The WACC for the Dutch TSO's and DSO's

Authority for Consumers and Markets

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1 Introduction

The Dutch Authority for Consumers and Markets (ACM) invited Rebel to determine the weighted average cost of capital for the Dutch gas and electricity transmission and distribution system operators (TSO's and DSO's) for the regulatory period that will start in 2017.

The cost of capital for the TSO's and DSO's is expressed in a real pre-tax weighted average cost of capital (WACC), with the cost of equity calculated using the Capital Asset Pricing Model (CAPM). The WACC reflects the two main types of finance used to fund investment: debt and equity. The assignment consists of updating the parameters of the pre-tax real WACC using ACM's WACC methodology and performing a sanity check on some WACC parameters[1]. The response of stakeholders on the draft version of this report has been taken into account in this final report.

Some of the WACC parameters are set using a comparator group. We identify the appropriate comparator group (chapter 2) and determine gearing (chapter 3), cost of debt (chapter 4), cost of equity (chapter 5), inflation and tax (chapter 6) and finally summarize the WACC determination (chapter 7).

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[1] The method to set the WACC is described in the method decisions of the TSO's and DSO's 2017-2021.

2 Comparator group

2.1 Introduction

In order to calculate the WACC we need to determine its individual parameters[2]. Some of these parameters are generic for all companies, these parameters –such as the risk free rate- do not depend of the risk profile of a company or sector. These parameters are calculated using general market information. Other parameters –beta, gearing, debt premium- do depend directly or indirectly on the risk profile of a company or sector. Ideally these sector specific parameters would be determined using market evidence of -for example- beta's of Dutch TSO's and DSO's.

However, the Dutch TSO's and DSO's are not listed on the (equity) exchanges. Therefore it is not possible to calculate the sector specific parameters on the basis of the observed market data of these companies. These parameters are therefore estimated on the basis of a comparator group or peer group. In this chapter we determine the comparator group.

2.2 Selection of comparators

In order to establish a comparator group the following (minimum) criteria that are used by ACM are related to the risk profile of companies, size of a company and liquidity of shares. We identified potential peers by looking at different criteria: share of regulated network activities compared to total activities & the nature of other (commercial) activities, geographical focus of candidate peers, size of a company, liquidity. Ideally the regulated TSO/DSO activities of peers would be high, peers operate in the Eurozone (same capital market as Dutch TSO's and DSO's), and size and liquidity meet or exceed the thresholds ACM uses. We note that company size and liquidity are knock out criteria.

Table 1: comparator group criteria

Criterium	Threshold	Ideal peer
Risk profile	Comparable to Dutch TSO's and DSO's	High share of TSO/DSO activities Operates in Eurozone country
Size company	Turnover > EUR 100 Mio	Turnover 2014 >> EUR 100 Mio
Liquidity	Minimum 90% days traded	100% of days traded

A leading element in determining the comparator group is the risk profile of the companies. Ideally the comparator group should only include comparators whose activities correspond highly to the regulated activities of Dutch TSO's and DSO's. We further prefer Eurozone above non-Eurozone comparators since capital markets and regulations differ; equity risk premia are for instance materially higher in US then in the Eurozone. This does eventually impact on investor behavior and the beta estimates. The information value of non-Eurozone peers and their beta for Dutch TSO's and DSO's is therefore less than a Eurozone peer if all other factors are equal.

[2] In order to provide maximum transparency on the calculations of the individual WACC parameters we decided –with the exception of gearing and equity risk premium- to consistently use 2 decimal figures for the WACC parameters in this report. We recognize however that we are providing an estimate of fair WACC and such estimate does not by any means have a two decimal accuracy.

We identified whether the comparators that that have been used in the method decision 2014-2016 still meet the comparator group criteria and whether other companies could be introduced. The result of this analysis is presented in table 2. All the possible comparators meet the turnover and liquidity criteria.

