Possible Impact of Global Financial Crisis on Prices in Croatian Electricity Sector

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Abstract: - A regulatory method chosen for setting allowed revenue in transmission and distribution of electricity in Croatia is a traditional Rate of Return method. The main feature and, at the same time, the main drawback of this method is that a price is in a direct relationship with the costs of regulated company. A parameter used in this method, which does not solely depend on the costs and management decisions, is the rate of return. The rate of return is usually calculated using the weighted average cost of capital formula (WACC). The WACC reflects two types of finance used to fund investments, debt and equity respectively. The cost of equity is calculated using the Capital Asset Pricing Model (CAPM). This Paper provides the WACC calculation based on the estimates of particular parameters which could be applied in the case of electricity transmission and distribution in Croatia. The estimates are given for two scenarios, for the period prior to and immediately after the beginning of domestic crisis (reflection of the global financial crisis) and secondly for the period throughout the domestic crisis. Thus, reflecting possible impacts of financial crisis on national and global level on cost of capital in transmission and distribution of electricity.

Key-Words: - Distribution, Transmission, Rate of return, WACC, CAPM, tariff system

1 Introduction

A regulatory experience and practice in electricity sector in Croatia are of newer date, especially in respect to economic regulation and implementation of its methods. Although the regulatory authority was established in 2001, the actual implementation of economic regulation happened in the first half of 2008. Such development is partially a consequence of the fact that in Croatia there is only one vertically integrated company (HEP Group), which carries out all electricity activities. The process of legal unbundling has been gradually carried out since the first reform steps taken in 2001 [1]. Nowadays there are five legally unbundled companies that carry out electricity activities (generation, trade, transmission, distribution and supply). A company that carries out distribution activity is also responsible for supply of tariff customers, which are as a consumer category eligible to be supplied under the regulated regime of end-user prices. Electricity generation and supply for households are regulated activities as well as natural monopoly activities of distribution and transmission. Methodology for setting prices for all four regulated activities are passed by the regulatory authority (the Croatian Energy Regulatory Agency, CERA), while the prices are set by the Government upon the opinion of the CERA.

The CERA in December 2006 passed the bylaws on tariff systems for four electricity activities, generation for tariff customers, transmission, distribution and supply for tariff customers [2,3,4,5]. A notion tariff customer only refers to households due to the fact that since July 2009 only households are considered as tariff customers and have regulated end-user price. The passed bylaws define methodologies for setting tariff items for all respective activities. In all tariff systems a traditional method of Rate of Return (RoR) as an initial method of economic regulation was chosen.

A reason for choosing this method lies in the fact that more developed and stricter methods of economic regulation, such as methods of incentive regulation, require development and implementation of certain regulatory mechanisms as well as undertaking of actions by the incumbent utility prior to introduction of incentive regulation [6]. These requirements primarily refer to actions such as:

- Fully-fledged unbundling of electricity activities;
- Development of benchmarking tools;
- Introduction of the regulatory quality of service monitoring tool etc.

However, European practice shows that to a great extent regulatory authorities have gradually adopted incentive regulation as a price setting approach in monopoly activities (Fig.1) [7,8].

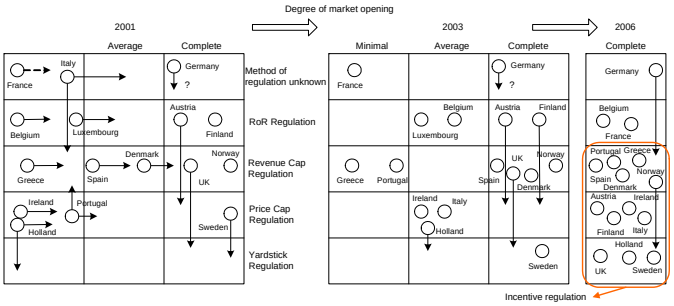

Fig. 1 Development and implementation of price regulation methods in EU-15 and Norway

Furthermore, European regulatory theory and practice [9] recognizes the RoR method as a method of regulation of monopoly activities, transmission and distribution of electricity accordingly, whereas generation and supply are considered to be market activities. Therefore, the Croatian case of applying the RoR method to generation and supply activity could be considered as a peculiarity within the European regulatory context. The experience shows that in some cases defining a regulatory method and amount of network charges is left to regulatory authorities while the government is in charge of setting all inclusive tariffs for customers who are eligible to be priced by these tariffs and not to buy electricity at the market [10]. Such practice is also in line with provisions of new electricity Directive 2009/72/EC [11].

