004 and ending in December 2005, a period during which the real tax rate was 15 percent

D20– a dummy variable that is attributed the value 1 for the period beginning in January 2006 and ending in December 2011, a period during which the real tax rate was 15 percent

D25 - a dummy variable that is attributed the value 1 for the period beginning in January 2012 and ending in December 2013 (end of the sample period), a period during which the real tax rate was 25 percent

D_MM_YY - a dummy variable that is attributed the value 1 only on the date indicated in the variable.

The results indicate that the composition of the public's asset portfolio changed as a result of the tax reform applied in early 2003 and, as a result of the tax rate changes over the years, after controlling for various exogenous factors reflected in the financial assets' prices - inflation, interest rates in the economy and activity level (the Composite State of the Economy Index).[17] Table 2 indicates that the short-term real interest rate has significant weight in explaining the asset portfolio composition, in particular – its sensitivity to holding cash, current accounts and self-renewing overnight deposits (SRO). Although no significant effect of short-term real interest on each asset separately was found, the value of the public's total taxable financial assets increases significantly in line with the short-term real interest rate. The dummy variables representing the tax changes in Israel in the various estimating equations are significant and stable, and their effect on the composition of the asset portfolio is considerable.[18]

[17] Other exogenous variables, such as equity indices abroad and home prices in Israel, were examined. These variables did not have significant explanatory power in the estimating equations. A possible reason for this result is that the prices of stocks abroad and in Israel are highly correlated, and changes in home prices in Israel are highly correlated with the real interest rate.

[18] Tax changes are represented by two types of dummy variables, intercept and trend, which enable tax rate changes to affect two dimensions - and over time. The trend variable throughout the period (excluding dummy variables representing the changes of the tax reform) was insignificant under the various specifications.

Table 2
The results of the estimating equations for the public's direct holdings in various types of taxable financial assets, by percentage of (estimated) GDP,[19]
January 2000 through April 2014

	Public's total taxable holdings* **	**Direct holdings in stocks Israel**	**Tradable bond holdings in Israel**	**Savings plans and deposits**	**Cash, current accounts and SROs**
The General Shares Index	0.29 (10.5)	1.14 (18.4)	0.17 (2.98)	-0.18 (-5.6)	-0.165 (-1.74)
Bond Price Index	0.42 (2.34)	1.07 (2.7)	-0.14 (-0.39)	0.9 (5.22)	-0.04 (-0.07)
* Inflation in the past 12 months	0 (-0.22)	-0.006 (-1.3)	0.01 (2.3)	0.0003 (0.13)	-0.008 (-1.1)
Short-term real interest rate (annualized)	0.006 (1.88)	0.007 (0.88)	-0.036 (-5.25)	0.023 (7.07)	-0.066 (-5.8)
C	1.6 (-2.07)	-11.2 (-6.5)	-0.37 (-0.23)	-1.76 (-2.34)	1.3 (0.49)
@TREND	0.005 (3.37)	-0.006 (-1.8)	0.015 (5.17)	0.0005 (0.42)	-0.0007 (0.88)
D2003	0.012 0.6	-0.05 (-1.1)	0.085 (2.07)	0.0004 (0.01)	-0.036 (-0.54)
D15	-0.16 (-5.6)	-0.26 (-4.12)	0.05 (0.85)	-0.08 (-2.9)	0.053 (0.55)
D20	-0.31 (-6.3)	-0.33 (-3)	-0.23 (-2.2)	-19 (-3.9)	0.32 (1.9)
D25	-0.78 (-7.6)	-0.59 (2.6)	-1.04 (-4.94)	-0.34 (-3.5)	0.59 1.7
*@TREND*D*2003	-0.015 (-5.4)	-0.022 (-3.55)	0.004 (0.63)	-0.007 (2.6)	0.007 (0.76)
*@TREND*D*15	-0.007 (-6.3)	-0.006 (-2.36)	-0.011 (-5)	-0.005 (-4.2)	0.008 (2.1)
*@TREND*D*20	-0.0065 (-8.5)	-0.002 (-1.35)	-0.011 (-6.8)	-0.003 (-4.1)	0.0055 (2.1)
*@TREND*D25*	-0.0078 (-8.2)	-0.002 (-0.86)	-0.013 (-6.8)	-0.006 (-6.5)	0.011 (3.38)
R^2	0.987	0.988	0.99	0.94	0.98
Engle-Granger tau -statistic (Value)	-5.1	-6.2	-6.4	-6	-4.6

The numbers in parentheses represent the statistical t-values of the estimated coefficients / the missing values indicate that the same coefficients were not found to be significant under the various specifications.
*/** Forced equality between the coefficients (thus improving the standard deviations of the coefficients, which were very similar to begin with).
*** Public holdings in taxable financial assets, including, *inter alia*, stocks, bonds, foreign assets, mutual funds, savings accounts and interest bearing deposits.

[19] The full results of the estimating equations, as calculated by the E-Views software are presented in Appendix 2.

Figure 2 indicates that the increase in tax rates is reflected in a decline in the public's direct holdings in taxable financial assets. It is interesting to see that when the reform was applied to all assets except for unindexed bonds and *makam* in 2003, the public decreased its equity holdings by 5 percent and increased its bond holdings by the same percentage. In contrast, where deposits and savings accounts were concerned, the change at the beginning of the reform was slow but persistent—due to this aggregate's nontradability. It should be mentioned that, in contrast to tradable financial assets, for savings plans and deposits, capital gains may not be offset by capital losses for other assets, and a date for when gains are realized cannot be set. Therefore, it is reasonable to assume that the introduction of the tax and its subsequent increase greatly influenced the public's choice between the two alternatives - savings plans and deposits versus direct holdings in bonds and *makam*.

One of the direct results of the decline in the worthwhileness of the public's direct holdings in taxable financial assets was a significant increase in the public's holdings in the cash, current accounts and SROs aggregate.[20] Although the tax effect on the aggregate was minor when the reform was first introduced, it increased over the years. After the latest tax increase (in early 2012), the effect increased rapidly, reaching a very high level towards the end of the sample period. This result is consistent with the findings of Offenbacher and Cohen, who estimated the demand equation for the means of payment in Israel between 1990 and 2014.[21] They argue that there was a gap in the current account aggregate between the expected amount of the current account deposits according to the equation and their actual amount, a gap that initially formed in 2005 and reached 40 percent at the end of the estimation period. In contrast, there was no large or consistent gap in the cash aggregate. They also found that, during the sample period, the growth rate of demand for current account deposits greatly exceeded the demand for cash, arguing that this difference is not easily explained by theory.[22] The explanation may be found in the numerous structural changes

