

# **Establishing Public Sector Investment Discount Rate**

---

**Center for Economic Analyses (CEA)**

**Prepared by: Vlatko Andonov**

**Vesna Garvanlieva, MBA**

**Skopje  
February 2009**

Disclaimer: Opinions expressed in this report are those of the Center for Economic Analyses and do not represent the opinion of the USAID, OSI or any other concerned institutions.

It is the responsibility of other authors to cite this report when it has informed their research and publications.



## General information about CEA

### Logo:



### Address:

#### **CENTER FOR ECONOMIC ANALYSES (CEA)**

Bul. Jane Sandanski 63/3,  
1000 Skopje Macedonia

Tel: + 389 (0)2 24 44 766

Mob: + 389 70 834 636

TIN: 4030003479278

Reg. 5763061

### Account number:

Stopanska Banka AD Skopje

Account number: 200000856268559

### Web page and e-mail:

[www.cea.org.mk](http://www.cea.org.mk)

[www.lsg-data.org.mk](http://www.lsg-data.org.mk)

[info@cea.org.mk](mailto:info@cea.org.mk)

# Establishing Public Sector Investment Discount Rate

For each capital investment the cost benefit analysis is an essential tool for evaluating the return of the investment, the related risks, and other variables that affect the costs of the investment on one hand and the benefits of the investment on the other hand.

The investments can be either in the private sector or they can be investments of the public sector. There are different models and approaches developed by many researchers who are discussing the topic of how to evaluate certain investment and how to assess the return of the investment. However, it is commonly understood that there are certain differences when it comes to investments in the public sector. The difference is mainly seen in the beneficiaries of the investment and the nature of the investors' capital.

When it comes to assessing the return of an investment in the private sector in Macedonia there are sufficient information and data that an investor can process in order to calculate the expected return of a given investment. On the other hand, this cannot be confirmed when we discuss the return on investments in the public sector. Having this in mind, this analysis will try to give an explanation of one possible method used to estimate the discount rate necessary for public sector investments since the discount rate is an essential part of each investment appraisal approach. The approach used in this paper is the tax-adjusted Capital Asset Pricing Model (CAPM).

To determine the present value of the forecasted cash flows, these are discounted with a discount rate to reflect the principle of time value of money. The present value of the future forecasted cash flows allows all cash flows to be restated in monetary terms in the current year when the investment is undertaken in order to have a meaningful comparison of the cash flows over time. Thus, the discount rate represents the adjustment factor used to restate the cash flows.

One of the most common methods used to determine the opportunity cost of capital is the **weighted average cost of capital (WACC)** method. The discount rate which is used to evaluate the capital expenditures represents the cost of capital for the investor, or the interest rate that the investor must pay to secure the money.

If the evaluated project has a return larger than the discount rate, then the project is acceptable and can provide adequate returns for the investor in the future period.

## Tax-Adjusted CAPM<sup>1</sup> – Discount Rate for Public Sector Investment in Macedonia

The tax-adjusted CAPM uses the following formula to calculate the cost of capital in the public sector:

$$\text{WACC}_{\text{nominal}} = [\text{RFR} \times (1 - T_c) + (E_p \times \beta_a)] / (1 - T_e)$$

Where:

RFR – risk free rate;

$E_p$  – equity premium

$T_c$  – corporate tax rate

$T_e$  – effective tax rate

$\beta_a$  – Asset beta

The real Weighted Cost of Capital ( $\text{WACC}_{\text{real}}$ ) on the other hand is computed using the following formula:

$$\text{WACC}_{\text{real}} = [(1 + \text{WACC}_{\text{nominal}}) / (1 + i)] - 1$$

Where:

$\text{WACC}_{\text{real}}$  – Tax-adjusted Weighted Average Cost of Capital;

$\text{WACC}_{\text{nominal}}$  – Nominal Weighted Average Cost of Capital;

$i$  - Inflation Rate.

Having these formulas the discount rate for the Macedonian public sector can be computed by using calculations based on information available on the Macedonian Stock Exchange (MSE) and from the audited annual financial reports of the listed companies.

The basic formula that this analysis will use is the  $\text{WACC}_{\text{real}}$  to determine the inflation adjusted cost of capital. However, in order to determine this inflation adjusted discount rate, first of all we need to calculate the  $\text{WACC}_{\text{nominal}}$  which incorporates several variables including the determination of the risk free rate for the Macedonian economy, the expected equity premium, the asset beta and the corporate tax rate. The following text will discuss the computation of these variables and the underlying assumptions.

### Establishing Public sector discount rate according to business sector

Besides the necessary adjustment for the net income tax rate, we need to consider the inflation rate adjustment as well in order to complete the second adjustment of the nominal WACC, and to convert it into real WACC.

---

<sup>1</sup> CAPM-Capital Asset Pricing Model

The real and the nominal rates are related through the formula:

$$\text{WACC}_{\text{real}} = [(1 + \text{WACC}_{\text{nominal}}) / (1 + i)] - 1$$

The inflation rate of Macedonia for 2008 according to the publications of the SSO<sup>2</sup> is 8,3%. This is the value for the variable *i* within the formula for real WACC.

Now when all variables of the basic WACC formula are calculated we can calculate the WACC nominal and then the WACC real which is considered to be the appropriate discount rate for the public sector according to the type of business/sector which will be considered for investing, as given in given Table.

Business Sector	WACC nominal	WACC real
Construction	22,57%	13,17%
Trade	19,23%	10,09%
Industry	18,03%	8,99%
Agriculture	17,34%	8,34%
Services	16,75%	7,80%
Catering	14,19%	5,43%
Banking	9,77%	1,36%

The values of the real WACC rates according to the specific sectors are weighted averages for the concerned sectors. However, it should be emphasized that specific discount rates in the specific sector are calculated on limited number of company data and limited time span. In the case of a specific public investment the investor should consider the data from other non-listed companies in the specific sectors for more accurate calculation of the discount rate.

In addition, as the discount rate can be expressed in real and nominal terms, the cash flows of the given investment can similarly be expressed in their real or nominal terms. The financial practitioners stress that whatever approach used there is a need of consistency.

## Conclusion

This analysis covered a period of more than four years and estimated that the risk free rate for capital investments in Macedonia is around 7,86% while the average market rate of return is 21,69%, which indicates a equity premium of 13,83%. The sector betas fluctuate and result with an weighted average nominal sector discount rates which range from 9,77% to 22,57% and weighted average sector real discount rates which range from 1,36% to 13,17%, for banking and construction sector, respectively.

<sup>2</sup> SSO – State Statistical Office of R. Macedonia ([www.stat.gov.mk](http://www.stat.gov.mk))

The estimated discount rates represent a good basis for an evaluation of a capital investment in the public sector in Macedonia. However, the investor should consider reevaluation of the beta values depending on the planned investment and the sector where the investment will be undertaken.

*For additional information regarding the calculation of the discount factor all interested operators will have to contact CEA.*