Table 2: characteristics possible comparators

	Company	2014 Turnover – Mln	%days traded	Average daily traded value shares (EUR/USD/GBP)	Country	Share of TSO/DSO activities
1	Snam Reta Gas	3566	98%	46,692,541	Italy	High
2	Terna	1996	98%	31,275,582	Italy	High
3	REN	756	99%	1,259,750	Portugal	High
4	Red Electrica	1847	99%	32,544,788	Spain	High
5	Enagas	1206	99%	32,188,342	Spain	High
6	Elia	839	99%	1,525,295	Belgium	High
7	TC Pipelines (USD)	424	98%	10,331,392	US	High
8	Fluxys	555	98%	79,257	Belgium	High
9	National Grid (GBP)	15201	98%	51,198,884	UK/US	Medium
10	Piedmont Natural Gas (USD)	1470	98%	13,061,615	US	Medium
11	Northwest Natural Gas (USD)	754	98%	4,664,390	US	medium - low

In the WACC methodology that has been used in the method decision 2014-2016 the comparator group included ten companies. The advantage of a relatively large peer group is that it reduces the statistical error in (beta) estimation. The disadvantage is that it may include comparators which risk profiles differ substantially compared to the Dutch TSO's and DSO's. In our view this is the case for National Grid, Piedmont Natural Gas and Northwest natural gas, since they do not operate in the Eurozone and also have a low or medium share of TSO/DSO activities. Based on these two characteristics combined, we are of the opinion that the risk profile of these comparators profile differs substantially from the Dutch TSO's and DSO's. We therefore decided not to include these companies in the comparator group.

We note that Fluxys' meets the comparator group criteria but its average daily traded value of shares is relatively low. However, this is not a knock out criterion and we have not encountered any evidence

in the literature suggesting daily trading volumes affect market beta estimates. We therefore include Fluxys as a comparator.

2.3 Conclusion

Since there are no ten best quality comparators available we opt to use a peer group of eight comparators: *Snam Retagas, Terna, REN, Red Electrica, Enagas, Elia, TC Pipelines and Fluxys.*

The size of this comparator group is sufficiently large to reduce the error in the (beta) estimates. In our opinion the disadvantage of including National grid and Piedmont Natural Gas outweighs the advantage of having a comparator group of ten companies.

3 Gearing

3.1 Introduction

Gearing relates to the extent to which a company is financed by debt capital, expressed as a fraction of the total capital. An important starting point for ACM is that TSO's and DSO's should maintain a healthy financial position. In the ACM methodology a single A credit rating represents a healthy financial position. In the method decision for Dutch TSO's and DSO's a 50% gearing is assumed for an efficiently financed TSO/DSO with an A credit rating. This percentage is (mostly) based on the gearing level of the comparator group.

In this chapter we will identify current credit ratings and gearing levels of the comparator group. We perform a sanity check in order to analyze whether the current gearing levels of the companies are comparable to recent years.

3.2 Current credit rating and gearing levels comparator group

Credit rating agencies take business risk as well as financial risk into account when assigning a credit rating. Factors that influence the rating include country risk, track record of stability in regulation, type of regulation (cost plus versus incentive based), likelihood of extraordinary support by shareholders in case of financial distress, stability of operating cash flow, operating cash flow related to debt position, investment program (capex) and gearing level. Gearing is therefore one of the factors that affect the credit rating, but not the only one and not likely to be the decisive criterion for (most) comparators.

Nevertheless it is worthwhile to investigate if the assumed gearing – credit rating relation holds for the current peer group. The credit ratings and gearing levels of the comparators are provided in table 3. All comparators except Fluxys do have a credit rating from Standard & Poor's, Elia is best rated (A-) and REN has the lowest rating (BB+). Except for REN (BB+) and Fluxys (no rating) all comparators do have an investment grade rating[3]. Gearing is calculated by determining the market value of equity and book value of the debt per 31-12-2014. We use end of year values 2014 because for this date most accurate information on both market value of equity as well as book value of debt (based on annual reports) is (publicly) available.

