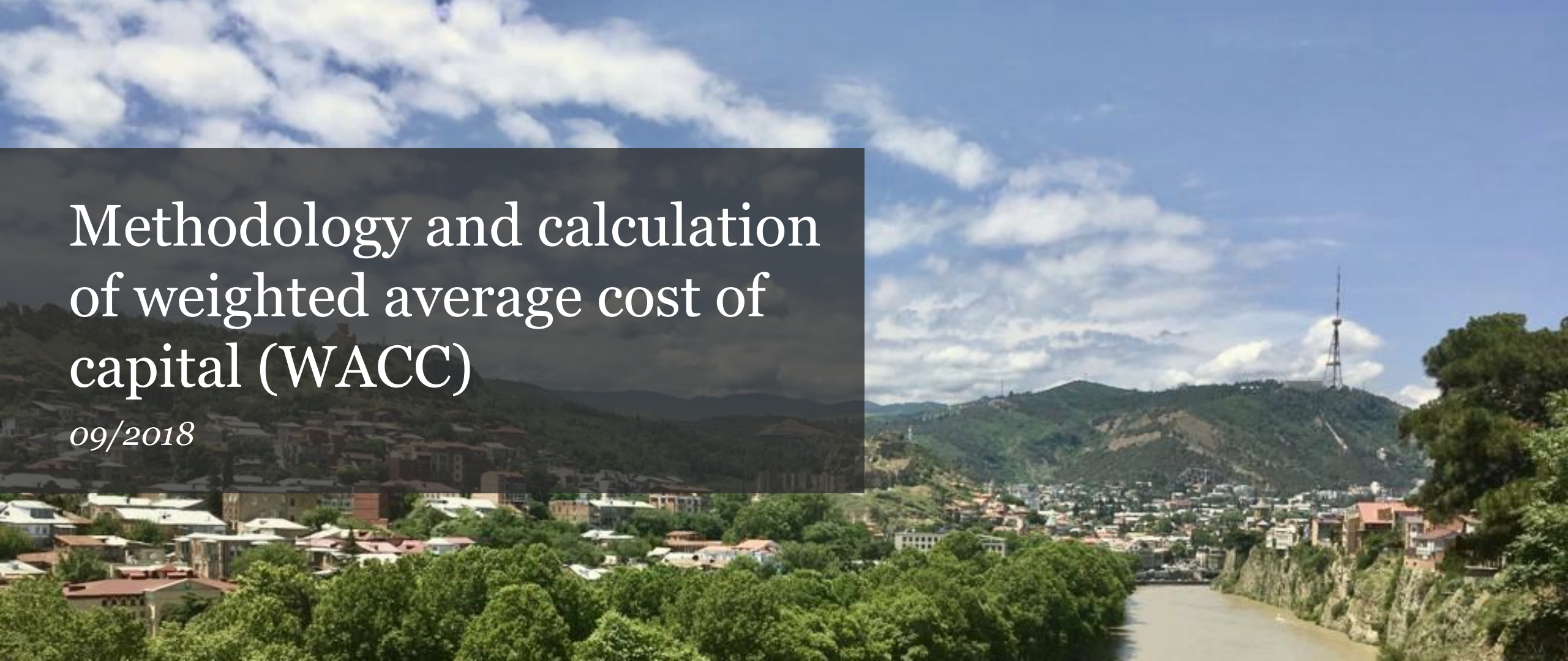


Methodology and calculation of weighted average cost of capital (WACC)

09/2018



Background

We understand that GNCC needs to establish a level of weighted average cost of capital (“WACC”) to help assess, among other things, adequate level of profit for companies operating on Georgian telecommunications market. In order to obtain this information, we were asked develop methodology and calculate the level of WACC for theoretical efficient operator providing telecommunication services at Georgian market, while considering current best-practices in the area of WACC calculation, especially methodology developed for European Commission by The Brattle Group, published as Review of approaches to estimate a reasonable rate of return for investments in telecoms networks in regulatory proceedings and options for EU harmonization. Further sourced documents are the best-practices applied by European regulatory authorities, IRG and BEREC.



