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Methodology and results of the calculation of weighted average cost of capital – Mobile Networks

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Building a better working world

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1. Introduction

In order to establish the costs of the public mobile network operator that operates effectively on the competitive market, bottom-up model of long-run incremental costs (hereinafter, BU-LRIC) is used. The development and implementation of the BU-LRIC model is based on the following legal acts:

- The system of the European Union (EU) electronic communications regulation (directives);
- The Law on Electronic Communications of Georgia;

One of the BU-LRIC design stages is calculation of the network value. During this stage the homogeneous cost categories (hereinafter, HCC) are established. HCC values are measured by adding mark-ups to cover the common cost (CAPEX and OPEX) to the estimated annual CAPEX of network elements. The weighted average cost of capital (hereinafter, WACC) is required in order to calculate the annual CAPEX. Therefore, the purpose of this document is the following:

- To present the calculation methodology of the weighted average cost of capital of the mobile network operator that operates efficiently on the competitive market;
- To determine the weighted average cost of capital of the mobile network operator that operates efficiently on the competitive market.

Further in this document we present the WACC calculation algorithms and results.

2. General methodology for WACC calculation

WACC reflects the alternative costs of investment into network components and related assets or, in other words, the return on investment (ROI). The value of WACC should be determined taking into consideration the period for wich costs of regulated services would be calculated. In this document, the nominal WACC value is determined with respect to the latest publicly available data (as of the date of March 2016).

WACC calculation methodology presented in this document is harmonized with the guidelines for WACC calculation describing the basic WACC calculation principles published by the Independant

Regulators Group (IRG)[1], economic literature and theory on cost of capital calculation, best practices established by other European telecommunications regulators.

The weighted average cost of capital is calculated taking into consideration the weighted price of equity and debt. WACC can be calculated with respect to or irrespective of the tax effect. To substantiate their investment projects, enterprises usually use WACC with respect to the tax effect. However, from the regulatory perspective, the WACC value before the tax effect may also be used. The reason is that profit tax in the BU-LRIC model may not be considered as costs, thus WACC value should be higher and should reflect the cost of capital before taxation. Thus, the arithmetic WACC calculation formula for both the pre-tax and after-tax WACC is the following:

$$WACC = \mathrm{Re} \times We + Rd \times (1 - T) \times Wd \quad (1)$$

$$W_d = \frac{D}{D + E} \quad (2)$$

$$W_e = \frac{E}{D + E} \quad (3)$$

$$\textit{Pre-tax WACC} = \textit{After Tax WACC} / (1\text{-}T) \quad (4)$$

Explanations:

- R_d – cost of debt in terms of percentage;
- R_e – required return on investment (after taxation) in terms of percentage;
- W_e – share of equity in capital employed[2];
- W_d – share of debt in capital employed;
- D – market value of debt;
- E – market value of equity;

[1] Source: European Regulators Group. „Principles of Implementation and Best Practice for WACC calculation (February 2007)". Internet access <www.erg.ec.europa.eu>

[2] Employed capital is defined as the sum of equity and debt.

- t – effective profit tax rate.

The calculation of WACC value described further in this document covers the following stages:

- Measurement of the debt ratio (W_d) and equity ratio (W_e);
- Measurement of the debt (R_d) and equity (R_e) cost.

3. Estimating the gearing ratio

According to ERG recommendations, there are three ways to determine the capital structure: based on book value, market values or optimal gearing. Based on the ERG recommendations, the basic advantages and disadvantages of these methods are the following:

- Calculation of the gearing ratio based on book values is easy to check and audit. The downside with the use of book value is that it is not forward-looking and does not reflect the company's true economic value. Besides, book values are dependent on the operator's strategic and accounting policy and so they may vary substantially.
- Calculation of the gearing ratio based on an optimal capital structure means that the Operator always borrows the amount needed (does not borrow too much) with the lowest interest rate. However, in practice this method is considered to be theoretical and subjective.
- Third method to calculate the gearing ratio is based on market values. The book value of debt usually equals its market value, since long-term loans to enterprises are usually issued with variable interest rate, e.g. basic interest rate LIBOR + bank interest margin. Loans with fixed interest rate are usually short-term (1 to 3 years); therefore, the fluctuation of interest rate has little effect on the market value of the loan. When the shares on an enterprise are publicly traded on the stock exchange, the data of the securities market is used for the calculation of equity value, i.e. the number of shares is multiplied by the value of one share at the end of the year. If the enterprises valued are private limited liability companies, ERG recommends using comparative data of the parent company or other listed telecommunication companies. The downside with the use of market values is that they are dependent on several market factors, namely volatility, investors' expectations and speculation.