Table 3: credit ratings and gearing levels of comparators

Company	Rating (S&P)[4]	Gearing[5]
Snam Reta Gas	BBB	49%
Terna	BBB	54%
REN	BB+	77%
Red Electrica	BBB+	37%
Enagas	BBB+	42%
Elia	A-	54%
TC pipelines	BBB-	27%
Fluxys	-	44%

[3] Investment grade refers to a credit rating of BBB- and higher. Credit ratings as per 31-12-2014.

[4] Source: www.standardandpoors.com

[5] Source: Six Financial Information & annual reports. Gearing is defined as debt capital as a fraction of total capital.

Median	46%
Average	48%

In the ACM methodology the gearing for Dutch TSO's and DSO's is based on efficiently financed TSO's and DSO's with an A credit rating. The gearing is based on the gearing level of the comparator group.

We note that in 2014 the credit ratings of all comparators were lower than single A flat, the starting point in the ACM methodology. The comparator group was dominated by triple B rated companies, only one comparator was rated on A(-) level. In order to judge the representativeness of gearing levels and credit ratings of these triple B dominated comparators for an efficiently financed single A rated Dutch TSO or DSO, we analyzed the credit rating history of comparators and possible drivers behind it.

In table 4 we compared current credit ratings of comparators to historical credit ratings. In the peer group we note upgrades of REN (Portugal), Red Electrica (Spain) and Enagas (Spain) in 2015. Looking back further we note rating downgrades. The Spanish and Italian peers Snam Reta Gas, Terna, Red Electrica and Enagas have been downgraded by credit rating agencies between 2012 and 2014.

The upgrades and downgrades align with the downgrades of the national treasuries of Portugal, Italy and Spain. Based on the methodology adopted by rating agencies it nearly never occurs that a company's credit rating is more than a notch higher than the respective countries rating[6]. For example: the credit rating of Italy currently is BBB-, the rating of Snam Reta Gas and Terna would typically be capped at BBB.

The credit ratings of Elia remained stable over the recent years, and so did the credit rating of their national treasuries (Belgium). TC Pipelines was downgraded due to a weaker financial profile, related to weakening volumes on their assets[7], the credit rating of the US remained stable.

Table 4: current and historical credit ratings of comparators and countries

Rated Entity	Country	Rating 2015[8]	Rating 2014	Rating 2012
Snam Reta Gas	Italy	BBB	BBB	A-
Terna	Italy	BBB	BBB	A-
REN	Portugal	BBB-	BB+	BB+
Red Electrica	Spain	A-	BBB+	A-
Enagas	Spain	A-	BBB+	A-
Elia	Belgium	A-	A-	A-
TC pipelines	US	BBB-	BBB-	BBB
Fluxys	Belgium	-	-	-
A rated comparators		3	1	5
BBB rated comparators		4	5	1
BB rated comparators			1	1
Spain		BBB+	BBB	A-

[6] See for example research update Enagas on researchandmarkets.com and annual report 2014 Snam Reta Gas.