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Calculation of Weighted Average Cost of Capital



Weighted Average Cost of Capital (“WACC”) represents the returns required by both debt and equity investors operating in the area of providing telecommunication services in Georgia, weighted by their respective contributions of capital. The conventional formulas for deriving the WACC and the associated definitions are presented below:

$$\text{After – tax WACC} = Kd * (1 - T_c) * (\text{Gearing}) + Ke * (1 - \text{Gearing})$$

$$\text{Gearing} = \frac{D}{D + E}$$

Where:

Kd: Pre-tax cost of debt

T_c : Effective tax rate

Ke: Cost of Equity

D: Market value of debt

E: Market Value of equity

In the regulatory context, proceeds acquired from the regulatory pricing, which includes WACC compensation, will be later subject to taxation. In order to reflect this, post-tax WACC needs to be adjusted for pre-tax WACC as follows:

$$\text{Pre – tax WACC} = \frac{(\text{After – tax WACC})}{(1 - T_c)}$$

Illustrative calculation applied on figures applicable for year 2017 in Georgia indicates following results:

Risk Free Rate	9,92%
Equity Risk Premium	6,00%
Beta	0,89
Size premium	
Cost of Equity	15,26%
Risk Free Rate	9,92%
Debt Risk Premium - GE data	1,51%
Corporate Tax Rate	15,00%
Cost of Debt	9,71%
Capital structure/Gearing [D/(D+E)]	46%
After-tax WACC	12,71%
Pre-tax WACC	14,95%

Source: PwC Analysis

Calculation and sources of above stated parameters is further explained in following sections of this document.

Gearing



Gearing level represents the ratio of net debt (D) to the value of the firm, including equity (D+E). Consequently, gearing determines the relative weight of debt and equity in the WACC. Debt financing provides higher tax shield to the company, although increases the risk of bankruptcy. The common practice for defining Gearing level to be used for calculation provides various options:

- Gearing level at the level of Peer group used to estimate Beta
- Gearing level at the level of regulated company (SMP or Theoretical efficient operator), whereby the market value of equity to be used is preferred to the use of book value of equity. In addition, the EU regulatory practice stipulates the gearing of regulated company should not exceed (or be below) the Peer group gearing by 10 percentage points, and overall should not be above 50%-55%

As GNCC recognizes multiple SMPs at the relevant market, the Gearing level at the level of regulated company would cause multiple levels of WACC, which is not a common practice. Moreover, the market value of assets of regulated company is often not available, similarly as the gearing level of Theoretical efficient operator. As a result, **GNCC will use the Median of Gearing levels of Peer Group companies considered when estimating Beta.** The Peer Group can be further adjusted to reflect target situation of Peer Group companies' specifics.

Company	Country	D/(D+E)
Hellenic Telecommunications Organization SA	Greece	36%
Magyar Telekom Telecommunications Public Limited Company	Hungary	66%
O2 Czech Republic AS	Czech Republic	12%
Telekom Austria AG	Austria	49%
Swisscom AG	Switzerland	31%
Vodafone Group Plc	United Kingdom	65%
Orange Polska Spolka Akcyjna	Poland	95%
Chinese Telecom	China	42%
Proximus PLC	Belgium	28%
Orange (France Telecom)	France	90%
TeliaSonera Aktiebolag (publ)	Sweden	58%
BT Group plc	United Kingdom	58%
Telefónica, S.A.	Spain	78%
KPN	Netherlands	65%
Deutsche Telekom	Germany	82%
Telenet	Belgium	72%
Elisa	Finland	21%
Kabel Deutschland	Germany	24%
Telenor	Norway	29%
NOS	Portugal	42%
Tele 2	Sweden	22%
Pharol	Portugal	0%
Median		46%

Source: Capital IQ

The Peer Group companies were selected as a combination of companies recommended by Brattle for WACC calculation, which focuses on EU Member States, and Peer Group companies used by GNCC in previous regulatory decisions to consider territory aspects and continuity with previous periods. The selected Peer group companies were adjusted for those with excessive gearing, respectively for companies with market capitalization (market value) below the debt book value. As a result, median of selected Peer Group companies' gearings is **46%**, which is considered to be the optimal gearing of theoretical efficient operator.