Since the role of economic regulation is to mimic the market forces in activities where competition is not economically justified, it is reasonable to analyze the use of RoR method and its parameters in natural monopolies, transmission and distribution of electricity respectively [9].

The paper provides analysis of the RoR method applied in transmission and distribution of electricity in Croatia, special emphasis is given to the analysis of its particular element, the rate of return. This element is essential for sustaining a financial stability of the power system through securing prudential and justified new investments. It has also an impact on the level of network fees. Estimation of the rate of return is quite important in countries where not much work has been done in this respect so far. Additionally, it is particularly important if analysed in a framework of the global financial crisis and its impact on Croatia. Having in mind that the CERA has not carried out empirical analysis of the rate of return, the paper presents results of the estimates carried out independently by the authors and they are not a part of regulatory price setting procedure.

2 Applied Regulation Method in Croatian Regulatory Process

The basic feature of the rate of return regulation method is that a regulatory authority determines a certain rate of return for invested capital that will enable the regulated undertaking to cover the cost incurred in the provision of energy service as well as it includes an appropriate return on invested assets [7]. A regulatory period, i.e., the period for which service cost of the regulated undertaking is defined, is normally one calendar year for which the regulatory authority defines all required RoR regulation elements. After that the elements are reviewed and defined for the next year. The RoR regulation allows the network service provider to cover all operating and capital costs through the rate of return on assets. A task of the regulatory authority is to assess if these costs are justified. The application of this method presupposes that the regulatory authority has a detailed and in-depth knowledge of the regulated undertaking's operation.

The RoR standard formula which is used for calculating the allowed revenue on yearly basis for all above mentioned electricity activities in the Croatian case is as follows [2,3,4,5]:

$$R_t = OPEX_t + RAB_t \text{ x } WACC_t + D_t \quad (1)$$

where
R_t is the allowed revenue in year t;
$OPEX_t$ are operating costs in year t;
RAB_t is the average value of regulated asset base in year t;
$WACC_t$ is the weighted average cost of capital in year t and
D_t is depreciation in year t.

The first element of the allowed revenue is operating expenditures (OPEX). These costs are incurred through the operation of the transmission and distribution activity. However, not all costs may be allowed and passed on the final consumers. The key principle is that companies should only be allowed to recover the level of costs that would be incurred if a service was provided in the most productively efficient manner, i.e. at prices that could be expected in a competitive market. If higher costs were allowed there would be a loss of welfare to consumers through higher tariffs and lower consumption than optimal.

The second element of the allowed revenue is the Regulatory Asset Base (RAB). In the Croatian case it is the average value of regulated asset base on the 1st January and 31st December of year t. The RAB presents the assets on which a regulated company is allowed to earn an allowed rate of return. The value of RAB is not the same as a value of assets reported in the company's balance sheet (or used for depreciation purposes) due to various reasons, such as disallowance of investments, inclusion of working capital, different valuation methodologies etc.

The third element of the allowed revenue is the allowed rate of return on RAB. The allowed rate of return should be set to provide a market related rate of return, taking into account the riskiness of the investment. Different levels of risk occur in different parts of the business. The allowed rate of return is usually related to the cost of capital of the company, estimated as the Weighted Average Cost of Capital (WACC). The estimation of WACC is based on the cost of equity and the cost of debt.

The last element of allowed revenue is depreciation. It is the charge allowed for writing off the value of existing assets over their lifetime, and recovering the costs of use of those assets. The financial flow created by depreciation is sometimes linked to financing the replacement of assets, but depreciation is actually a charge for the consumption of assets.

The RoR regulation proved to be a good regulation model at the beginning of its application. However, with the passage of time some of its defects and weaknesses have come out, primarily the following:

- lack of incentive for price reduction,
- lack of incentive for improving business efficiency, and
- high cost of regulation.

Lack of incentive for price reduction is the key problem of the RoR regulation, because regulated prices are directly linked to the individual costs of each regulated undertaking. If a regulated undertaking is incurring increasing costs, it will be allowed to raise its prices in proportion to cost increase. Likewise, the more the undertaking invests, the higher its regulatory asset base will be, which in turn impacts the price increase.

Such a behavior is opposed to the one prevailing on a fully competitive market where unnecessary costs and investments always result in shrinking profits of the market participant concerned. On competitive markets it is the market that determines prices, not individual companies. For that reason, generally speaking, profit and cost are inversely proportional. When corporate costs rise and prices remain the same, profit will decline. This linkage is a powerful incentive to competitive enterprises to cut back on costs. For the regulated undertakings this linkage is proportional, whereby the incentive to cut back on costs is weakened. The higher the costs approved by the regulatory authority, the higher the prices that the regulated undertaking will be able to charge to its customers.

