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Executive Summary

Governmental Discount Rate

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Jack Hirshleifer (1961) defined investment as the sacrificing of certain incomes in the present for the sake of uncertain incomes that are expected in the future. The discount rate refers to a technical tool which is used to reduce the value attributed to those uncertain future incomes, in order to assess their value in terms of certain income at the present. A high discount rate means a more significant reduction in terms of income at the present, and thus will inevitably lead to fewer investments. If the extent of investments is predetermined, then a higher discount rate will mean that a higher value is assigned to investments which yield incomes in the short-term compared to those which yield them in the long-term.

This research asks a fundamental question about the discount rate as it relates to Israel's policy and investment strategy: How should the governmental discount rate be determined? The proper way to determine the governmental discount factor, or the discount rate at which the government takes on debt for its own investments, has been at the heart of a stubborn controversy at the academy and among policy makers for the last 50 years. In a nutshell, the views that dominate the controversy can be divided to three distinct categories:

(A) Discounting an income that is expected at time t according to the yield on a government zero-coupon bond of t years.
(B) Using the discount rates applied by the private sector. The discount rate which is applied by the private sector to a specific investment is estimated using the yields that are earned from a similar investment in the financial markets.
(C) Determining the discount rate according to ethical considerations which justify reducing the value of future income compared to income in the present ("social time preference").

Integrating Market Risk to the Discount Factor

Even if the government has highly diversified sources of income, it cannot protect itself from the risk that the entire market will yield low outputs, a risk which is often referred to in the literature as, "market risk" or, "non-diversifiable risk." An investment policy which takes market risk under consideration must assess possible investments in view of the correlation between the incomes they generate and the performance of the market as a whole - the more

correlated these two are, the higher the premium that the investor needs to compensate for market risk.

Market risk, unlike project-specific risk, is not embodied in the calculation of income expectations. Expectation estimates regard all income equally while ignoring the environment in which it is generated. In particular, such calculations do not reflect the fact that investments that are correlated with the market yield high incomes in circumstances in which the entire market yields high returns and the marginal dollar has a lower value. Thus, we find that income expectation calculations are often characterized by an upward bias.

Those who argue for using the private sector's discount rates attempt to correct the bias by applying a discount rate which is equivalent to the interest that a similar investment will yield in the financial markets. When the market is (approximately) perfect, the expectation of the interest rate garnered from possessing equity in a certain asset will be the sum of a riskless interest rate (which reflects investors' time preference) in addition to a market risk premium. To address the challenge of market risk, this research suggests using the Capital Asset Pricing Model (CAPM)[1] which reflects this viewpoint and allows for estimating the risk premiums where the market is approximately perfect yet suffers failures or shocks in specific sectors.

On the other hand, those who favor determining the discount rate according to the returns on government bonds believe that the market risk attached to government investments is usually negligible. In their view, the risks that the government bears in its investments are well reflected in the basic calculations of expected income/benefits. Discounting should only embody time preference, a preference which is equal to the price of substituting consumption for today for consumption to the future with not risk. The yield on a government bond, which has very little risk, is a good estimate for such a price, and, by extension, for the time

[1] CAPM states that the expected return from a financial asset is equal to the return from a safe asset in the economy, in addition to a market risk premium which depends on the correlation of the assets to the overall market performance. Formally:

$E(r_i) = r_f + \beta_i(r_m - r_f)$

where r_i is the return from asset i, r_f the return from a safe asset (bond), r_m the weighted average of market return and β_i and estimate to i's market correlation which is derived from regressing the returns from i on the returns of the entire market.

preference of the market. In addition, discounting by using the interest that the government pays for its debt ensures that the government does not invest in projects which yield lower returns than those it will earn by investing the money in lowering the national debt.

Social Time Preference

In recent years, there is a growing trend of determining discount rates in light of normative considerations and without relying on market indicators. This trend, based on an idea often referred to as social time preference, reflects notion that failures in the market are so severe that they cannot be used to generate plausible estimates for individuals' time and risk preferences. One of the market failures which is often discussed by this method is the under-valuation of future benefit due to incomplete markets – an undervaluation which leads to under-investment in the welfare of future generations.

Most discussions that are held about social time preference assume that the reasons to discount the value of future benefits (compared to present ones) are that: (a) future society is expected to enjoy greater overall wealth, which diminishes the value of the marginal unit of consumption, and (b) future benefits bear the risk that society will become extinct before enjoying them.

World Trends

This research reviews 10 developed countries to discover that they differ from one another in their methodology for determining the governmental discount rate and in the rates that are eventually chosen. Yet each one of the three methods for discounting mentioned above is applied by at least two countries. Governmental discount rates in the countries analyzed fall in a range between 2% (Germany) and 8% (New-Zealand).

Importantly, none of the countries in the sample adjusted their discount rates to the low interest environment of the recent years. For instance, despite of the fact that the price of debt for the government bears an interest of 0% - 3%, governments that rely on debt price for discounting employ historical debt price, thereby determining discount rates that are higher than 3%. In view of this situation, Israel, in setting the governmental discount rate, faces two

problematic alternatives: either it can determine a discount rate while ignoring the interest environment, or it can determine a discount rate which is very low (less than 2%) compared to the ones used in other developed nations.

Recommendation

As described in brief above, a few main considerations should be addressed in the process of determining the discount rate for Israel, including: measuring the risk premium of governmental investments, estimating the government debt price, deciding upon a discount rate in view of the low interest environment, and discounting long-term investments. All of these considerations should be embedded in a methodology that prioritizes simplicity, and which is flexible enough for the body charged with setting the discount rate to be able to adjust its main parameters for a given investment.

In light of these considerations, this research offers two main methods for determining the discount rate. The first method is based on the CAPM model, and distinguishes investments that are not correlated with the market, which are discounted using the government debt price, from those investments that are correlated with it, which are discounted by using the debt price in addition to a risk premium of 7% (assumes an asset which is perfectly correlated with the market - $\beta = 1$ in the CAPM model). The second method was developed by the Dutch government, and discounts all investments using the debt price in addition to a 1% market risk premium. The debt price for both methods is estimated as the average interest on a zero-coupon Israeli government bond. It ranges between -0.19% for 1 year to 2.5% for 20 years.

In addition, we recommend discounting incomes and benefits that are expected in the long term (more than 30 years) by implementing the idea of social time preference. We believe that using a social time preference measure which is similar to the ones used in the UK and France – about 2% to 3% - should be the default choice.

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