[7] www.researchandmarkets.com

[8] Source on credit ratings: Six Financial Information

Italy	BBB-	BBB-	BBB+
Portugal	BB+	BB	BB
Belgium	AA	AA	AA
US	AA+	AA+	AA+

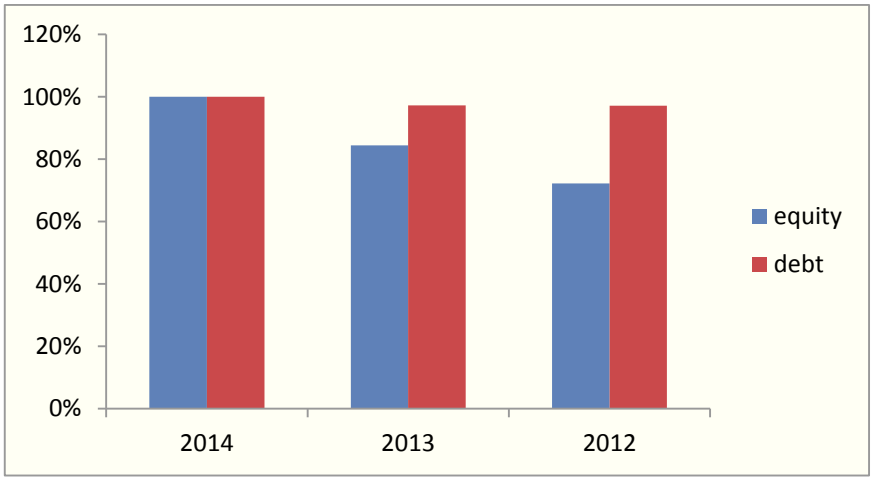
We conclude that credit rating agencies take a number of factors into account when assigning a credit rating, but the credit standing of the treasury of the country a company has domicile (and most of its economic activity), does affect the credit rating of comparators. The credit rating of the Dutch government was recently upgraded to AAA (since Q4 2015). This rating is significantly higher than Spain, Italy, Portugal. Taking the difference in country risk into account, we are of the opinion that efficiently financed Dutch TSO's and DSO's should be able to remain a single A rating given the gearing level of the comparator group in line with Belgian Elia. Numerically the average gearing of the comparator group is 48%, and median gearing is 46%.

3.3 Sanity check

We perform a sanity check analyzing current gearing level of the comparator group with historical gearing. The reason for this is that market value of equity can significantly change over time, due to varying circumstances on equity markets. We test whether current gearing levels are representative for gearing levels in the years 2012-2014, by looking at market value of equity and book value of debt for the comparator group for this period.

We used 2014 as a reference year, market value of equity and book value of gearing is 100%. In the period 2012-2014 the book value of debt is rather stable, but market value of equity increased. In the peer group we note a trend of decreasing gearing levels over the recent years, which could well be driven mostly by increasing stock prices. We conclude that historical gearing levels are somewhat higher compared to current gearing levels.

Figure 1: market value equity and book value debt comparator group 2012-2014[9]



[9] Source: Six Financial Information & annual reports.

3.4 Conclusion

Taking the gearing levels and credit ratings of the comparator group as well as the results of the sanity check into account we find a gearing of 50 % appropriate for efficiently financed Dutch TSO's and DSO's in the next regulatory period.

4 Cost of debt

4.1 Introduction

The cost of debt is calculated as the sum of the risk free rate, debt premium and transaction costs. Traditionally for both elements of the cost of debt, a 10 year maturity is used for selecting reference products and yields. Arguments to the selection of this tenor is that 10 – year maturity products are typically liquid and well available and the 10 year reference scope is considered common practice in similar financial studies.

4.2 Nominal risk free rate

The risk-free rate in essence should be the cheapest interest rate available as a higher rate implies more risk, implying that the rate is not risk-free. Next to 'lowest –rate' arguments there are availability arguments. Government bonds are widely available to investors and are typically used to provide for risk-free rate estimates.

Since the credit crisis, spreads amongst different government bonds within the EURO space have widened and nationality selection matters. The ACM method uses an average between Dutch and German government bond rates. German government bond are relevant since German rates are lowest (most-risk free). Dutch government bonds are relevant taking the effects of country risk (the reference companies are Dutch) and differences between liquidity of German and Dutch bonds into account.