The lack of incentive for improving business efficiency also stems from non-existent competition. This attitude is often based on the notion that profits from exceptionally successful innovations will be limited by regulation and that stakeholders will be forced to bear the consequences of unsuccessful innovations, especially if found that an investment has not been used and useful. That is why the management of the regulated undertaking is quite reluctant to accept innovations, especially if a lack of symmetry is seen between the risk taken and the reward, if any, for such business

The high cost of regulation is the third weakness of the RoR regulation. As the regulatory period is one year, the application of this method requires repeated cost and price auditing and employment of more experts to control the costs of the regulated undertaking's services at both ends, the regulatory authority and the regulated undertaking. Such an approach may lead to a situation where the regulation costs exceed the expected benefits of regulation. In the conditions of market competition a great part of this cost and effort would be unnecessary, because customers would be protected by the invisible hand of competition, not the visible hand of the regulatory authority.

Due to the mentioned problems encountered in the application of the RoR regulation method, the regulatory authorities, with a view to ensuring better and more efficient regulation, especially in respect of improved efficiency of the regulated undertakings, set about introducing new, more complex method of price regulation. The introduction of incentive regulation was aimed to eliminate deficiencies specific to RoR regulation.

Development and implementation of incentive regulation, assumes introduction of new regulatory elements and tools as an upgrade of the RoR regulation. However, the element of the RoR regulation which is also used in some forms of incentive regulation is the rate of return. The rate of return should be allowed at the level which is sufficient for attraction of the financial capital required to finance the investments and to enable operation of the networks in safe and efficient manner. [12] This is especially emphasised in transmission of electricity due to the European aim of creating the investment climate which would enable a creation of regional electricity markets and ultimately the single European market.

3 Allowed Rate of Return

The allowed rate of return does not depend only on regulated company costs and management decisions, but also heavily depends on national and international socio-economic environment. In many cases the regulatory authorities estimate the rate of return using the weighted average cost of capital (WACC). Such approach is also used in the Croatian case. The analysis of WACC estimates is a real regulatory challenge. The methodological basis for determination of the WACC has been rooted in modern finance theory and the asset pricing models that have been developed as that theory has evolved. The estimation of WACC is based on the cost of equity and the cost of debt.

A Croatian methodology defines the post tax WACC. It reflects two types of finance, debt and equity:

$$WACC_{post\text{-}tax} = g \times r_d \times (1\text{-}T) + (1\text{-}g) \times r_e \qquad (2)$$

where
g is a proportion of finance that is debt;
r_d is the cost of debt;
r_e is the cost of equity and
T is the corporate tax rate.

The cost of debt is defined as the average interest rate on liabilities [2,3,4,5]. However, a very common approach in estimating the cost of debt is estimating the risk free rate on which country specific debt premium is added [13].

The most widely used approach for estimating the cost of equity is the Capital Asset Pricing Model (CAPM) [14]:

$$r_e = r_f + \beta \times (r_m - r_f) \qquad (3)$$

where:
r_f is the risk free rate;
β is the measure of relative (or non-diversifiable) risk of the company or industry
r_m is the expected return on the market and
$(r_m - r_f)$ is the market risk premium.

The risk free investments and the return obtained from them exist only as a theoretical abstraction. In practice, such investments with minimum risks are investments in government securities.

Market risk premium is implied that any additional risk taken by an investor should be rewarded with an interest rate higher than the risk-free rate. The difference between the market return and the risk free rate of return is a risk premium. Risk premiums may be calculated for a particular security, a class of securities, or a market.

The equity β (beta) coefficient is essentially a measure of price volatility of company's shares in comparison to the market index. In the case of high beta the company's shares' prices will tend to move more than the market index (β is greater than 1) and in a case of low beta the company's shares' prices will tend to move less than the market index (β is lower than 1). A standard procedure for estimating betas is to regress stock returns against market returns. The slope of the regression corresponds to the beta of the stock, and measures the riskiness of the stock. The beta is very often estimated by using relatively straightforward statistical parameters:

$$\beta = (\mathrm{cov}_{s,m})/(var_m) \qquad (4)$$

where
$\mathrm{cov}_{s,m}$ is the covariance of the company's share prices with the market prices and
var_m is the variance of the market prices.