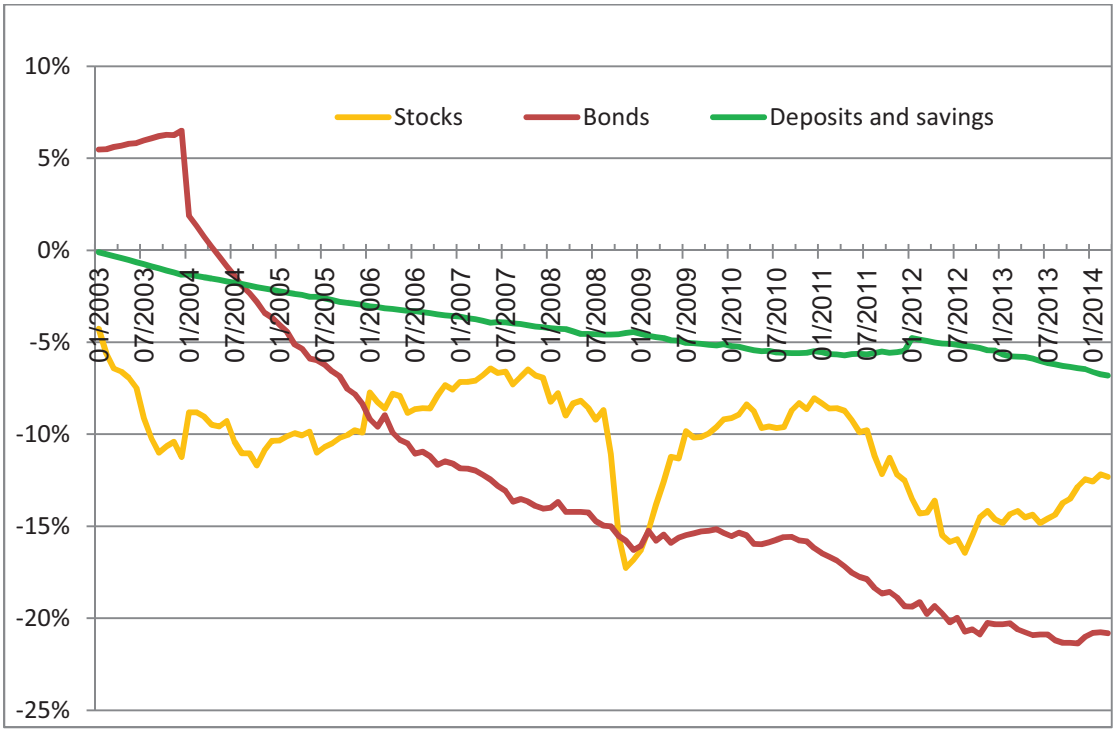
[20] When decomposing the aggregate, the effect is significant, and to the greatest extent, in SROs, but less so in current accounts, and is non-significant in cash.

[21] An internal memorandum of the Bank of Israel, by Edward Offenbacher and Noa Cohen, entitled: "Re-examination of the Demand for Means of Payment in Israel: 1990–2014".

[22] As the gap between the demand and the means of payment according to the equation of the demand for funds in the internal memorandum by Offenbacher and Cohen began as early as 2005, and in the current paper in 2004, before the monetary interest rate dropped to the zero environment, the liquidity trap, as described in the theoretical literature, cannot serve as the main explanation for the gap. However, the possibility of a liquidity trap, especially at the end of the sample period, in which the

introduced shortly before the sample period, such as the capital market taxation in early 2003.

Figure 2
The tax effect on the share of the public's direct holdings in various assets, the cumulative rate of change, 2003–14 (according to the estimation results)



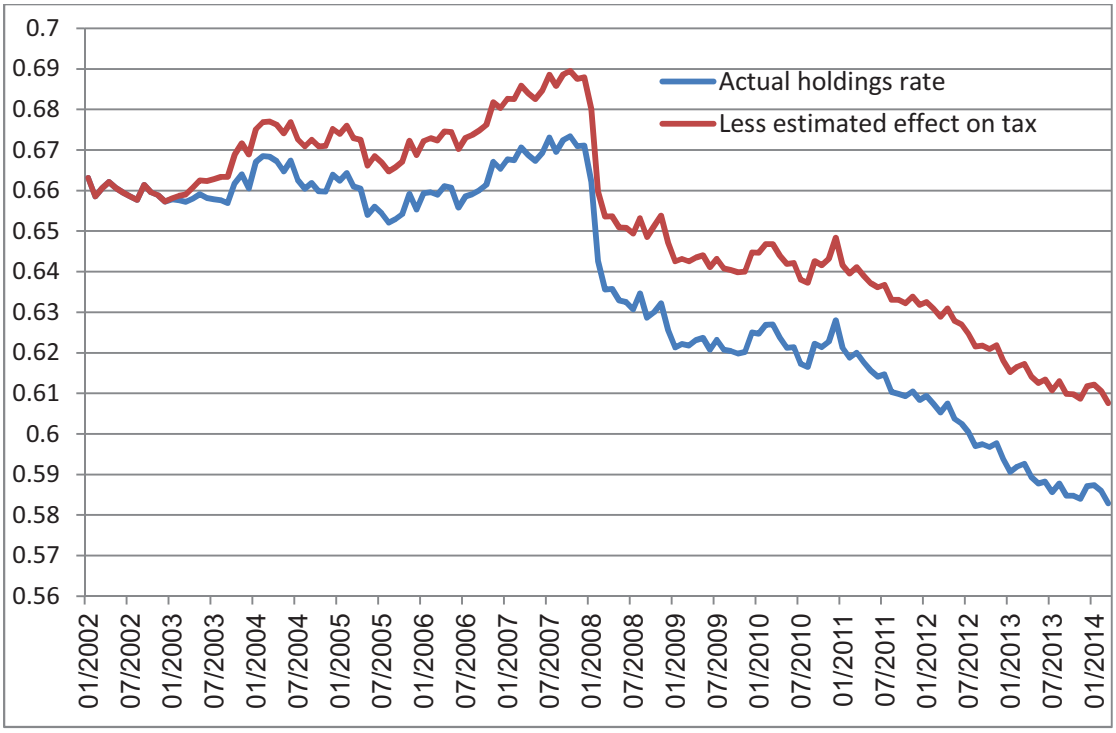
It is interesting to examine the extent to which the reform in capital market taxation and the increases in tax rates over the years affected the public's overall taxable direct holdings.[23] Figure 3 (and the estimation results presented in Table 2) indicates that in recent years, and especially after the recent tax increases on financial assets, the rate of decline in public's direct holdings in these assets accelerated somewhat. At the same time, the regulatory changes introduced in the area of institutional savings during the sample period, which are expected to increase the public's holdings in financial assets through institutional investors, have somewhat offset the public's direct holdings in taxable financial assets. However, according to the estimation findings in this paper—the decline in the public's holdings in taxable financial assets prior to the regulatory changes in institutional savings and the decrease in holdings in

interest rate reached the zero environment, may bias the estimated gap in the estimating equation upward.

[23] Accepted alternatives for direct holding in financial assets by the public are savings through institutional investors, which are tax-exempt, and investments in other asset classes, such as real estate.

line with the tax rate hikes—the effect of the taxation on the scope and composition of the public's financial assets portfolio cannot be ignored.

Figure 3
Share of the public's holdings in taxable financial assets out of the public's total financial asset portfolio24
2002–14 (according to the estimation results)



Beyond the effect of the capital-market tax reform on the worthwhileness of the public's holdings in taxable financial assets, it is interesting to examine whether tax hikes over the years have increased tax revenues, given the tax base—i.e., if they have led to an actual increase in the percentage of the tax paid. Chapter 4.4 examines this question.

[24]The public's asset portfolio, as calculated by the Bank of Israel, excludes the government, Bank of Israel and investments by nonresidents, commercial banks and mortgage banks.