Cost of debt



In estimating the cost of debt for use in a WACC the objective is to arrive at an overall estimate of the weighted average cost of debt finance for the company as if it was refinancing all of its debt. The pre-tax cost of debt is multiplied by the interest-tax shield $(1-T_c)$ to determine the after-tax cost of debt.

$$\text{After – tax cost of debt} = Kd * (1 - Tc)$$

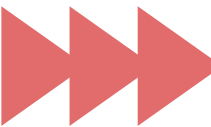
Cost of debt after tax is 9,71% in 2017

Based on the data published by Statistical Office of Georgia, the average yield on 10-year Risk-free government bonds issued in 2017 is 9,92%. Based on the data issued by the National Bank of Georgia, the average interest rate on loans provided in Georgia to industry producers by commercial banks is 11,42%. Market premium is therefore 1,51% and the applicable Cost of Debt after tax is 9,71% in 2017.

Based on current best practice, it is recommended to use 12-months average interest rate to avoid seasonality of corporate bonds with 10-years maturity provided in national currency to industry producers, published by the National Bank of Georgia.

Kd is composed of Risk-free rate and Market premium (ie. $Kd=R_f+M$), we may assume the Market premium is a difference between the yield on 10-year Risk-free government bonds and corporate bonds with 10-years maturity.

The above described approach assumes that the risk profile (credit rating) of a telecommunication operator in Georgia is the same as the risk profile (credit rating) of average industry producer in Georgia. Although no data are available to support this assumption, we can compare telecommunication and industry producers in other countries and if the difference is usually negligible, the approach is considered acceptable.



Risk-free rate represented by Georgian government bonds with 10-years maturity:

	TIBR		NBG CD-s		Yield on Government Bonds			
	1 day	7 days	3 months	6 months* 6 months	1 year	2 year	5 year	8, 10 year
Jan-17	6,61%	6,64%	6,82%	6,97%	7,57%	8,17%	8,94%	
Feb-17	6,79%	6,81%	6,99%	7,04%	7,74%	8,21%	9,18%	11,21%
Mar-17	6,76%	6,81%	6,90%	7,13%	7,79%	8,25%	9,07%	
Apr-17	6,98%	6,92%	6,88%	6,97%	7,65%	8,00%	8,64%	9,97%
May-17	7,10%	7,07%	7,11%	7,14%	7,55%	7,97%		
Jun-17	7,08%	6,97%	7,11%	7,17%	7,42%	7,74%	8,30%	
Jul-17	6,80%	7,03%	7,12%	7,19%	7,25%	7,66%	8,13%	
Aug-17	7,05%	7,02%	7,12%	7,13%	7,19%	7,52%	8,03%	9,41%
Sep-17	7,11%	7,04%	7,11%	7,12%	7,16%	7,40%	7,87%	
Oct-17	6,96%	7,04%	7,09%	7,12%	7,13%	7,34%	7,72%	9,09%
Nov-17	7,03%	7,06%	7,13%	7,10%	7,12%	7,33%	7,78%	
Dec-17	7,27%	7,18%	7,33%	7,05%	7,01%	7,95%		
Average								9,92%

Source: Statistical Office of Georgia

12-months average interest rate of corporate bonds with 10-years maturity provided in national currency to industry producers:

Annual Market Interest Rates on Loans							
	Interest Rate on Loans, Total	Out of Which					
		In National Currency	O/W		In Foreign Currency	O/W	
			Legal Entities	Individuals*		Legal Entities	Individuals*
Jan-17	13,6	18,2	11,63	23,4	8,8	8,8	8,7
Feb-17	13,0	17,1	11,65	20,3	8,5	8,7	8,1
Mar-17	12,7	15,6	11,37	18,5	8,5	8,7	8,2
Apr-17	13,1	16,5	11,67	20,3	8,5	8,6	8,2
May-17	13,9	17,5	11,57	20,9	8,6	8,8	8,2
Jun-17	12,9	16,6	11,65	20,5	8,3	8,4	8,0
Jul-17	12,8	16,1	11,51	20,6	8,0	8,0	8,0
Aug-17	13,7	17,3	11,64	20,7	8,4	8,5	8,0
Sep-17	13,3	16,1	11,02	20,6	8,3	8,4	8,0
Oct-17	13,1	16,7	11,14	20,8	8,1	8,2	7,9
Nov-17	12,8	16,3	10,84	21,4	8,0	8,0	8,0
Dec-17	12,6	16,8	11,42	21,2	7,9	7,9	7,8
Average			11,42				