4 Calculation of WACC based on estimated parameters

A theoretical assumption that was followed as a basis for the WACC estimation was that the WACC should not be the same for transmission and distribution activity and that the WACC for transmission should be lesser than in

the case of distribution activity. Namely, a distribution activity is supposed to be more risky business. Such assumption was founded on two grounds, firstly on the experience of other regulatory authorities [15,16,17] and secondly, on the financial statements of companies that carry out analyzed activities, HEP Transmission System Operator ltd. (HEP TSO) and HEP Distribution System Operator ltd. (HEP DSO) [18,19]. An overview of nominal pre-tax WACC estimates in several countries is shown in Table 1. However, it should be mentioned that in the initial stage of implementation of economic regulation in energy sector, in many countries in transition without developed financial markets at that time and with the lack of experience in calculating the WACC setting, the rate of return was determined on the basis of the overall government macroeconomic policy and the purchasing power of consumers (e.g. Bulgaria, Slovenia) [9]. Neglecting thus the real value of capital employed.

Previously explained WACC parameters in case of Croatia were estimated using three different versions, as shown in Table 2. These estimates refer to data from the period year 2007 to 2008. Hence, they include data from two periods, before a domestic financial crisis in Croatia as a consequence of global financial crisis and from the very beginning of the domestic crisis. As indicated in following Chapter 5 of this Paper, April 2008 could be referred as a beginning of the domestic financial crisis. Having in mind the environment in which respective activities are carried out, six parameters (risk free rate, market risk premium, beta, tax rate, cost of debt and cost of equity) are the same for all three versions, while a difference could be seen in capital structure (gearing). However, this difference significantly influences a range of results and a level of optimal WACC.

Table 1 Overview of the nominal pre-tax WACC for different countries

Country	T^1 (%)	D^2 (%)
Czech Republic	7.479	8.114
Northern Ireland	6.41	6.91
France	7.25	7.25
Hungary	7,1	7,1
Slovenia	4.13	4.13

Legend: [1]Transmission; [2] Distribution

The first parameter, the risk free rate (r_f) was estimated using two different sources. The first source was the Croatian Ministry of Finance and the return on government bonds issued in the past few years [20] as shown in Table 3.

The second source used for confirmation of the results, was Aswath Damodaran's estimates of default free government bond rate for Croatia [21]. Based on these two sources as the risk free rates for both activities the value of 5 per cent was set.

Table 2 Estimation of WACC (year 2007-2008)

Parameters	Version 1		Version 2		Version 3	
	T[1]	D[2]	T	D	T	D
Risk free rate (r_f)	*5.00%*					
Market risk premium ($r_m - r_f$)	*3.38%*					
Beta (β)	*0.839*					
Cost of equity (r_e)	*7.67%*					
Share Equity (E)	*0%*		*76%*		*40%*	*50%*
Share of debt (D)	*100%*		*24%*		*60%*	*50%*
Cost of debt (r_d)	*5.5%*					
Tax rate (T)	*20%*					
WACC (%)	4.40		7.01		5.77	6.12

Notation: [1]Transmission;[2] Distribution

The second parameter, market risk premium ($r_m - r_f$) was estimated according to country rating, which is Baa2 (Moody's) [22]. Additionally, according to [21] market risk premium for Croatia in January 2009 was 3.38 per cent. This percentage is used in calculations.

Table 3 Croatian Ministry of Finance Bonds – Series and interest rate

Bonds - Series	Currency	Maturity	Interest rate
Bonds-Series 07 D-	EUR	2019	5.375%
Bonds-Series 12 D-	HRK	2017	4.75%
Bond Series 09 D-	EUR	2015	4.25%
Bonds-Series 05 D-	EUR	2014	5.50%

The third parameter, the equity beta (β) was calculated using both mentioned approaches for the beta calculation. However, in the Croatian case there are many obstacles in using such approaches in calculation of the equity beta. One of the main obstacles lies in the fact that only one energy company is listed on the Zagreb Stock Exchange and that is INA, privatizes oil and gas company. The second obstacle is a degree of the financial market development. The assumption on which the beta calculation was based was that the beta of INA is similar to beta of the HEP Group (proxy variable). Therefore, the beta was estimated by comparing the price of INA's shares against the national stock index Crobex. The Beta was based on historical data of 112

weeks (1st December 2006 to 3rd February 2009) [23]. Dynamics of the price of INA's shares and the national stock index Crobex are shown in Fig.2.

The result of such calculation is the value for INA's beta of 0.839, as shown in Fig.3. The stock beta is the slope of the straight line.