4.4 The estimating equations—the effective tax rate

Tax revenues are determined not only by the tax rates and by the scope of the public's holdings in taxable financial assets (the tax base), but also by the degree to which tax avoidance is worthwhile (through tax planning aimed at reducing the tax liability, such as that described in Chapter 5). Equation 2 estimates the rate of tax revenue from the public on payouts received from deposits and savings (as well as from coupon payments and the purchase of bonds at discount):[25]

$$(2)\qquad \log\left(\frac{tax\_\text{int}_t}{S2_t}\right) = \alpha + \beta_1 ribR1_t + \beta_2 \Pi_t^{24} + \beta_3 \log(@\ trend) + \beta_4 \log(@\ trend)D20 + \beta_5 \log(@\ trend)D25 + \varepsilon_t$$

Where:

tax_int – revenue from tax on deposits and savings;

S2 – the savings plans and interest-bearing deposits;

ribR1 – the real annual yield from the zero curve;

Π^{24} – the inflation rate in the past 24 months;

$@trend$ - the time trend;

D20 – a dummy variable that is attributed the value 1 for the period beginning January 2006 and ending in December 2011, a period during which the real tax rate was 20 percent

D25 – a dummy variable that is attributed the value 1 for the period beginning January 2012 and ending in September 2013, a period during which the real tax rate was 25 percent

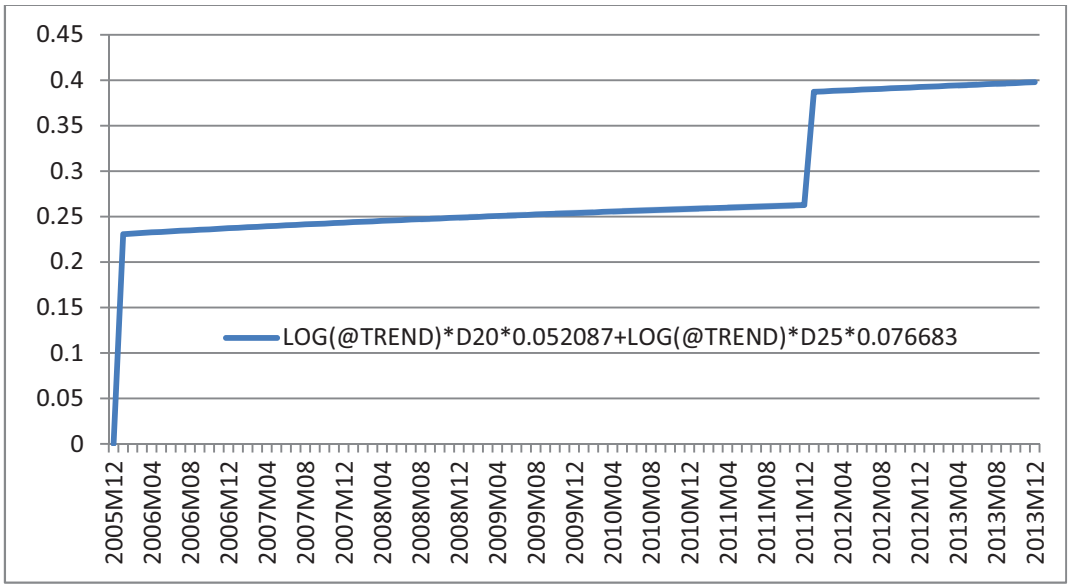
Appendix 3 presents the results of the estimation. The results of Equation 2 indicate that the real 1-year interest rate is positively correlated with the effective tax rate on savings and deposits. The interest rate in this equation reflects the percentage of profit on deposits and savings. We thus expect that the interest rate will have a positive effect on tax revenues. In Israel, there are two different taxation tracks for individuals—nominal and real. It would be interesting to examine which interest rate better explains the tax revenue rates. The estimation results of various specifications indicate that the short-term real interest rate and the actual inflation rate have a

[25] The public seldom holds bonds directly, but rather through mutual funds or ETNs. Therefore, most of the tax revenues on interest may be attributed to that paid out on savings plans and interest-bearing deposits.

statistically significant effect on revenue data, while the nominal interest rate does not enhance the explanatory power. It may be that (CPI-indexed) savings plans are more affected by the financial worthwhileness than deposits (which usually are not indexed to the CPI).

The main result of this equation is that, as expected, the tax revenue rate has indeed increased, but not at the full rate of the tax increase. For every increase in the real statutory tax rate (33 percent and 25 percent), there was only a partial increase (about 26 percent and 14 percent, respectively) in the effective tax revenue rate.[26] This result—with regard to the small rate of increase in tax revenues relative to the increase in the tax rate—may possibly be explained by the increase in the worthwhileness of tax avoidance, *inter alia*, through tax relief requests, such as by senior citizens.

Figure 4
The change in the effective tax rate on savings plans and deposits, 12/2005-12/2013



See Appendix 3 for the full results of Equation 2.

[26] Note as well that the interaction between the interest rate and tax changes does not increase the significance of the equation's explanatory power.

Following is the estimation equation of the effective capital gains tax rate:[27]

$$(3)\qquad \log\left(\frac{tax\_capi_t}{S4_t}\right) = \alpha + \beta_2 \log(volume\_s_t) + \beta_3\left(madd\_s_t \Big/ madd\_s_{t-4}\right)$$
$$+ \beta_4 D10\_04 + \beta_5 D12\_05 + \beta_6 D12\_11 + \beta_7 D12\_12 + \beta_8 D20 + \beta_9 D25 + \varepsilon_t$$

Where:

Tax_capi – revenue from capital gains tax (realization of financial assets);

S4 - the public's direct holdings in stocks traded in Israel;

Volume_s - the average monthly trading volume of the General Shares Index;

Madd_s - the stock price index.

Appendix 3 presents the results of the estimation.

Equation 3, which describes the rate of tax revenues on profits earned from the realization of financial assets, shows that tax payments are highly correlated to the rate of increase in the General Shares Index in the last four months.[28] It was also found that trading volumes indeed have a positive effect on tax revenue (but without sufficient significance). The main result of this estimating equation is that the effective rate of tax revenue did not increase at all as a result of the tax increases.[29] At the same time, the option given to the public - to realize its profits (at least as a notional sale) prior to the tax hike - was widely utilized, which should have been reflected in a relative decline in tax payments in the period following the tax hike. The results of the estimation may also be affected by an increase in the share of corporate bonds in the public's total holdings in financial assets (both directly and through mutual funds and ETNs): corporate bonds generally yield lower profits than stocks, which reduces the total tax revenues on the profits. It is important to note that these findings are based on revenue data that include many types of assets, so that firm conclusions cannot be reached. To estimate the effect of tax changes more accurately, it is important to use data specific to each type of asset separately.

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[27] Since the tax is collected on the financial assets' sale date and according to the statutory tax rate known on that date, changes in the statutory tax rate will be reflected immediately on the date of the realization of the profits (unlike in the case of tax collection on deposits and savings). There is therefore no need to add a time trend variable to this estimating equation in order to explain the development in tax revenue.

[28] Several specifications were examined, including the change that took place the previous month, and the index log. It was found that the variable with the greatest explanatory power was the change in the index in the past four months. No explanation was found for the rate of increase in the Bond Price Index.

[29] The coefficients were non-significant negatives.

5. Asset Pricing Issues

Issue 1 - the indexed vs. the unindexed track

Different tax tracks for alternative financial assets may have a significant impact on their relative worthwhileness, and, as a result, on the development of their prices. When the tax rate on income from holding a CPI-indexed bond is 25 percent of the real profit, while the tax rate on income from holding unindexed bonds is 15 percent of the nominal profit, there are only very specific interest rate combinations in which the tax payments on both bonds will be the same; in other interest rate combinations, the different tax payments will be considered in decisions on investing in these assets. It is therefore important to understand the extent to which they impact on asset pricing. Table 3 presents several examples of yield-to-maturity combinations on two alternative assets—an indexed bond and an unindexed one—each with a one-year duration, as well as the break-even inflation point (the inflation rate) in which gross and net yields are equal.

Table 3
The real yield, nominal yield, and the difference between them
(Gross and net annual yield, in percent)

The real yield on CPI-indexed bonds		The nominal yield on unindexed bonds		The breakeven inflation point*	
Gross	Net	Gross	Net	Gross	Net
0	0	2.35	2	2.35	2.0
0	0	1.18	1	1.18	1.0
-1	-1[30]	1.18	1	2.18	2.0
1.33	1	1.18	1	-0.16	0
3	2.25	5	4.25	2.0	2.0

* The break-even inflation point is the difference between the nominal yield and the real yield.