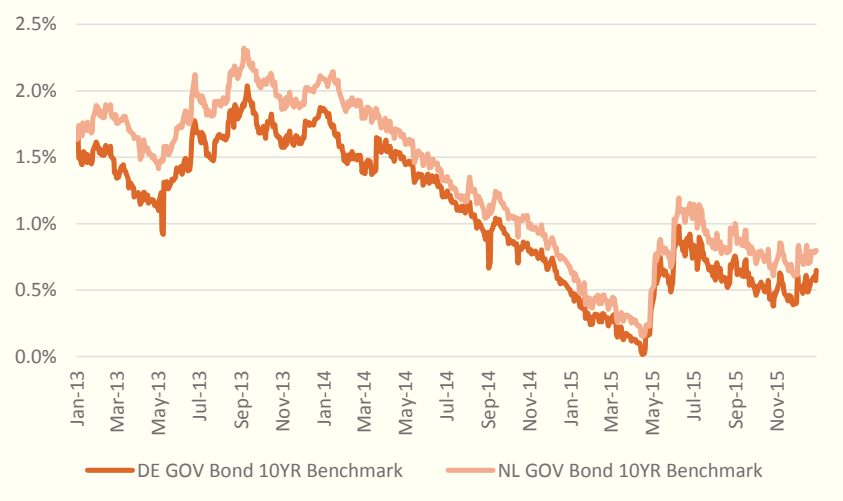
In the selection of a reference period for historical yields a balance is sought between stability & predictability (long term) and most relevant information (spot rates). In line with and based on available research the ACM prescribes a three year (daily average) reference period.

In this paragraph we determine the nominal risk free rate using the ACM methodology, however the real risk free rate is also relevant since the ACM determines a real pre-tax WACC. Paragraph 6.4 includes a sanity check on the real risk free rate that results from determining the nominal risk free rate and inflation using the ACM methodology.

Figure 2 includes the historical yield on the ten year Dutch and German government bonds for the period January 2013-December 2015[10]. The yields on Dutch as well as German government bonds have declined over the reference period, from around 1.6% respectively 1.4% in the beginning of January 2013, to around 0.8% respectively 0.6% at the end of December 2015. Driver behind this -from historical perspective- relatively low interest rates during the reference period is the (financial) crisis in the Eurozone and the easing of monetary policy by the European Central Bank (ECB).

[10] Source: Six Financial Information.

Figure 2: historical nominal risk free rate NL and DE 10 year government bond

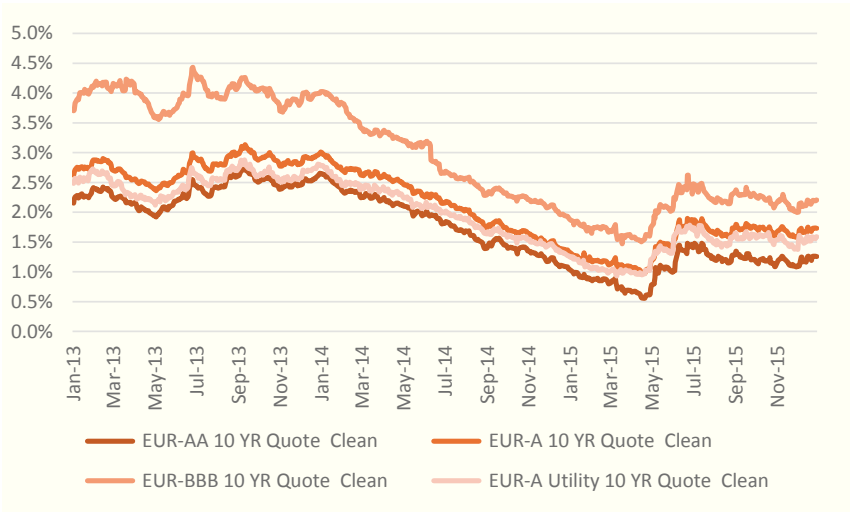


For the reference period the average interest on ten Year Government Bonds for The Netherlands and Germany have been respectively 1.31% and 1.07%, of which the average is 1.19%.

4.3 Debt premium

For the debt premium we assess the daily interest rates for EURO denominated non-government bonds in three rating categories. Again we look at ten year tenor for the three year reference period from for the period January 2013-December 2015. This reference period is in line with the ACM methodology . As with the government bonds, also the non-government bonds have been impacted by the low interest environment over the recent years.

Figure 3: historical credit spread 10 year non-government bonds[11]



[11] Source: Six Financial Information.