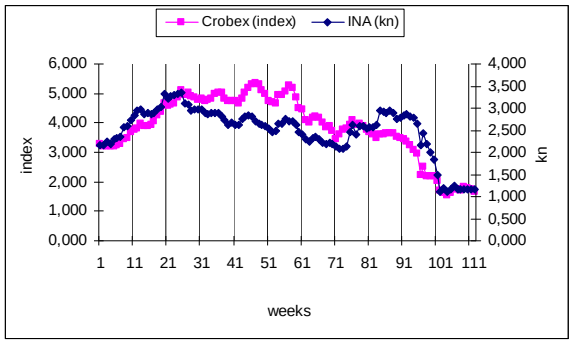

Fig.2 Price of INA's shares and the national stock index Crobex

This result was further challenged and confirmed by comparing it with the betas of the electricity utility companies from Europe and the United States [21] as shown in Table 4. The betas of the respective companies are in between 0.74 and 0.89.

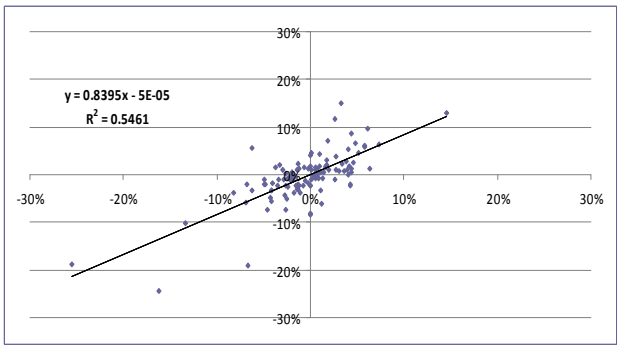

Fig.3 INA's stock beta

The fourth parameter, the cost of debt (r_d) is a result of two elements taken from the financial statement of HEP Group for 2007 [24]: the weighted average structure of long-term and short-term liabilities, and calculation of interest rate for every liability (debt). The weighted average cost of debt for the HEP Group is approximately 5.5 per cent. This analysis is quite superficial since the calculation is not carried out independently for each activity. However, the prerequisite for further more thorough analysis of the cost of debt for each activity is unbundling of liabilities within the HEP Group. Monitoring of such exercise is within the competences of the CERA.

The CERA's monitoring should be two-folded. On one hand, past debts should be rationally allocated between activities in order to prevent subventions enabling thus a development of a fair playing field for completion. On the other hand, the CERA is in charge of approving a three-year development and construction plans of HEP TSO and HEP DSO. One of the essential components of this procedure is giving approval for future financial resources needed for realization of planned investments. A level of indebtedness for each daughter company is decided by the management board of the HEP Group and not by the managers of daughter companies although the investment plans and tariffs are set separately for each of the activities. This gives, however, the space for unfair allocation of debts.

Table 4 The betas of the electricity utility companies in Europe and the United States

Industry	Number of firms	Average Beta
USA		
Electric Util. (Central)	24	0.82
Electric Util. (East)	26	0.74
Electric Util. (west)	16	0.79
Europe		
Electric Utilities	35	0.89

The fifth parameter, the capital structure or the gearing (g), it showed to be the most challenging and interesting parameter of the WACC estimation. Three different versions of the gearing were used:

1. Version 1 – a gearing equals 1 (a share of capital is 0 per cent and a share of debt is 100 per cent) for both activities. Such ratio results from the data in annual reports of HEP TSO and HEP DSO [18, 19]. Namely, the owner of all assets of the HEP Group is a mother company. The daughter companies have signed a contract with the mother company with which they were granted a right to operate the assets, but are not the owners of the assets. The contracts *per see* have a form of the financial leasing contracts;

2. Version 2 – a share of capital is 76% and share of debt is 24%, for both. In this case capital structure was taken form the consolidated balance sheet of HEP Group [24]. HEP Group is a 100% state-owned energy company which has been active in electricity production, transmission and distribution and in district heating and natural gas supply.

Operating income of the Group was 10,815.5 million kunas in 2007. Income from electricity sales (including electricity production, transmission and distribution) was 80.8 per cent of the total operating income. The income from the heat and gas sales was 4.2 per cent and 2.2 per

cent respectively. Other operating income was 12.8 per cent.