After the assessment of the advantages and disadvantages of each method, the market values are used to estimate the capital structure.

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Further gearing ratio calculation is provided. Gearing ratio is estimated according to European telecommunications companies' capital structure statistics provided by S&P Capital IQ. Proportions of debt and enterprise value[3] (hereinafter - W_d.) of European telecommunications companies are provided below.

Table 1. European telecommunications companies' capital structure statistics

Telecommunications company	Country of Incorporation	W_d, %
Hellenic Telecommunications Organization SA	Greece	56.88%
VimpelCom Ltd.	Netherlands	62.11%
Sistema JSFC	Russia	6.17%
Tele2 AB (publ)	Sweden	19.95%
Magyar Telekom Telecommunications Public Limited Company	Hungary	46.13%
O2 Czech Republic AS	Czech Republic	2.92%
Telekom Austria AG	Austria	54.35%
Telenor ASA	Norway	20.54%
Vodafone Group Plc	United Kingdom	30.50%
Orange Polska Spolka Akcyjna	Poland	24.50%
China Telecom	China	30.74%
Proximus PLC	Belgium	22.17%
Deutsche Telekom AG	Germany	53.27%
Orange (France Telecom)	France	55.82%
Mobistar SA/NV	Belgium	26.55%
Telekom Slovenije d.d.	Slovenia	43.22%
TeliaSonera Aktiebolag (publ)	Sweden	29.71%
Türk Telekomünikasyon A.S.	Turkey	21.42%
Telecom Italia S.p.A.	Italy	70.03%
Telefónica, S.A.	Spain	52.16%
Arithmetic median:		30.62%

Source: S&P Capital IQ. Internet access: <www.capitaliq.com>.

According to W_d value $W_e=1- W_d=1-0,3062=0,6938$. Consequently, proportion of borrowed capital is 30.62% and equity – 69.38%.

[3] EV=debt (market value) + equity (market value).

4. Cost of debt

Cost of debt is calculated according to the interest rate statistics provided and published by the statistics department of the National Bank of Georgia. Average interest rate of loans in the period of January 2015 – January 2016 is provided below.

Table 2. Interest rate of loans in the period of January 2015 – January 2016

Market Interest Rates on Loans issued By Commercial Banks in Georgia							
	Interest Rate on Loans, total	Including:					
		National Currency			Foreign Currency		
			Legal Entities	Individuals		Legal Entities	Individuals
Jan-15	15.4	19.2	***11.6***	22.6	10.7	***10.2***	12.2
Feb-15	15.1	18.5	***11.5***	22.1	10.8	***10.1***	12.6
Mar-15	15.0	18.5	***12.2***	22.8	10.7	***10.1***	12.5
Apr-15	16.1	19.1	***12.0***	22.8	11.1	***10.3***	12.7
May-15	15.8	18.8	***12.0***	22.4	11.7	***11.4***	12.5
Jun-15	15.0	18.4	***11.8***	22.2	11.5	***11.3***	12.2
Jul-15	14.8	18.2	***12.0***	21.6	11.2	***11.0***	11.8
Aug-15	15.8	18.8	***12.6***	22.4	11.0	***10.6***	12.0
Sep-15	16.4	20.6	***13.1***	24.5	10.9	***10.7***	11.6
Oct-15	15.4	19.9	***13.6***	23.3	10.2	***10.1***	10.4
Nov-15	16.2	21.1	***13.7***	25.5	10.4	***10.2***	10.9
Dec-15	15.3	20.4	***13.7***	24.6	10.3	***10.1***	10.6
Jan-16	16.8	22.4	***14.0***	26.6	10.5	***10.3***	11.0
Average interest rate used for cost of debt calculation			***12.6***				

Consequently, estimated cost of debt that will be used in order to calculate WACC is equal to 12.6% - interest rate estimated for loans issued to legal entities in Georgia in national currency.