These combinations indicate that the taxation tracks' impact is not negligible, especially when the real interest rate is near zero. CPI-indexed bonds are not taxable, while nominal profit from unindexed bonds is. When the real interest rate is near-zero and the assumption is that inflation expectations are in the middle of the target range, the gross nominal interest rate according to the taxation considerations will be 2.35 percent—compensation of 35 basis points more than the tax payments, which are not

[30] When there is a real loss on the holding of a financial asset (a loss that does not arise from a nominal loss but rather from a relatively sharp increase in the Consumer Price Index), the loss cannot be offset against other profits in the investment portfolio (i.e., the loss does not serve as a tax shield).

imposed on real holdings.[31] These considerations increase the worthwhileness of holding CPI-indexed bonds. Moreover, when inflation expectations do not materialize, and actual inflation is other than 2 percent, the tax payments remain the same, but the net earnings on both types of bonds changes. For example, if the actual inflation rate during a bond's holding period was 3 percent, the real profit on holding a CPI-indexed bond will remain negligible, but the real profit on holding an unindexed bond will be negative, although the tax payment will remain the same.

It is also important to present the equilibrium according to the Trajtenberg Committee, which recommended raising the tax rate on the real channel rather than on the nominal one. Table 2 shows that when the gross real interest rate is 3 percent and the gross nominal interest is 5 percent (assuming a 2 percent inflation rate), the tax payments on these two holdings are the same, and therefore, the break-even inflation point, obtained from the net yield difference, is close to 2.0 percent. However, in no other combination of interest rates will the tax payments be identical, and there will be some difference between the gross breakeven inflation point and the net breakeven inflation point. It is important to recall that the real interest rate may, and should, change over time—*inter alia*, in accordance with the central bank's monetary policy over the business cycle. The lower/higher the real interest than the breakeven interest rate, the more positive/negative the bias at the breakeven inflation point.

It may be assumed that, in practice, the biases described above are offset by those same investors who pay a uniform tax rate on all their profits, or those who are exempt from tax on profits earned in the capital market. However, the effect of the two tax tracks on private investors cannot be ignored; even if they do not constitute the market's marginal investor and are not the ones to serve as a determinant pricing factor, the worthwhileness to those investors of the investment may varies markedly over time and under various combinations of interest rates/yields and inflation rates.

To calculate the extent of the bias of the break-even inflation point as a result of the capital gains tax paid by individuals, the two different tax tracks should be taken into account, as shown in the following formula:

$$BEI\_T_i = \frac{(1+N_i)\times 0.15}{(1+R_i)\times 0.25} - 1$$

[31] Assuming that there is no inflationary risk premium and no liquidity premium differences between the nominal and real interest rates (for the sake of simplicity).

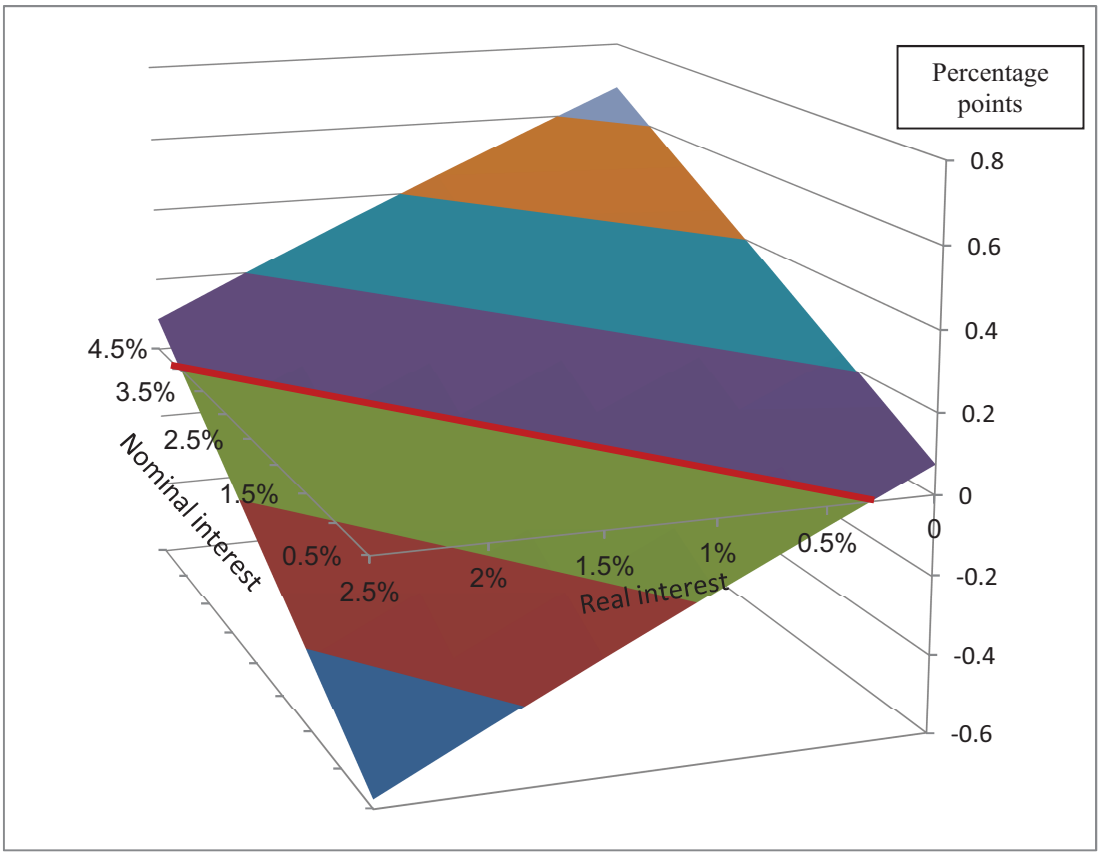
Where:

Ni - the nominal yield on day i;

Ri - the real yield on day i;

BEI_Ti - the bias at the break-even inflation point on trading day i. This bias stems from the different tax tracks for private investors in Israel.

Figure 5
The bias in the breakeven inflation point as a result of the different tax rates on CPI-indexed and unindexed bonds*



* The bias at the breakeven inflation point is calculated as the difference between the estimate obtained on the basis of the gross yield calculation and the one obtained on the basis of their net calculation. The red line indicates the interest rate/yield combinations in which a bias is not obtained at the breakeven point.

Figure 5 indicates that in various real and nominal interest rate combinations, the breakeven inflation point bias may be high, and it increases the further the real interest rate moves away from the one assumed by investors as the breakeven interest rate, assuming that inflation expectations are at the center of the inflation target.

Another problem that derives from the real taxation system is the calculation of the real profit for tax purposes—the adjustment for inflation. The profit adjusted for

inflation is calculated according to the last known CPI. Under this rule, when investors purchase a financial asset on the 15th of the month (just before the CPI for the previous month is published) and sell it the next day (after the CPI's publication) they will pay tax adjusted for the published CPI, although they have held the asset for a single day only, and not on the month covered by the CPI. Moreover, investors who buy or sell their assets frequently may hold a financial asset intermittently over a relatively long period, yet their tax assessment will not be fully adjusted for inflation. Such an investor may pay tax at a nominal rate of up to 25 percent, above the prescribed rate. Based on these considerations, investors in CPI-indexed bonds and other assets, such as stocks and mutual funds, will increase their holdings around the CPI publication dates in which there was a positive change over the previous month, in order to receive the adjustment for inflation relative to the previous month, and decrease them around the publication dates of CPIs in which there was a negative change in relation to the previous month, to avoid the adjustment. Thus, the adjusted profit will be smaller, tax payments will be reduced accordingly, and the net nominal profit will be greater. This situation may create a strong correlation between an investment's worthwhileness and the timing relative to CPI publication dates. Empirical tests also confirm the influence of the CPI publication date. We examined equity trading volumes in two different periods—before and after the introduction of the tax reform—and found that trading volume was affected by the CPI publication date: it increased by 16 percent in the period following the implementation of the reform, and decreased by 7.5 percent prior to it (Table 4).[32,33] The increase in trading volume on the day preceding the publication of the CPI during the reform period is particularly notable in view of the decline in trading volumes prior to the tax reform's introduction in Israel—a decrease that may be due to the greater uncertainty just before the publication of an economic figure.