Structure of operating income from electricity activities is show in Fig.4. A share of electricity production in total operating income from electricity activities is 48 percent, a share of transmission is 10 per cent, while a share of distribution is 42 per cent;

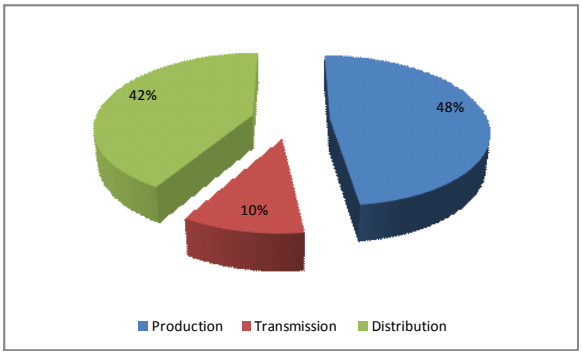

Fig.4 Structure of HEP's operating income from electricity activities in 2007

3. Version 3 - has two options, one for a transmission and the other for a distribution activity. A share of equity for transmission is 40 per cent, while for distribution is 50 per cent. On the other hand, a share of debt for transmission is 60 per cent and for distribution 50 per cent. This diversification in structure of capital results significantly from the fact that the in Croatia a deep approach toward connection fees has been adopted. Table 5 shows the structure of planned and realized investments in HEP DSO for a three year period 2005-2007 [19]. From Table 5 it could be seen that in this period on average roughly 40 per cent (a creation of conditions in the network for new connections) of all realized investments were financed from the connection fees. On the other hand, in case of HEP TSO no investments have been financed from the connection fees so far [18].

The values of gearing in this version are result of the author's analysis based on three grounds. Firstly, the estimates carried out by other authors were analyzed [13]. Secondly, the authors' judgment and estimates were based on the capital structure resulting from the thorough analysis of the HEP Group's consolidated balance sheet, HEP DSO's and HEP TSO's balance sheets [18, 19, 24]. Finally, gearing was defined according to future investment plans and financial resources planned for them respectively.

As the sixth parameter, lastly, a tax rate is used to calculate tax liability. In Croatia tax rate is 20 per cent.

A range of the post tax WACC for activities, transmission and distribution, is from 4.4 per cent to 7.01 per cent. According to the authors' opinion the Version 3 is the most realistic and applicable version. The post tax WACC for HEP TSO should be approximately 5.77 per cent and for HEP DSO approximately 6.12 per cent. This result at the same time proves the previously stated assumptions.

The WACC estimates and its implementation should be analyzed in wider context, as a part of regulatory costs' review. However, it is important to emphasis that the values of WACC used in tariff setting procedure carried out in 2008 are not publically available. Therefore, the values that were used by the CERA could not be challenged against the values obtained though the author's analysis. This fact additionally opens space for a further, deeper academic analysis and a dialogue between the regulatory authority and regulated entities.

5 Impact of global financial crisis on WACC parameters

A new challenge in analysis of WACC was the influence of global financial crisis on cost of capital and indirectly on prices of monopoly activities, respectively. Therefore, this Chapter provides the estimates of WACC in a period which faced the crisis' influence, namely end of 2008 and beginning of 2009.

The global financial crisis started to show its effects in the middle of 2007 and into 2008. Around the world

Table 5 Structure of planned and realized investments of HEP-ODS in period 2005-2007

Type of investments	2005			2006			2007			2005-2007		
	Planned mil. kunas	Invested mil.kunas	Realisation	Planned mil. kunas	Invested mil.kunas	Realisation	Planned mil. kunas	Invested mil.kunas	Realisation	Planned mil. kunas	Invested mil.kunas	Realisation
Investments' preparation	23.79	25.19	106%	24.25	13.17	54%	37.60	19.60	52%	28.55	19.32	68%
Replacements	230.22	251.24	109%	269.21	218.05	81%	97.50	225.30	231%	198.97	231.53	116%
Revitalization	15.56	13.43	86%	5.40	4.58	85%	3.10	4.30	139%	8.02	7.44	93%
War demages	83.29	73.38	88%	126.10	72.40	57%	25.00	101.80	407%	78.13	82.53	106%
New facilities	251.23	252.31	100%	283.78	231.43	82%	217.10	267.20	123%	250.70	250.31	100%
Other investments	188.75	212.81	113%	124.53	163.48	131%	180.50	157.10	87%	164.59	177.80	108%
Connections	719.55	427.88	59%	781.40	560.67	72%	445.00	597.00	134%	648.65	528.52	81%
R&D	3.09	2.22	72%	3.51	0.00	0%	20.00	0.00	0%	8.87	0.74	8%
Total	**1,515.47**	**1,258.46**	**83%**	**1,618.18**	**1,263.78**	**78%**	**1,025.80**	**1,372.30**	**134%**	**1,386.48**	**1,298.18**	**94%**

stock markets started to fall. Large financial institutions collapsed or were bought out. Therefore, the governments even of the wealthiest nations had to come up with rescue packages to bail out their financial systems. In Europe, a number of major financial institutions failed or needed rescuing. Most economic regions have been facing recession since then. This includes the US, the Eurozone, and many others. Croatia also has been hard-hit by the global financial crisis and started to feel its own particular domestic crisis. The country's gross domestic product fell 6.7 per cent in the first quarter of 2009. It was its biggest drop in years. Namely, while the foreign interest rates fell to historically low levels, as results of the ECB's (European Central Bank) interventions, interest rates in Croatia started to be much higher than abroad. The reason for this lays in the fact that almost 90 per cent of Croatian banking and financial sector is under control of the European banks. Influence of global financial instability increased real interest rates in Croatia as well as cost of business and government's (re)financing of debt. After a period of intensive capital inflow and low capital prices, capital has become scarce.