5. Cost of equity

The cost of equity is calculated in three steps:

- Cost of equity (R_e) calculation (after-tax);
- Estimating share of equity (W_e) in total capital employed;
- Calculation of effective tax rate (t).

5.1 Estimating cost of equity

In order to estimate the cost of equity usually the capital asset pricing model (hereinafter, CAPM) is employed. CAPM assesses the required rate of return for the company's shareholders based on the risk level of the company. Mathematical expression of CAPM is:

$$R_e = R_f + \beta \times (R_m - R_f) \quad (5)$$

Explanations:

- R_f – risk free rate of return in the market;
- R_m – average market rate of return;
- R_m- R_f – equity risk premium, showing the required rate of interest premium compared to risk free rate of return;
- β – beta, relative risk indicator, showing company's risk compared to all companies in the market.

5.1.1 Risk free rate of return

According to ERG recommendations, the risk free rate of return should be estimated based on long- term (>10 years) government bonds.

In WACC model the risk free rate of return for BU-LRIC model is set accordingly to the arithmetical average rate of USA Federal Reserve 10 year treasury bills for the year 2015, which equals to 2, 14%[4]. This value will be used as a risk free rate of return in calculating WACC.

5.1.2 Equity risk premium

Risk premium reflects additional rate of return compared to risk free rate of return that is required by investors. Although equity risk premium describes future oriented expectations of investors, in practice this indicator is measured by the analyzing historical average rate on investment.

Theoretically, risk premium should be calculated subtracting the risk free rate of return from the historical average equity yield. As Georgian stock exchange market is still developing and has comparatively low liquidity, the above-mentioned calculation on premium risk with reference to Georgian stock market data can be inconsistent and give incorrect results.

Risk premium is estimated using the below-described methodology, which is proposed by Aswath Damodaran. A. Damadoradan is a professor in finance in New York University Stern School of Business. He is widely known for books and articles regarding evaluation, investment management and finance. Articles are published in the leading finance magazines – The Journal of Financial and Quantitative Analysis, The Journal of Finance, The Journal of Financial Economics, The Review of Financial Studies.

4 Source: Federal Reserve Bulletin [Checked on 15 March 2015]. Internet access <http://www.federalreserve.gov >

Georgian risk premium is calculated by adding up equity risk premium of the countries with developed capital markets and Georgian market risk premium.

First of all risk premium of a country with a developed capital market is estimated. It is calculated using the difference between the return on investments into stock market return and risk free rate of return. There are three aspects to be considered when calculating stock market risk premium of a country with a developed capital market :

- The first aspect is the period the data is taken from. In practice when calculating risk premium, both long-term and short-term data is used. The main argument for using short -term data from is that unwillingness of an average investor to risk is very unstable, thus in a short term more relevant results are obtained. However, it should be noted that the standard error of risk premium significantly increases as the observation period is shortened[5]. As the number of years increases, the standard error decreases. Due to the above, a period as long as possible is chosen when calculating risk premium. Whereas the US capital market historical data is one of the oldest and most reliable (1928-2015) in the world, this country is chosen to calculate Georgia's' risk premium.
- The second aspect which has to be taken into consideration is return on long-term and short-term government bonds. In this situation a decision is taken according to what kind of government bonds are used to calculate risk free rate of return. As risk free rate of return is calculated based on long-term government bonds (see section 5.1.1 – Risk free rate of return), long-term government bonds are used to calculate risk premium as well.
- The third aspect is usage of arithmetical or geometrical average to calculate the average return on shares or government bonds. According to A. Damodaran *„Equity Risk Premiums (ERP): Determinants, Estimation and Implications, 2015 Edition"*, if annual returns didn't correlate that would be a strong argument for using the arithmetical average. However, the empirical analysis performed shows that a negative correlation exists – growth of the economics follows after a decline and vice versa. Consequently, the arithmetic average return is likely to over state the premium. Historical data from 1928 is used in order to calculate risk premium and argument for geometric average premiums becomes stronger. Consequently, the geometrical average for the estimation of risk premium is being used.