Source: National Bank of Georgia

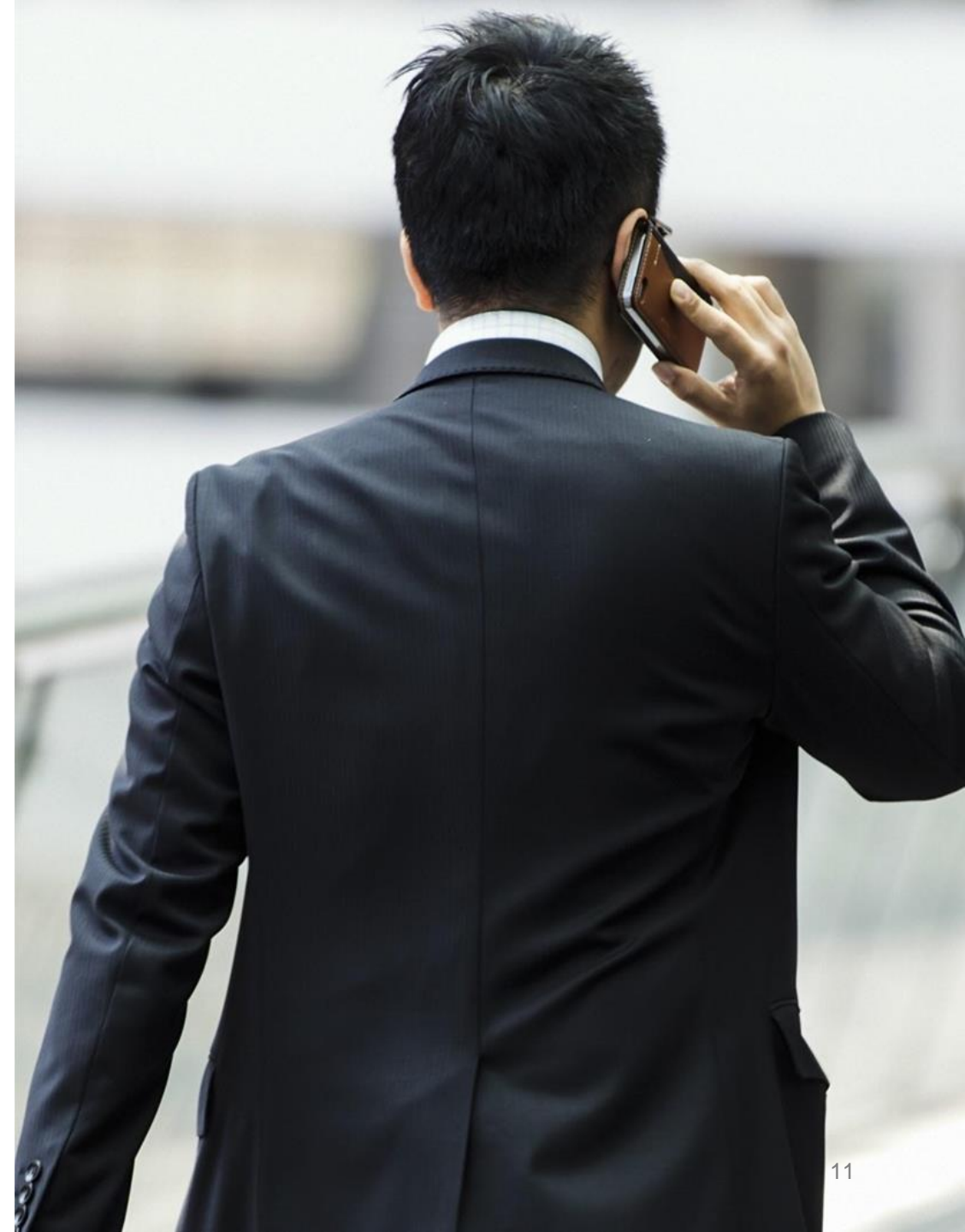
We analysed available data on EU market, whereby the difference between interest rates of loans provided to telecommunication (1,429%) and industry (1,476%) producers is at the level of 0,047% in 2017, which is considered non-significant and confirms the use of data valid for industry producers.