Higher costs of government (re)financing in Croatia are shown through treasury bills yielding. The Ministry of Finance issues short-term transferable immaterialized treasury bills. Treasury bills are issued with the maturity deadline of 91, 182 and 364 days. Fig. 5 shows that interest rates of short-term treasury bills increased starting from April 2008 [25]. This point also denotes the beginning of financial crisis in Croatia, as a consequence of the global financial crisis.

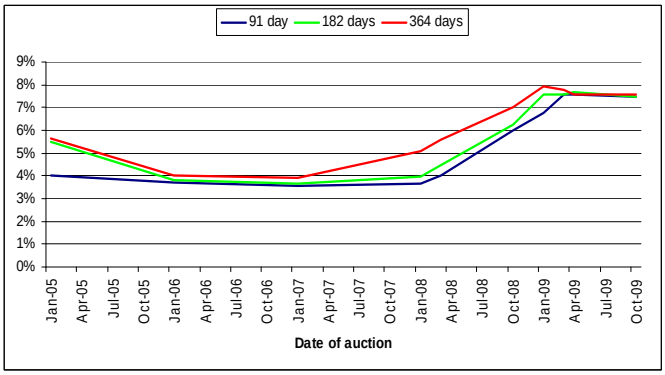

Fig.5 Treasury bill's auctions held by the Ministry of Finance and accepted yielding

The Ministry of Finance started to (re)finance the Government's debt not with the long-term government's bonds, as a better solution, but with the short-term treasury bills. Such financial policy has also an impact on the value of risk free rate as a parameter of WACC. Therefore, for a new analysed period (2008 and 2009) the authors' estimates were based on the short-term treasury bills' interest rate, which resulted in higher level of risk free rate (6 per cent), compared to the original estimate (5 per cent).

At the same time, the HEP Group's long-term loans became cheaper. Namely, the most of HEP Group's loans interests have been determined on the basis of the reference rate of x-month EURIBOR plus a margin of certain value y. Due to the fact that in analysed period the EURIBOR (Euro Interbank Offered Rate) decreased, the cost of debt for HEP Group decreased accordingly.

Fig.6 shows the historical data for Euribor for the period January, 1st 2008 to September, 1st 2009 (1 month, 3, 6 and 12 months) while Table 6 shows HEP Groups's liabilities according to reference rate of x-month EURIBOR [26,27].

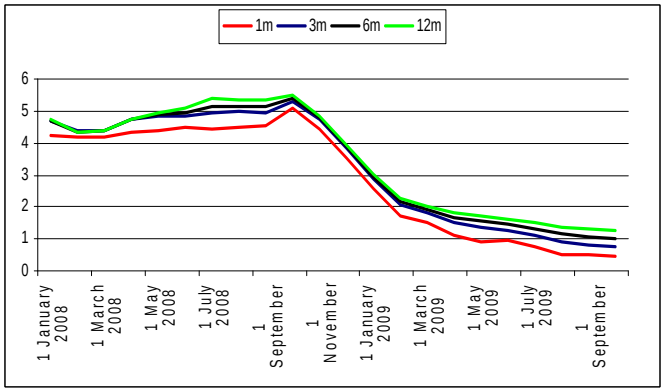

Fig.6 The historical data for Euribor 2008 and 2009 (1-3-6-12 month)

New estimated cost of debt, based on the structure of HEP Group's liabilities according to reference rate of x-month EURIBOR (3 and 6 months) and other liabilities with fixed interest rate, is 4 per cent (as shown in Table 7).

Table 6 HEP Group's liabilities according to reference rate of x-month EURIBOR

Liabilities:	Interest rate
Domestic bank borrowings	EURIBOR+ (1,00%-2,0%)
Foreign bank borrowings	EURIBOR+ (0,50%-2,75%)
Liabilities to domestic companies	EURIBOR+ 1,95%
Liabilities to foreign companies (taken up via domestic banks)	EURIBOR+ 1,5%
Paris Club Debt	EURIBOR + 0.50%.
Bonds	5%-6,5%

Additionally, the Moody's Investors Service has downgraded the local currency government bond rating of the Republic of Croatia from Baa2 to Baa3. This

decrease in rating in Moody's opinion was a consequence of slow and "likely inadequate" response of the Croatian Government to national deteriorating economy and a budget gap. Croatia's main domestic vulnerability is its large external debt and late and inadequate response from fiscal authorities.
According to Aswath Damodaran's estimates of default free government bond rate for long-term rating Baa3 is 3,90 per cent [21].