In order to determine the debt premium the ACM methodology prescribes to use the A-rated utility Euro-denominated non-government debt with ten year maturity. We assessed the difference between the yield on this Utility subset and the nominal risk free rate as calculated in paragraph 4.2. The average spread for the A-rated EUR utility bonds was 0.77% over the reference period.

Table 5: credit spreads BBB, A, AA non-government bonds

Rating of referenced bonds	Average interest	Spread over Risk Free Rate
BBB	2.95%	1.76%
A	2.14%	0.95%
AA	1.75%	0.56%
A (Utility sub-Group)	**1.96%**	**0.77%**

Furthermore in the ACM methodology 0.15% additional spread for non interest (transaction & handling) costs is applied.

4.4 Conclusion

Based on the ACM methodology the cost of debt is 2.11%. The nominal risk free rate is determined at 1.19%, the debt premium at 0.77% and an additional spread of 0.15% is applied for transaction costs.

5 Cost of equity

5.1 Introduction

The cost of equity is determined using the Capital Asset Pricing Model (CAPM). On the basis of the CAPM model, one can calculate a compensation for all systematic risks (market risks) incurred by –in this case- TSO's and DSO's. The equity risk premium (5.2) is the expected return that investors require for the additional risk resulting from investment in the market portfolio compared to a risk-free investment. The beta (5.3) measures the market risk exposure of a company compared to the risk profile of the equity market.

5.2 Equity risk premium

The equity risk premium is the expected return that investors require for the additional risk resulting from investing in the market portfolio compared to a risk-free investment. The equity risk premium is determined using the historical equity risk premium and cross checking the results using sources basing their estimates on forward looking analyses, as for instance the Dividend Growth Model.

5.2.1 Historical ERP

The historical equity risk premium is based on the results of the extensive research of Dimson, Marsh and Staunton, which is a widely recognized report. In their 2015 report the historical equity risk premia for the period 1900-2014 have been calculated for most important equity markets globally[12].

In the ACM methodology the equity risk premium is based on the average of the historical geometric and arithmetic mean of the Eurozone countries, taking the market size of the countries into account. The equity risk premium could be calculated using bills or long term government bonds. We calculated the equity risk premium relative to long term government bonds, in order to be consistent with the methodology to calculate the risk free rate (which is based on long term government bonds as well).

Table 6 summarizes equity risk premia of Eurozone countries. Since the DMS study focusses on most important equity markets, equity risk premia are not available for smaller markets in the Eurozone such as Greece, Slovenia, Cyprus, Malta, Slovakia and Baltics. However the large markets represent almost 99% of market capitalization in the EURO denominated Eurozone[13].

[12] Credit Suisse Global Investment Returns Sourcebook 2015, table 10.

[13] See annex 1

Table 6: historical equity risk premium Eurozone countries 1900-2014

Country	Geometric mean	Arithmetic mean	Average	Market cap 2014 Dollar
Austria	2.5	21.5	12	100,168.80
Belgium	2.3	4.4	3.35	374,059.34
Finland	5.1	8.7	6.9	198,543.63
France	3	5.3	4.15	1,935,090.75
Germany	5	8.4	6.7	1,837,847.38
Ireland	2.6	4.5	3.55	140,410.98
Italy	3.1	6.5	4.8	561,294.50
Netherlands	3.2	5.6	4.4	398,313.09
Portugal	2.6	7.4	5	61,380.74
Spain	1.9	3.9	2.9	724,417.88
Simple Average			5.37	
Market cap based weighted average			4.97	

We use the ERP for the Eurozone, since an investor in the Dutch DSO's and TSO's is likely to comfortably invest in the Eurozone as noted in the ACM method. We therefore excluded EU related countries as well as EU countries with a non-euro national currency (for instance: Denmark, UK, Switzerland). The market capitalization based weighted average is 4.97%, which we round at 5%. The equity risk premium would have been lower if EU related countries and Eurozone countries with a national currency would have been included in the determination of the equity risk premium.