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[5] $SE = \frac{s}{\sqrt{n}}$

Explanations: SE – standard error, s – standard deviation, n – in this case number of years.

Historical data of the return on government bonds and stock is provided in Appendix 2.

Table 3. Risk Premium

Average of US annual stock return	Average of US annual government bonds return	Risk Premium
11.41%	5,23%	11,41% - 5,23%=6,18%

Notes: the figures in table are rounded to two numbers after comma; the arithmetic operations are performed with unrounded values

According to the A. Damodaran calculations provided above US stock risk premium is equal to 6,18%.

Additional equity risk premium for Georgia reflects additional risk that investors require when investing in a country with not fully developed capital markets and lower stability. Risk premium is higher due to lower liquidity, higher risk, higher inflation and other negative economic and political phenomena. Additional risk premium in Georgia is set based on risk rating assigned by Moody's (which is currently Ba3 for Georgia) and on the relative equity and bond market variation. Based on A. Damodaran calculations additional Georgia risk premium is 5,37%[6].

Finally equity risk premium is calculated summing up the US stock risk premium (6,18%) with the additional stock risk premium of Georgia (5,37%). Therefore, equity risk premium is 11,55%. This value is used in calculating WACC.

5.1.3 Risk level beta

Beta reflects a relative risk level of a company or an industry compared to all companies in the market. Beta is influenced by the amount of leverage the companies use. Beta value that is higher than one means that the company being analyzed is riskier compared to the average risk in the market and thus, investors require a higher rate of return. Beta value that is less than one means that the company being analyzed is less risky compared to the average risk in the market and thus investors require a lower rate of return.

Thus we may distinguish between two beta values:

- β_U -unlevered beta means risk level when a company does not use debt;
- β_L- levered beta means risk level when a company uses debt.

[6] Internet access: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/data.html

Companies with higher debt will have higher leverage beta, which would mean higher risk. The relationship between leverage and beta is expressed as:

$$\beta_L = \beta_U \times (1 + (1-t) \times \frac{D}{E}) \quad (6)$$

Explanation: t –profit tax rate in Georgia

When the shares on an enterprise are publicly traded on the stock exchange, mathematically beta is estimated taking into account co-variation of stock price yield and market yield. These beta values are called historical. However, using this method may result in significant errors. This happens because of a significant variation in beta value with time. Therefore ERG recommendations advise to use adjusted beta.

For the measurement of beta values Capital IQ's European telecommunication companies unlevered beta values were used. The arithmetical median of these values equals to 0,51. The list of telecommunication companies with unlevered beta values is represented in Appendix 3.

Selection of the companies was performed in the S&P Capital IQ database by selecting public companies which are operating in the telecommunications industry, are operating as of the date of preparation of the methodology and provide services comparable with those of our Subject of Analysis and are operating in Europe and CIS markets. Beta calculation was performed using regression analysis to estimate the relation between changes in stock price and the price of the relevant stock index for each peer company selected for the last 5 years prior to the analysis date.

Levered beta according to formula No. 5 is equal to 0.71:

$$0{,}51 \times (1 + (1 - 0{,}15) \times \frac{0{,}3062}{0{,}6938}) = 0{,}71$$

Most of these companies are groups, which provide mobile and fixed network services. Operators for whom WACC is calculated are assumed to provide only mobile network services. Provision of fixed or mobile communication services is related to different risk levels, therefore usaging the provided adjusted beta values in order to calculate WACC would be inadequate. Table 4 shows the share of mobile network services in total Revenue.