Illustrative calculation applied on figures applicable for year of 2017 in Georgia indicates following results:

TEO GNCC

Interest rates on loans provided in Georgia to industry producers by Commercial banks	11,42%
Risk free rate (10 years GE government bonds)	9,92%
Margin	1,51%
Risk free rate (10 years GE government bonds)	9,92%
Corporate tax rate	15,00%
Cost of Debt after tax	9,71%

Source: PwC Analysis



Cost of equity



Cost of equity is calculated using the Capital Asset Pricing Model (CAPM). The model is based on two components – the risk-free interest rate and a risk premium that represents a systematic risk of the market and asset’s exposure to this risk. The formula goes as follows:

$$K_e = R_f + \beta * (R_m - R_f)$$

Where:

K_e: *Cost of equity*

R_f: *Risk-free rate (the expected returns of risk-free rate)*

β: *Equity Beta (measure of the specific non-diversifiable / systematic risk of the investment)*

R_m - R_f: *Return on market portfolio – expected market excess returns over risk-free assets, which is also called the Equity Risk Premium (ERP)*

Risk-free rate is the starting point of assessing the cost of equity. To consider an asset to be risk free, its cash flows should be considered as having no risk of default. Moreover, actual return on investment should be equal to its expected return, therefore there should be no reinvestment risk of not knowing what the rate of return will be in the future.

Note: Size premium is not considered due to alignment with methodology prepared for European Commission by Brattle

Risk-free rate should in this case be a default-free long-term (10-year) Georgian government bonds issued in applicable year.

The Beta coefficient is a measure of contribution of an individual asset to the risk of a well-diversified portfolio. It is a measure of systematic risk. It describes how the expected return of given stock of portfolio is correlated to the return of the financial market as a whole.

A beta of one indicates that the price of the stock moves in line with the market. A beta less than one indicates that the price of stock is less volatile than the market (or, over time, the security’s change in value is less dramatic than market’s in both directions); while beta greater than one suggests greater than market volatility with security’s change in both directions being more significant than market’s over time.

Beta coefficient can be determined by analysing stock market data of a comparable group of companies (Peer group).

For each of these companies, following steps are performed:

- analysis of monthly movements of stock prices over at least two-year period of time;
- analysis of monthly movements of market index on which these stocks are quoted (over the same period of time);
- regression analysis of the above movements to determine correlation coefficient (beta) between movement of stock price and its respective market index;
- adjustment of beta toward one to reflect that, over time, there is a tendency on the part of betas of all companies to move towards one since companies, as they grow, become more established on their markets and less volatile to its movements.

Based on the methodology developed by Brattle, the 2-years Beta shall be used. In case the 2-years Beta is not statistically significant, the closest data are used (e.g. 3-years Beta).

Beta coefficients calculated in this way reflect capital structure of individually analyzed companies. In order to finalize beta coefficient calculation for a specific company (or industry sector), individual beta coefficients of peer group companies (equity betas) need to be “ungeared” (or, in other words, “cleaned” of debt).

As a final step in calculation, median of these asset betas is “regeared” with a target expected capital structure of assessed company or industry sector, based on Gearing median defined in previous section.

The financial data used are sourced from Capital IQ.

1. As a first step, the Peer Group companies are assessed from their statistical significance. Betas selected for analysis are adjusted, with median at the level of 0,8850.
2. Individual Betas are further ungeared with their individual gearings.
3. Median of ungeared Betas selected from the Peer Group and statistically suitable for further analysis (0,5781) is regeared with a target expected capital structure (46%), with the final Beta at the level of **0,8901**.

Illustrative calculation applied on figures applicable for year of 2017 in Georgia indicates following results:

Company name	Beta adjusted	Number of points	R2 Correlation	p-value	Selection (use of beta or not)	Selected adjusted betas	debt to equity	ungeared beta	relevered beta
Hellenic Telecommunications Organization S.A.	0,7	36	6,0%	14,95%	no		0,4		
Magyar Telekom Telecommunications Public Li	0,7	36	16,8%	1,32%	yes	0,7	0,7	0,4	
O2 Czech Republic a.s.	0,2	36	0,2%	78,00%	no			0,1	
Telekom Austria Aktiengesellschaft	0,8	36	20,1%	0,61%	yes	0,8	0,5	0,5	
Swisscom AG	0,8	36	19,9%	0,63%	yes	0,8	0,3	0,6	
Vodafone Group Plc	0,9	36	22,3%	0,36%	yes	0,9	0,6	0,5	
Orange Polska S.A.	0,7	36	4,1%	23,57%	no		0,9		
China Telecom Corporation Limited	0,9	36	24,2%	0,23%	yes	0,9	0,4	0,6	
Proximus PLC	0,5	36	5,7%	16,12%	no		0,3		
Orange S.A.	0,8	36	15,9%	1,61%	yes	0,8	0,9	0,4	
Public Joint Stock Company Long-Distance and	1,0	36	15,0%	1,95%	yes	1,0	1,3		
Public Joint Stock Company Tattetelecom	0,8	36	9,3%	7,12%	no		1,1		
Telia Company AB (publ)	0,6	36	10,7%	5,12%	no		0,6		
BT Group plc	1,1	36	28,8%	0,07%	yes	1,1	0,6	0,7	
Türk Telekomünikasyon A.S.	0,7	36	5,6%	16,40%	no		0,8		
Telecom Italia S.p.A.	1,1	36	20,6%	0,54%	yes	1,1	2,3		
Telefónica, S.A.	1,0	36	24,9%	0,20%	yes	1,0	1,3		
Koninklijke KPN N.V.	0,4	36	0,9%	57,71%	no		0,6		
Deutsche Telekom AG	0,9	36	34,3%	0,02%	yes	0,9	0,8	0,5	
Telenor Group Holding NV	0,6	36	7,7%	10,04%	no		0,7		
Elisa Oyj	0,5	36	3,0%	31,16%	no		-		
Kabel Deutschland Holding AG	0,4	20	2,0%	55,40%	no		0,2		
Telenor ASA	0,8	36	14,5%	2,20%	yes	0,8	0,2	0,6	
NOS, S.G.P.S., S.A.	0,7	36	7,6%	10,43%	no		0,3		
Tele2 AB (publ)	0,7	36	10,8%	5,00%	no		0,4		
Median	0,7	36	10,8%	5,00%		0,8850	0,5781	0,5423	0,8901

Source:
Capital IQ

Equity risk premium represents the difference between the return on the market portfolio and the risk free interest rate is termed the market risk premium. This premium reflects investor's required rate of return (in addition to risk-free rate) in order to invest in equities rather than risk-free government bonds.

There can be many uncertainties and judgement surrounding the elaboration and exact specification of market risk premium. Market risk premium can be determined on the basis of historical researches of stock market data performed in various countries over various time periods. These researches suggest a certain interval of values for risk premium, with most recent and reasonable being used in commercial sector are in the range of 4% to 6%. Based on the data sourced by Brattle the historical arithmetic average ERP over bonds for Europe is 4.5%, and the corresponding figure for the US is 6.4%. As a result, Brattle considers the ERP of 5-5.5% over bonds would as reasonable for EU Member States.

It is important to consider whether such a range would be applicable to Georgia. Traditionally, economies enjoying higher rates of transformation or lower degrees of economic development are often considered to merit higher equity risk premium. Theoretically, in order to establish whether this applies to Georgia, it would be necessary to conduct detailed country-specific research on historic market returns. However, the relevance of historical research is diminished when there are important structural changes in the economic environment which could be expected to affect returns over time. Given the fundamental transformation and rate of change seen by the Georgian economy in the past 15 years, it is questionable whether such historic research would provide useful additional information.

In the absence of the more detailed study described above, we recommend using 6% as a reasonable approximation for the risk premium in Georgia. Moreover, **application of 6% risk premium is consistent with PwC best practice when calculating WACC.**

Cost of equity
after tax is
15,26% in 2017

Illustrative calculation applied on figures applicable for year of 2017 in Georgia indicates following results:

Cost of Equity Calculation

	Parameter	Source
Risk free rate	9,92%	National Bank of Gerogia - Arithmentical average yield on bonds issued in 2017
Equity Risk premium	6,00%	(Rm-Rf) Brattle study, PwC best practice
Beta coefficient	0,89	Bloomberg, PwC analysis
Cost of Equity	15,26%	

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