Summing up previously said, the influence of global financial crisis on the WACC parameters this respective case is two-folded. Firstly, there was an increase in risk free rate and market risk premium. Secondly, there was a decrease in value of cost of debt as a result of decrease in reference rate, EURIBOR.

Estimation of WACC with new parameters, which are result of global crisis and domestic situation on financial market, is shown in Table 7.

Table 7 Estimation of WACC after inclusion of global financial crisis' impact

Parameters	Version 1		Version 2		Version 3	
	T[1]	D[2]	T	D	T	D
Risk free rate (r_f)	***6.00%***					
Market risk premium ($r_m - r_f$)	***3.90%***					
Beta (β)	*0.839*					
Cost of equity (r_e)	*9.27%*					
Share Equity (E)	*0%*		*76%*		*40%*	*50%*
Share of debt (D)	*100%*		*24%*		*60%*	*50%*
Cost of debt (r_d)	***4.0%***					
Tax rate (T)	*20%*					
WACC (%)	3.20		7.81		5.63	6.24

A new range of the post tax WACC for activities, transmission and distribution of electricity, is from 3.20 per cent to 7.81 per cent. According to the authors' opinion the Version 3 is the most realistic and applicable version as explained in original estimates. The post tax WACC for HEP TSO should be approximately 5.63 per cent and for HEP DSO approximately 6.24 per cent. If one compares results for Version 3 with the results for the same Version in Table 2 (5.77 per cent and 6.12 per cent respectively) one can conclude that there was no significant influence on WACC due to domestic and global financial crisis. This is the consequence of diverse approaches in tackling financial crisis on national and global level.

6 Conclusion

Implementation of the RoR method in the monopolies, such as electricity transmission and distribution, implies that regulated prices are directly related to the costs of a particular company. A parameter of the RoR method, which to a certain extent depends on a wider socio-economic framework and not solely on company's costs, is a cost of capital. The experience shows that cost of capital is usually calculated using the WACC approach. Estimating the WACC and its parameters is a real challenge for the regulatory authorities, especially in the countries where the financial market is in its initial phase of development (e.g. in case of Croatia). In such cases, estimation of the WACC requires additional evaluations and argumentation concerning past values and future trends.

Estimating the WACC in the Croatian case and deciding on its justified level has not been performed by the regulatory authority *per see,* so far. Therefore, the authors have carried out their independent analysis which was not an integral part of a tariff setting process. The input data used in calculation is publically available.

Authors carried out estimates for two scenarios: firstly, for the period prior to and immediately after the beginning of domestic crisis (reflection of the global financial crisis) and secondly for the period throughout the domestic crisis. For both scenarios three different versions of estimates were carried out. The estimates for the post tax WACC in the first scenario for both activities range between 4.4, and 7.01 per cent, while for the second scenario range from 3.20 to 7.81 per cent. The authors' opinion is that the estimates in Version 3 are the most viable since the gearing in this case is in line with other countries empirical analysis and experience. In both scenarios the Version 3 estimates are very similar, for HEP TSO WACC is 5.77 per cent (the first scenario) and 5.63 (the second scenario) and for HEP ODS WACC is 6.12 per cent (the first scenario) and 6.24 per cent (the second scenario).

A difference in results between two activities stem from a different gearing (a capital structure). In case of transmission indebtedness is higher. Additionally, a trend of future indebtedness is positive, while a distribution activity shows a constant level indebtedness, primarily due to deep connection fees.

Another remark refers to a negligible difference in the values of post-tax WACC between two scenarios for both activities. Namely, the estimates show that the global financial crisis and its reflection on the domestic crisis do not have a significant impact on a value of WACC and on the level of prices of monopoly activities respectively. Namely, the influence of two crises and the way they were tackled on global and national level have

"neutralized" each other through a different impact on respective WACC's parameters.

Finally, one can conclude that there is still space for further analysis of the WAAC and improvements in WACC estimates. Firstly, due to a fact that a complete and thorough unbundling of liabilities between different activities within the HEP Group has not been carried out yet and secondly the Croatian financial market has not still reached its mature level, which would be sufficient for a well founded WACC estimates.

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