Table 4. Share of mobile network services revenue

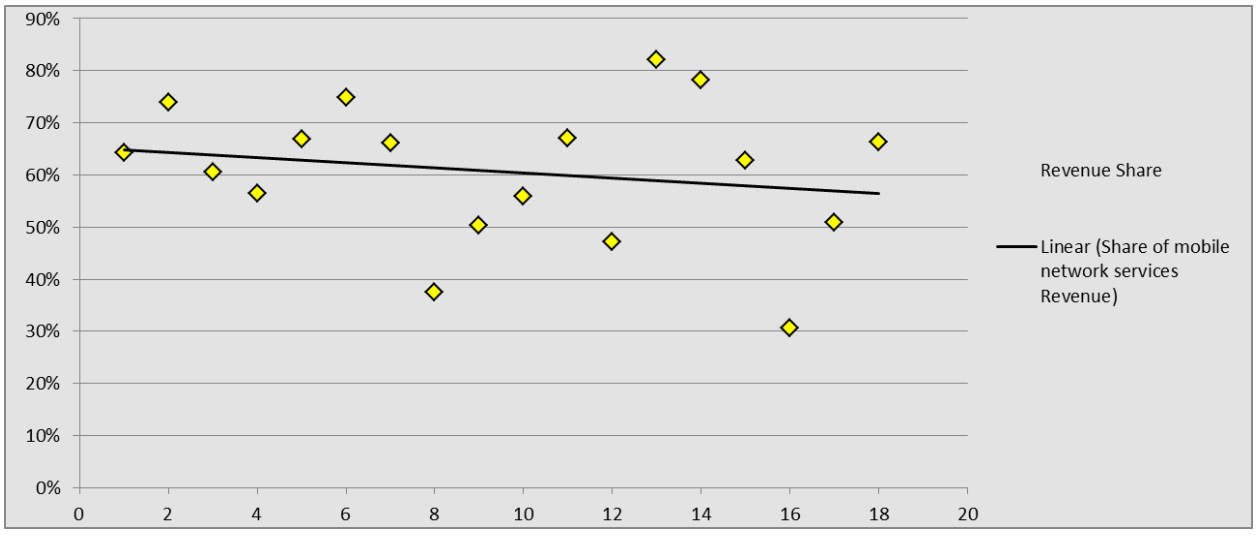
Telecommunication company	Beta (β_u) value, unlevered	Share of mobile network services Revenue
Hellenic Telecommunications Organization SA	0.56	64%

Tele2 AB (publ)	0.44	74%
Magyar Telekom Telecommunications Public Limited Company	0.39	60%
O2 Czech Republic AS	0.57	57%
Telekom Austria AG	0.39	67%
Telenor ASA	0.62	75%
Vodafone Group Plc	0.57	66%
China Telecom	0.57	37%
Orange Polska Spolka Akcyjna	0.50	50%
Proximus PLC	0.54	56%
Deutsche Telekom AG	0.43	67%
Mobistar SA/NV	0.50	82%
Telekom Slovenije d.d.	0.60	78%
TeliaSonera Aktiebolag (publ)	0.52	63%
Türk Telekomünikasyon A.S.	0.58	31%
Telecom Italia S.p.A.	0.38	51%
Telefónica, S.A.	0.50	66%

Source: Share of mobile network services revenue is calculated according to the companies' public yearly reports.

Note: List of companies in Table 4 consists of companies provided in Appendix 3 and those who provided information about Revenue distribution between service types.

Values from Table 4 are put in graphic (see Picture 1). According to the results of Picture 1, it is assumed that the positive correlation exists between risk level beta and the share of mobile network services Revenue. Considering the calculated correlation ratio and Picture 1 results, the assumption of a positive correlation existence between risk level beta and the share of mobile network services Revenue is accepted.



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Picture 1. Correlation of risk level beta and share of mobile network services Revenue

According to the data from Table 4, a regression Y=0.53-0.04*X is set, based on the following calculations Slope(b) = (NΣXY - (ΣX)(ΣY)) / (NΣX2 - (ΣX)2) and Intercept(a) = (ΣY - b(ΣX)) / N.

Where,
x and y are the variables.
b = The slope of the regression line
a = The intercept point of the regression line and the y axis.
N = Number of values or elements
X = Mobile share in revenue
Y = Beta
ΣXY = Sum of the product of Beta and Revenue Share
ΣX = Sum of Revenue Shares
ΣY = Sum of Betas
ΣX2 = Sum of square of Revenue Shares

As Operators provide mobile network services only, X=1 (100% equivalent) is inserted in the regression. Finally, the output (risk level beta) of regression is 0,50 (calculated as Y=0.53-0.04*1). Levered beta according to formula No. 5 is equal to 0,68:

$$0{,}50 \times (1 + (1 - 0{,}15) \times \frac{0{,}3062}{0{,}6938}) = 0{,}68$$

This beta value is used to estimate WACC.