[32] The effect of the CPI's publication date on trading in financial assets was examined specifically in stocks, because bond prices, especially of indexed bonds, are directly affected by the CPI and the trade turnover is therefore likely to be impacted. Stock prices, on the other hand, are less affected by the CPI, and therefore we do not expect the publication date to have a significant effect. Note that a similar picture, albeit less significant, emerges when analyzing government bond trading volumes.

[33] Trading volumes again decline within several days, beginning on the second day after the CPI's publication. When estimating the equation without an autoregressive process, this result is evident, but with a high serial correlation in the residuals. An analysis of the effect of the sign of the rate of change in the CPI (negative or positive) on the turnovers shows that there was no difference in this effect: the turnovers increase at the same rate on the two trading days surrounding the CPI publication dates.

Table 4
An analysis of the effect of the real taxation track on stock trading volumes
The dependent variable: The natural log of daily stock turnover at par value*

The explanatory variables	Before the introduction of the reform 8/1995-12/2002	After the reform** 1/2011-11/2013
Dummy variable for the trading day preceding the publication of the CPI D_PUBLICATION (1)	-0.075 (-1.93)	0.16 (2.4)
Dummy variable for the trading day following the CPI's publication date D_PUBLICATION	0.06 (0.16)	-0.09 (-1.37)
Dummy variable for the second trading day after the CPI's publication date D_PUBLICATION (-1)	0.04 (1.01)	-0.12 (-1.8)
Dummy variable for the first day of the week - Weekday1	-0.22 (-9.9)	-0.27 (-7.1)
Dummy variable for the second day of the week - Weekday2	0.09 (4.2)	0.12 (3.1)
The natural log of time	0.16 (11.4)	-1.98 (-8.4)
C - constant	4.75 (19)	26 (16.07)
The lagged dependent variable	0.64 (35.8)	0.46 (13.9)
No. of observations	1817	701
R^2	0.615	0.466
DW	2.3	2.14

* The numbers in parentheses denote the statistical t-values of the estimated coefficients.

**The tax reform was implemented gradually beginning in January 2003.

Issue B - Tax on profits from foreign assets vs. nominal assets

The difference in the indexation basis of the tax on domestic investments and investments in assets denominated in foreign currencies creates tax incentives that are contradictory to the economy's interests in terms of exchange rate volatility and financial stability: In periods where the shekel depreciation is expected, there is greater incentive to invest in foreign assets. The tax system thus contributes to accelerating the depreciation trend, while in periods during which appreciation is expected, there is less incentive to invest in foreign assets. The taxation system thus

intensifies the appreciation trend. The problematic nature of tax incentives is exacerbated when the shekel is sharply depreciated or appreciated, which poses risk to the economy's stability. In such situations, the aforesaid taxation system is an important key component in investors' decisions, which prevents them from diversifying their investments in a manner that is beneficial to the economy.[34]

Table 5
The net and gross yield according to the two taxation systems: the existing situation and following the introduction of a uniform nominal taxation system (percent)

	Change in exchange rates	Gross yield in the investment currency	Gross yield in nominal shekel terms	Net return in nominal shekels under the current taxation system*	Net return in nominal shekel terms using a uniform nominal taxation system**
1	5	8	13	11	10.4
2	-5	6	1	-0.5	0.75
3	-8	8	0	-2	0
4	8	-4	4	4	3.2
5	6	0.5	6.5	6.375	5.2
6	-6	0.5	5.5	-5.625	-5.5

* In the current situation, investments in foreign stocks are taxed for the profits in the currency in which the investments are denominated.
**For the purposes of this example—a uniform nominal taxation system at a rate of 20 percent.

To illustrate how the indexation base may affect the worthwhileness of investing abroad, we examine the net yield in nominal shekels of the profits earned from holding foreign assets in various (but possible) world scenarios, under the current taxation system and under another one, in which the tax rate is nominal and uniform—20 percent. The findings of this analysis, presented in Table 5, illustrate the distortion that the current taxation system creates in terms of investment incentives.
Thus, for example, in world scenarios 2 and 3, under the current taxation system, the profits from investments abroad are taxed, but due to the appreciation during the investment period, the net yield in nominal shekels is negative. This situation reduces the incentive for investing in assets abroad despite the rise in their prices. On the other hand, in world scenario 1, in which the shekel depreciated, taxation according to the current system only applies to the yield in the investment currency, and the net yield

[34] In contrast, a uniform nominal taxation system completely eliminates the tax incentives that accelerate exchange rate trends.

in nominal shekels (due to the depreciation) is relatively high. This situation increases the worthwhileness of foreign investments, thus increasing the pressure for continued depreciation of the shekel. In world scenarios 5 and 6, investments in bonds are shown, which usually yield a relatively small profit rate, and the worthwhileness of investing in them is highly dependent on the development of the exchange rate. Even in these world scenarios, it seems that the current taxation system increases the volatility of profit and loss on these investments, as opposed to the nominal taxation system.

Another advantage of the transition to a uniform nominal taxation system is the possibility of offsetting profits and losses in different securities. In world scenarios 3 and 6, in which the asset did yield a positive profit in the denominated currency but a negative one in nominal shekels, these losses may not be offset against profits from other investments. The same is true for offsets of nominal against real assets: a real loss on the holding of a financial asset that did not result from a nominal loss may not be offset against profits from other assets in the investment portfolio (i.e., the loss is not used as a tax shield). This situation creates an effective tax payment that is higher than the statutory rate on the public's total financial asset portfolio and motivates the public to take into account tax considerations when making investment decisions.[35]

Issue C - Mutual funds as an alternative for direct investment in bonds

The value of the mutual funds in Israel is NIS 220 billion, distributed over some 1,240 different funds, which enable the public to invest its money in diversified channels.[36] Some mutual funds enable investors to receive excess returns on direct investment in *makam* series or unindexed bonds, which are called money market/financial funds. Their advantage lies in a different tax track they are subject to: When private investors purchase *makam*, they pay a 15 percent tax on the nominal profit. In contrast, when they buy a tax-exempt mutual fund, they pay a 25 percent tax on the real profit. In an

[35] In contrast, under a uniform nominal tax regime, there is no restriction on offsetting losses against profits on other assets.

[36] For taxation purposes, the reform defined two types of mutual funds: A taxable fund and a tax-exempt fund. In a tax-exempt mutual fund, the tax applies only to the fund units' owner on the sale. The tax rate is 25% of the accrued real profit. This type of fund is also suitable for institutional investors, who are exempt from tax on profits from securities. In a taxable mutual fund, the tax applies only to the fund manager, and is to be paid out of the fund itself, on any security, at the tax rate set for that type of security under law, subject to the appropriate indexation base. Taxable funds comprise only about 3 percent of the mutual funds in Israel in terms of assets under management.

inflation environment of around 2 percent and an annual makam yield of 2.5 percent, investors holding *makam* through mutual funds pay a 25 percent tax on a real profit of 0.5 percent, i.e., 0.125 percent, compared to 15 percent tax on a nominal profit of 2.5 percent, i.e., 0.375 percent when holding *makam* directly. Thus, even after deducting management fees (at a maximum rate of 0.25 percent, but usually much less), investment in a mutual fund is still preferable to a direct investment in *makam*. Recall that in low-risk financial assets, excess returns, even small ones, can have great significance for investors.

Money market mutual funds are a good alternative not only for direct investment in unindexed bonds but also for investment in short term deposits. Investors who deposit their money in short term deposits pay 15 percent tax on the nominal profit, similar to a direct holding in *makam*, but may not offset their profits against losses in other assets—a tax shield—in contrast to money market funds, in which the use of the tax shield is possible.

6. Conclusion

Different taxation tracks for alternative financial assets have a marked impact on their worthwhileness, and as a result, on the development of their prices. In particular, different taxation tracks—nominal and real—distort the worthwhileness of investing in CPI-indexed and unindexed assets in line with the development of inflation, giving tax considerations a significant weight in investment decisions. It was found that the difference in the indexation base of the taxation of profits between investments in foreign assets and domestic investments also generates investment incentives arising from tax considerations. These incentives are contrary to those desired for the economy in terms of exchange rate fluctuations and financial stability. It was also found that, since the introduction of the reform, the timing of the publication of the CPI has affected stock market trading volumes, a finding indicating that taxes have a significant impact on financial decisions and related distortions. Serving as an important component in the public's investment decisions, the tax regime applied in Israel—nominal and real taxation—therefore prevents the efficient diversification of the public's investments.

In recent years, there has been a consensus in the professional literature regarding the added value of imposing a capital gains tax, but there is still no agreement on its scope. The main reason for the great difficulty in determining the optimal tax rate lies

in the wide range of the assessments of income and future income elasticities of savings. Against this challenging background, this paper empirically examined the effect of the increases in tax rates in the capital market on both the composition of the public's asset portfolio and the government tax receipts in this market. The findings show that the tax increases in Israel have had a great impact on the composition of the public's asset portfolio, reducing its direct holdings in financial assets and savings plans, and significantly increasing the volume of holdings in the cash, current accounts and SROs aggregate. In addition, a strong negative impact was found on the public's direct holdings in taxable financial assets. An analysis of the effective tax rate on savings plans and deposits showed that this rate had indeed increased, but less than the increase in the statutory tax rate, with a significant decrease in the volume of savings plans and deposits. In examining the effective tax rate on capital gains from tradable financial assets, no positive correlation was found between raising the statutory tax rate and the actual tax revenue rate. These findings, which indicate a decrease in the volume of the public's holdings in taxable financial assets and only a moderate increase in the effective tax rate, indicate that the current tax rates are at a point where if raised, they may reduce tax revenues. However, it is important to note that the revenue data in this paper are not sufficiently detailed by type of asset, and it is therefore difficult to draw firm conclusions from this paper's empirical findings.

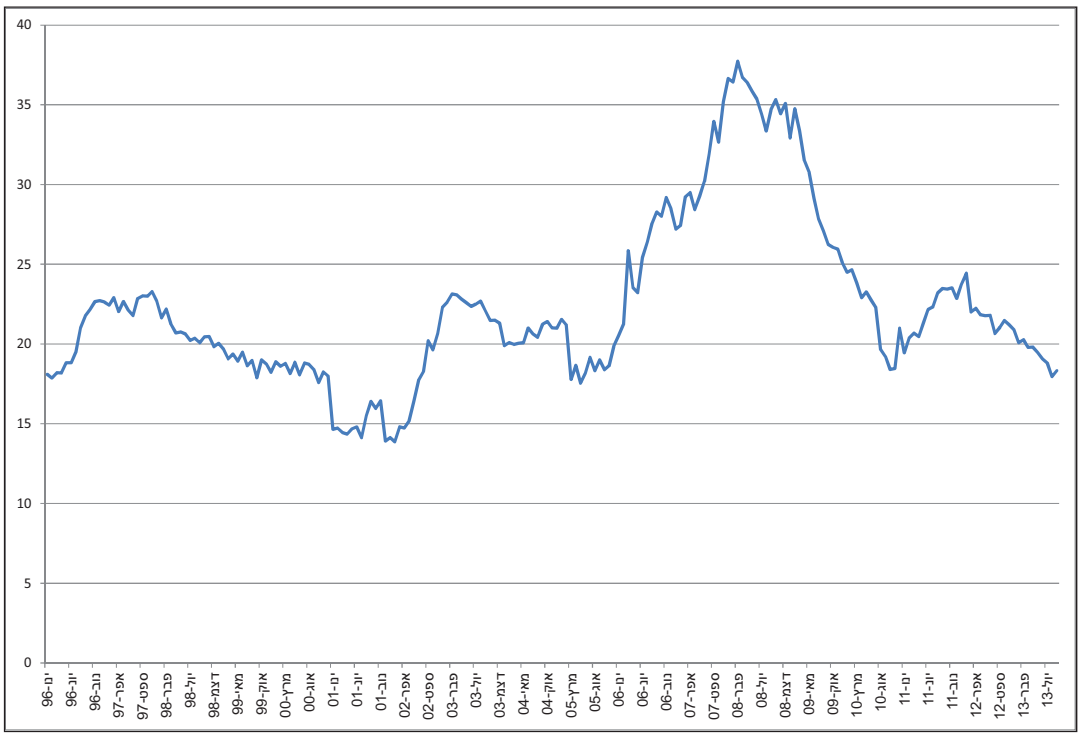
Appendix 1

In order to assess the possible bias in bond pricing deriving from tax considerations, it is important to identify the marginal investor in the market, and to understand that investor's tax considerations. Identifying capital market investors—who are those executing purchases and sales of securities—is classified information, found only at the TASE and ISA, and therefore it is not simple to identify the marginal investor. One possible way is to define the marginal investor on the basis of the distribution of financial assets holdings by investor type, by using assumptions regarding the trading velocity of various investors.

Figure 1.1 presents the share of the public's direct holdings in government bonds. The figure indicates that the public very much changed the scope of its direct holdings in the past decade, and its total holdings ranged from 20 percent to almost 40 percent. Although institutional investors, who are tax exempt, hold bonds and *makam* at slightly higher percentages, they also typically hold bonds for longer periods of time, and are less affected by market fluctuations. It is therefore reasonable that their trading volume for the same scope of assets is lower than that of the public. Based on this assumption, we cannot negate the possibility that the marginal investor is the private investor, who pays taxes on profits from financial assets, on the two different tax tracks. If that is the case, the public's tax considerations are liable to impact on the bond pricing, and should be taken into account (at least some of them) in estimating inflation expectations and any other estimation based on bond prices.

Figure 1.1

Share of public's direct holdings in tradable government bonds out of their total value*



Government bonds and *makam

Appendix 2

Individual results of equations estimating the development of the public's direct holdings in various taxable assets

Dependent Variable: LOG((S4)/MDD_MESHULAV_L)
Method: Dynamic Least Squares (DOLS)
Sample (adjusted): 2000M03 2014M04 **The public's direct**
Included observations: 170 after adjustments **holdings in equities**
Cointegrating equation deterministics: C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Fixed leads and lags specification (lead=1, lag=1)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth =5)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(MDD_B)	1.07	0.40	2.70	0.01
LOG(MDD_S)	1.14	0.06	18.40	0
@MOVSUM(MDD,12)	-0.006	0.00	-1.29	0.20
MDD_R1	0.007	0.01	0.88	0.38
C	-11.2	1.73	-6.49	0
@TREND	-0.006	0.00	-1.83	0.07
D2003	-0.05	0.04	-1.09	0.28
D15	-0.26	0.06	-4.12	0.00
D20	-0.33	0.11	-3.00	0.00
D25	-0.59	0.23	-2.60	0.01
TD2003	-0.022	0.01	-3.55	0.00
TD15	-0.006	0.00	-2.37	0.02
TD20	-0.002	0.00	-1.35	0.18
TD25	-0.002	0.00	-0.87	0.39
R-squared	0.988	Mean dependent var		1.104
Adjusted R-squared	0.986	S.D. dependent var		0.277
S.E. of regression	0.033	Sum squared resid		0.155
Durbin-Watson stat	0.697	Long-run variance		0.003

Cointegration Test - Engle-Granger
Specification: LOG((S4)/MDD_MESHULAV_L) LOG(MDD_B) LOG(MDD_S) @MOVSUM(MDD,12) MDD_R1 C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Cointegrating equation deterministics: C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Null hypothesis: Series are not cointegrated
Automatic lag specification (lag=0 based on Schwarz Info Criterion, maxlag=13)

	Value	Prob.*
Engle-Granger tau-statistic	-6.2	0.0007
Engle-Granger z-statistic	-61.9	0.0007

*MacKinnon (1996) p-values.