6. Results of WACC calculations

The weighted average cost of capital of Operators is calculated based on the data described in the previous chapters:

1. Calculation of required cost of equity:

$$R_e = R_f + \beta \times (R_m - R_f) = 2{,}14\% + 0.68 \times 11{,}55 = 10{,}01\%.$$

Using Fischer equation for calculation of cost of equity for Georgia in national currency. The International Fisher Effect (IFE) is an economic theory that states that an expected change in the current exchange rate between any two currencies is approximately equivalent to the difference between the two countries' nominal interest rates for that time.

Calculation of cost of equity is based on the risk free rate and market risk premium in USD as obtained from the Damodaran data. While estimating cost of equity in local currency we should additionally adjust our calculation to local currency, due to the fact that default

spread is based on dollar denominated bonds and Country Default Spreads. According to the correspondence with the Professor Aswath Damodaran, compounded adjustment to the local currency should be used by applying Fisher Equation:

(1+ih)/(1+if) = (1+Ph)/(1+Pf)

Where:

Ih – rate in come currency

If – rate in foreign currency

Ph – inflation in home country

Ph – inflation in foreign country

Ke in home currency=(10,01%+1) *(1+4.02%)/(1+2.10%) = 12.08%

Based on the information obtained from the BMI Research, A Fitch Group Company, long term inflation for Georgia is 4.02% and for USA 2.10%[7].

2. Calculation of pre tax WACC:

After-tax WACC = We*Re+Wd*Rd*(1-T)

After-tax WACC = 69,38%*12,08%+30,62%*12,60%*(1-15%) = 11,66%

Pre-tax WACC = After-tax WACC / (1-T)

Pre-tax WACC = 11,66% / (1-15%) = 13,72%

WACC as a financial parameter reflects investors' expactations, while infliation reflects price index of the domestic goods and services. Therefore, these two parameters can not be directly compared. Also the period through which high interest rate will persist remains undefined.

The value of WACC identified above will be used in BU-LRIC model. However, in case of significant economical changes that influence the WACC estimation parameters, WACC value should be recalculated but with a forward looking perspective.

[7] Internet access: https://bmo.bmiresearch.com/home

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Appendix 1. Comparative of information for the European telecommunication companies

Telecommunication company	Country of incorporation	BETA, unlevered	D/E	Wd
Hellenic Telecommunications Organization SA	Greece	0.56	1.32	56.88%
VimpelCom Ltd.	Netherlands	0.32	1.64	62.11%
Sistema JSFC	Russia	1.17	0.07	6.17%
Tele2 AB (publ)	Sweden	0.44	0.25	19.95%
Magyar Telekom Telecommunications Public Limited Company	Hungary	0.39	0.86	46.13%
O2 Czech Republic AS	Czech Republic	0.57	0.03	2.92%
Telekom Austria AG	Austria	0.39	1.19	54.35%
Telenor ASA	Norway	0.62	0.26	20.54%
Vodafone Group Plc	United Kingdom	0.57	0.44	30.50%
Orange Polska Spolka Akcyjna	Poland	0.50	0.32	24.50%
China Telecom	China	0.57	0.44	30.74%
Proximus PLC	Belgium	0.54	0.28	22.17%
Deutsche Telekom AG	Germany	0.43	1.14	53.27%
Orange (France Telecom)	France	0.50	1.26	55.82%
Mobistar SA/NV	Belgium	0.50	0.36	26.55%
Telekom Slovenije d.d.	Slovenia	0.60	0.76	43.22%
TeliaSonera Aktiebolag (publ)	Sweden	0.52	0.42	29.71%
Türk Telekomünikasyon A.S.	Turkey	0.58	0.27	21.42%
Telecom Italia S.p.A.	Italy	0.38	2.34	70.03%
Telefónica, S.A.	Spain	0.50	1.09	52.16%

Source: S&P Capital IQ internet source: www.capitaliq.com

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Appendix 2. US Government bonds and stock return historical data