Dependent Variable: LOG((S3)/MDD_MESHULAV_L)
Method: Dynamic Least Squares (DOLS)
Date: 06/04/15 Time: 14:33 **The public's direct**
Sample (adjusted): 2000M03 2014M04 **holdings in bonds**
Included observations: 170 after adjustments
Cointegrating equation deterministics: C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Fixed leads and lags specification (lead=1, lag=1)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth =5)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(MDD_B)	-0.14	0.37	-0.39	0.70
LOG(MDD_S)	0.17	0.06	2.98	0.00
@MOVSUM(MDD,12)	0.01	0.00	2.28	0.02
MDD_R1	-0.04	0.01	-5.25	0
C	-0.37	1.60	-0.23	0.82
@TREND	0.01	0.00	5.17	0
D2003	0.08	0.04	2.08	0.04
D15	0.05	0.06	0.85	0.40
D20	-0.23	0.10	-2.23	0.03
D25	-1.04	0.21	-4.95	0
TD2003	0.004	0.01	0.64	0.52
TD15	-0.011	0.00	-4.99	0
TD20	-0.011	0.00	-6.86	0
TD25	-0.013	0.00	-6.80	0

R-squared	0.994	Mean dependent var	0.874
Adjusted R-squared	0.993	S.D. dependent var	0.389
S.E. of regression	0.032	Sum squared resid	0.148
Durbin-Watson stat	0.782	Long-run variance	0.002

Cointegration Test - Engle-Granger
Specification: LOG((S3)/MDD_MESHULAV_L) LOG(MDD_B) LOG(MDD_S) @MOVSUM(MDD,12) MDD_R1 C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Cointegrating equation deterministics: C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Null hypothesis: Series are not cointegrated
Automatic lag specification (lag=0 based on Schwarz Info Criterion, maxlag=13)

	Value	Prob.*
Engle-Granger tau-statistic	-6.4	0.0003
Engle-Granger z-statistic	-65.8	0.0003

*MacKinnon (1996) p-values.

Dependent Variable: LOG((S2)/MDD_MESHULAV_L)
Method: Dynamic Least Squares (DOLS)
Sample (adjusted): 2000M03 2014M04 **Savings and deposits**
Included observations: 170 after adjustments
Cointegrating equation deterministics: C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Fixed leads and lags specification (lead=1, lag=1)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth =5)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(MDD_B)	0.90	0.17	5.22	0
LOG(MDD_S)	-0.18	0.03	-6.54	0
@MOVSUM(MDD,12)	0.00	0.00	0.13	0.90
MDD_R1	0.02	0.00	7.07	0
C	-1.76	0.75	-2.35	0.02
@TREND	0.00	0.00	0.42	0.68
D2003	0.00	0.02	0.02	0.98
D15	-0.08	0.03	-2.90	0.00
D20	-0.19	0.05	-3.94	0.00
D25	-0.34	0.10	-3.46	0.00
TD2003	-0.007	0.00	-2.63	0.01
TD15	-0.005	0.00	-4.19	0
TD20	-0.003	0.00	-4.10	0.00
TD25	-0.006	0.00	-6.47	0

R-squared	0.944	Mean dependent var	1.767
Adjusted R-squared	0.934	S.D. dependent var	0.056
S.E. of regression	0.014	Sum squared resid	0.030
Durbin-Watson stat	0.690	Long-run variance	0.001

Cointegration Test - Engle-Granger
Specification: LOG((S2)/MDD_MESHULAV_L) LOG(MDD_B) LOG(MDD_S) @MOVSUM(MDD,12) MDD_R1 C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Cointegrating equation deterministics: C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Null hypothesis: Series are not cointegrated
Automatic lag specification (lag=0 based on Schwarz Info Criterion, maxlag=13)

	Value	Prob.*
Engle-Granger tau-statistic	-6.0	0.0016
Engle-Granger z-statistic	-57.8	0.0018

*MacKinnon (1996) p-values.

Dependent Variable: LOG((S1)/MDD_MESHULAV_L)
Method: Dynamic Least Squares (DOLS)
Sample (adjusted): 2000M03 2014M04
Included observations: 170 after adjustments
Cointegrating equation deterministics: C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Fixed leads and lags specification (lead=1, lag=1)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth =5)

Cash, current accounts, SROs

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(MDD_B)	-0.04	0.61	-0.07	0.94
LOG(MDD_S)	-0.17	0.10	-1.74	0.08
@MOVSUM(MDD,12)	-0.01	0.01	-1.10	0.27
MDD_R1	-0.07	0.01	-5.81	0
C	1.30	2.64	0.49	0.62
@TREND	0.00	0.00	-0.15	0.88
D2003	-0.04	0.07	-0.54	0.59
D15	0.05	0.10	0.55	0.58
D20	0.32	0.17	1.90	0.06
D25	0.59	0.35	1.71	0.09
TD2003	0.01	0.01	0.76	0.45
TD15	0.01	0.00	2.08	0.04
TD20	0.01	0.00	2.11	0.04
TD25	0.01	0.00	3.39	0.00

R-squared	0.982	Mean dependent var	0.131
Adjusted R-squared	0.979	S.D. dependent var	0.340
S.E. of regression	0.050	Sum squared resid	0.356
Durbin-Watson stat	0.933	Long-run variance	0.006

Cointegration Test - Engle-Granger
Specification: LOG((S1)/MDD_MESHULAV_L) LOG(MDD_B) LOG(MDD_S) @MOVSUM(MDD,12) MDD_R1 C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Cointegrating equation deterministics: C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Null hypothesis: Series are not cointegrated
Automatic lag specification (lag=12 based on Schwarz Info Criterion, maxlag=13)

	Value	Prob.*
Engle-Granger tau-statistic	-4.6	0.0833
Engle-Granger z-statistic	81.3	1

*MacKinnon (1996) p-values.

Dependent Variable: LOG((S10-S1)/MDD_MESHULAV_L)
Method: Dynamic Least Squares (DOLS)
Sample (adjusted): 2000M03 2014M04
Included observations: 170 after adjustments
Cointegrating equation deterministics: C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Fixed leads and lags specification (lead=1, lag=1)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 5)

Public's total direct holdings in taxable financial assets

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(MDD_B)	0.42	0.18	2.34	0.02
LOG(MDD_S)	0.29	0.03	10.50	0
@MOVSUM(MDD,12)	0.00	0.00	-0.22	0.82
MDD_R1	0.01	0.00	1.88	0.06
C	-1.61	0.78	-2.07	0.04
@TREND	0.005	0.00	3.37	0.00
D2003	0.012	0.02	0.61	0.54
D15	-0.16	0.03	-5.58	0
D20	-0.31	0.05	-6.31	0
D25	-0.78	0.10	-7.64	0
TD2003	-0.015	0.00	-5.37	0
TD15	-0.007	0.00	-6.31	0
TD20	-0.006	0.00	-8.48	0
TD25	-0.008	0.00	-8.22	0

R-squared	0.987	Mean dependent var	2.575
Adjusted R-squared	0.985	S.D. dependent var	0.117
S.E. of regression	0.014	Sum squared resid	0.030
Durbin-Watson stat	0.652	Long-run variance	0.001

Cointegration Test - Engle-Granger
Specification: LOG((S10-S1)/MDD_MESHULAV_L) LOG(MDD_B) LOG(MDD_S) @MOVSUM(MDD,12) MDD_R1 C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Cointegrating equation deterministics: C @TREND D2003 D15 D20 D25 TD2003 TD15 TD20 TD25
Null hypothesis: Series are not cointegrated
Automatic lag specification (lag=0 based on Schwarz Info Criterion, maxlag=13)

	Value	Prob.*
Engle-Granger tau-statistic	-5.08	0.0253
Engle-Granger z-statistic	-38.5	0.0669

*MacKinnon (1996) p-values.