Year	Stock	Government bonds
1928	43.81%	0.84%
1929	-8.30%	4.20%
1930	-25.12%	4.54%
1931	-43.84%	-2.56%
1932	-8.64%	8.79%
1933	49.98%	1.86%
1934	-1.19%	7.96%
1935	46.74%	4.47%
1936	31.94%	5.02%
1937	-35.34%	1.38%
1938	29.28%	4.21%
1939	-1.10%	4.41%
1940	-10.67%	5.40%
1941	-12.77%	-2.02%
1942	19.17%	2.29%
1943	25.06%	2.49%
1944	19.03%	2.58%
1945	35.82%	3.80%
1946	-8.43%	3.13%
1947	5.20%	0.92%
1948	5.70%	1.95%
1949	18.30%	4.66%
1950	30.81%	0.43%
1951	23.68%	-0.30%
1952	18.15%	2.27%
1953	-1.21%	4.14%
1954	52.56%	3.29%
1955	32.60%	-1.34%
1956	7.44%	-2.26%
1957	-10.46%	6.80%
1958	43.72%	-2.10%
1959	12.06%	-2.65%
1960	0.34%	11.64%
1961	26.64%	2.06%
1962	-8.81%	5.69%

Year	Stock	Government bonds
1963	22.61%	1.68%
1964	16.42%	3.73%
1965	12.40%	0.72%
1966	-9.97%	2.91%
1967	23.80%	-1.58%
1968	10.81%	3.27%
1969	-8.24%	-5.01%
1970	3.56%	16.75%
1971	14.22%	9.79%
1972	18.76%	2.82%
1973	-14.31%	3.66%
1974	-25.90%	1.99%
1975	37.00%	3.61%
1976	23.83%	15.98%
1977	-6.98%	1.29%
1978	6.51%	-0.78%
1979	18.52%	0.67%
1980	31.74%	-2.99%
1981	-4.70%	8.20%
1982	20.42%	32.81%
1983	22.34%	3.20%
1984	6.15%	13.73%
1985	31.24%	25.71%
1986	18.49%	24.28%
1987	5.81%	-4.96%
1988	16.54%	8.22%
1989	31.48%	17.69%
1990	-3.06%	6.24%
1991	30.23%	15.00%
1992	7.49%	9.36%
1993	9.97%	14.21%
1994	1.33%	-8.04%
1995	37.20%	23.48%
1996	22.68%	1.43%
1997	33.10%	9.94%
1998	28.34%	14.92%

Year	Stock	Government bonds
1999	20.89%	-8.25%
2000	-9.03%	16.66%
2001	-11.85%	5.57%
2002	-21.97%	15.12%
2003	28.36%	0.38%
2004	10.74%	4.49%
2005	4.83%	2.87%
2006	15.61%	1.96%
2007	5.48%	10.21%
2008	-36.55%	20.10%
2009	25.94%	-11.12%
2010	14.82%	8.46%
2011	2.10%	16.04%
2012	15.89%	2.97%
2013	32.15%	-9.10%
2014	13.52%	10.75%
2015	1.36%	1.28%

Source: Damodaran - Annual Returns on Stock, T.Bonds and T.Bills: 1928 – Current. Internet access: http://pages.stern.nyu.edu/

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Appendix 3. Beta values (β_u) of European telecommunication companies

Telecommunication company	Beta (β_u) value, unlevered
Hellenic Telecommunications Organization SA	0.56
Tele2 AB (publ)	0.44
Magyar Telekom Telecommunications Public Limited Company	0.39
O2 Czech Republic AS	0.57
Telekom Austria AG	0.39
Telenor ASA	0.62
Vodafone Group Plc	0.57
China Telecom	0.57
Orange Polska Spolka Akcyjna	0.50
Proximus PLC	0.54
Deutsche Telekom AG	0.43
Orange (France Telecom)	0.50
Mobistar SA/NV	0.50
Telekom Slovenije d.d.	0.60
TeliaSonera Aktiebolag (publ)	0.52
Türk Telekomünikasyon A.S.	0.58
Telecom Italia S.p.A.	0.38
Telefónica, S.A.	0.50

Source: S&P Capital IQ. Internet access: <www.capitaliq.com>.

Notes: the figures in table are rounded to two numbers after comma; the arithmetic operations are performed with unrounded values.