Legend:

S1– Cash, Current accounts, SROs (self-renewing overnight deposits)
S2 – Public's deposits and savings plans
S3 – Bond holdings

S4 – Equity holdings
S10 – Public's holdings of total taxable financial assets*
S100 – Public's financial assets portfolio
MDD – Consumer Price Index
MDD_R1 –1-year real yield from zero curve
MDD_R10 – 10-year real yield from zero curve
MDD_I1 – 1-year nominal yield from zero curve
MDD_I10 – 10-year nominal yield from zero curve
VOLUME_S – Average daily stock trading volume
MADD_S – General Shares Index
MADD_B – Bond price index
MDD_MESHULAV_L – Composite State of the Economy Index
D10_2004 – Dummy variable for month of October 2004
D12_2005 – Dummy variable representing the last date before the tax rate increase at the beginning of 2006
D12_2011 – Dummy variable representing the last date before the tax rate increase at the beginning of 2011
D12_12 – Dummy variable for month of December 2012
D2003 – Dummy variable for year of 2003 (period of gradual imposing of tax reform)
D15 – Dummy variable for period when real tax percentage was 15 percent (January 2004–December 2005)
D20 – Sample period when real tax on interest was 20 percent (January 2006–December 2011)
D25 – Sample period when real tax on interest was 25 percent (January 2012–end of sample)

*Share of direct holdings in financial assets is calculated together with the share of the public's holdings in mutual funds. This estimation essentially reflects the scope of financial assets and cash held by the public.

Appendix 3:

Results of equations estimating capital-gains tax revenues received from savings plans and deposits

Dependent Variable: LOG(TAX_RIBIT/S2)
Method: Dynamic Least Squares (DOLS)
Sample (adjusted): 2004M01 2014M01
Included observations: 121 after adjustments
Cointegrating equation deterministics: C LOG(@TREND) D20*LOG(@TREND) D25*LOG(@TREND)
Fixed leads and lags specification (lead=1, lag=1)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 5)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
@MOVSUM(MDD,24)	-0.06	0.01	-4.10	0.00
MDD_R1	0.22	0.03	7.04	0.00
C	-4.74	1.29	-3.67	0.00
LOG(@TREND)	0.64	0.29	2.23	0.03
D20*LOG(@TREND)	0.05	0.03	1.84	0.07
D25*LOG(@TREND)	0.08	0.04	2.05	0.04

R-squared	0.76	Mean dependent var	-1.45
Adjusted R-squared	0.73	S.D. dependent var	0.34
S.E. of regression	0.17	Sum squared resid	3.28
Durbin-Watson stat	1.48	Long-run variance	0.05

Cointegration Test - Engle-Granger
Specification: LOG(TAX_RIBIT/S2) @MOVSUM(MDD,24) (MDD_R1) C LOG(@TREND) D20 D25
Cointegrating equation deterministics: C LOG(@TREND) D20*LOG(@TREND) D25*LOG(@TREND)
Null hypothesis: Series are not cointegrated
Automatic lag specification (lag=0 based on Schwarz Info Criterion, maxlag=12)

	Value	Prob.*
Engle-Granger tau-statistic	-7.6	0
Engle-Granger z-statistic	-78.5	0

*MacKinnon (1996) p-values.

Legend:
TAX_RIBIT – Total tax revenues on deposits and savings
S2 – Total deposits and savings plans of the public
MDD – Consumer Price Index
MDD_R1 – 1-year real yield from the zero curve
D20 – Sample period when real tax on interest was 20 percent (January 2006–December 2011)
D25 – Sample period when real tax on interest was 25 percent (January 2012–end of sample)

Continuation:

Results of equations estimating capital-gains tax revenues received from financial-asset holdings

Dependent Variable: LOG(TAX_CAPITAL/S4)
Method: Dynamic Least Squares (DOLS)
Sample (adjusted): 2004M01 2014M01
Included observations: 121 after adjustments
Cointegrating equation deterministics: C D20 D25 D10_04 D12_05 D12_11 D12_12
Fixed leads and lags specification (lead=1, lag=1)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 5)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(VOLUME_S)	0.51	0.38	1.36	0.18
MDD_S/MDD_S(-4)	3.26	0.68	4.76	0
C	-6.06	1.18	-5.14	0
D20	-0.27	0.36	-0.73	0.47
D25	-0.39	0.25	-1.58	0.12
D10_04	2.58	0.73	3.53	0.00
D12_05	1.82	0.75	2.43	0.02
D12_11	1.15	0.69	1.66	0.10
D12_12	-2.33	0.69	-3.36	0.00

R-squared	0.64	Mean dependent var	-1.19
Adjusted R-squared	0.59	S.D. dependent var	0.69
S.E. of regression	0.44	Sum squared resid	20.37
Durbin-Watson stat	1.00	Long-run variance	0.45

Cointegration Test - Engle-Granger
Specification: LOG(TAX_CAPITAL/S4) LOG(VOLUME_S) (MDD_S /MDD_S(-4)) C D20 D25 D10_04 D12_05 D12_11 D12_12
Cointegrating equation deterministics: C D20 D25 D10_04 D12_05 D12_11 D12_12
Null hypothesis: Series are not cointegrated
Automatic lag specification (lag=0 based on Schwarz Info Criterion, maxlag=12)

	Value	Prob.*
Engle-Granger tau-statistic	-6.05	0
Engle-Granger z-statistic	-57.03	0

*MacKinnon (1996) p-values.

Legend:

TAX_CAPITAL – Total capital gains tax revenues
VOLUME_S – Average daily stock trading volume
MADD_S – The General Shares Index
MADD – Consumer Price Index (monthly rate of change)
D10_2004 – Dummy variable for month of October 2004*
D12_2005 – Dummy variable representing the last date before the tax rate increase at the beginning of 2006

D12_2011 – Dummy variable representing the last date before the tax rate increase at the beginning of 2011
D12_12 – Dummy variable for month of December 2012**
D20 – Sample period when real tax on interest was 20 percent (January 2006–December 2011)
D25 – Sample period when real tax on interest was 25 percent (January 2012–end of sample)

* Revenue in the month of October 2004 was particularly high compared with the months before and after that month. This atypical revenue also does not appear in the survey of government tax revenues in 2004, as published by the Ministry of Finance.

** Revenue in the month of December 2012 was particularly low. Based on the new directives regarding deducting at source, which were first imposed in 2012, losses generated at the end of the year can be offset against profits from the beginning of the year. The tax refund is carried out automatically by Stock Exchange members after calculating the annual profits. Therefore, it pays to realize securities at a loss at the end of the year, if tax was paid on profits during that year. It should be noted that in December 2013 as well there were relatively low revenues compared with the other months of the year, but as there were not any significant declines in early 2013, the offsets in December 2013 were less significant than in December 2012.

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