Table 7: historical equity risk premium Eurozone countries 1900-2014

Region	Market cap based weighted average
Eurozone	4.97%
Eurozone incl. national currency countries	4.65%
Eurozone incl. national currency countries & EU related countries	4.41%

5.2.2 Sanity check

We identified whether adjustments should be made to the results of the historical equity risk premium analysis, in order to determine a more representative estimate for the next regulatory period. We have been able to identify only a few forecasts of equity risk premia. In this subparagraph we present forecasts of DMS, KPMG and Capital Spectator on the equity risk premium.

The DMS study suggests that the historical equity risk premium might overestimate the future premium[14]. Barriers for diversification for investors have diminished, this effect is non-repeatable according to DMS. Furthermore the historical expansion of the price/dividend ratio cannot be extrapolated and changes in real exchange rate are assumed to be zero. After adjusting for "non-repeatable factors" the DMS study infers that investors expect an arithmetic global risk premium of around 4.5 to 5%[15] for the long run equity risk premium (the historical arithmetic global risk premium was estimated at 5.7%).

Compared to the results of the historical DMS results, KPMG Netherlands suggests using a higher equity risk premium. KPMG derives the equity market risk premium by assessing current income, (forward looking) growth expectations and current stock prices. A discounted cash flow formula is used to solve for the implied discount rate that reconciles these parameters. Deducting the risk-free rate from this implied discount rate will yield an implied equity market risk premium.

KPMG states that the spread between the implied equity returns and the risk-free rates was comparatively lower in the period before the crisis as compared to more recent times. A possible explanation is that before the crisis the perceived market risk was lower, as demonstrated by relatively more stable expected equity returns and higher government bond yields. Other evidence for a higher equity market risk premium compared to pre-crisis levels can be found in yields on government bonds having been lower than expected inflation rates at certain points in time. This implies that the risk aversion of investors has increased ('flight to safety'), accepting zero or negative real returns in order to protect against significant capital loss. Based on the application of the implied equity risk premium methodology, KPMG recommends to use an equity market risk premium of 6% as per December 2015[16].

Capital Spectator publishes the Global Market Index (GMI) — an unmanaged, market-value weighted mix of the major asset classes. This index is projected (February 2016) to earn an annualized 2.9% over the "risk-free" rate in the long term. The expected risk premium of foreign (non US) stocks in developed markets is around 4.7%[17].

We conclude that there is a limited availability of relevant forecasts of future equity risk premia for the Eurozone and the available expectations differ. DMS argues to use an equity risk premium that is lower than 5%, Capital Spectator projects an expected risk premium of foreign (non US) stocks in developed markets of around 4.7% and KPMG recommends an equity risk premium of 6%. The studies however do not specifically focus on the Eurozone. Overall we do not see convincing evidence to deviate from the historical equity risk premia for the Eurozone in the DMS study as presented in subparagraph 5.2.1.

5.2.3 Conclusion

The equity risk premium is determined at 5%.

[14] Credit Suisse Global Investment Returns Sourcebook 2015, p.33.

[15] The historical arithmetic risk premium in the DMS study was estimated at 5.7% (globally).

[16] Equity market risk premium – research summary, KPMG, January 7 2016, www.kpmg.com.

[17] www.capitalspectator.com.

5.3 Beta

The beta measures the risk profile of a company compared to the risk profile of the equity market, by measuring changes in value of companies' equity compared to the value of the total equity market over a period of time. Since Dutch TSO's and DSO's are not publicly listed we use comparators to measure the risk profile (see comparator group). As stated in chapter 2 we use a peer group of 8 most quality comparators: Snam Retagas, Terna, REN, Red Electrica, Enagas, Elia, TC Pipelines and Fluxys.

In order to calculate the equity beta of the Dutch TSO's and DSO's we first need to determine the equity beta of the comparator group (see paragraph 5.3.1). To compare the betas of the companies in the comparator group, the asset beta is determined. In order to calculate the asset beta, the equity betas are adjusted for differences in financing structure and corporate tax rate (see paragraph 5.3.2). Finally the equity beta of the comparator group is determined, using the asset beta of the comparator group, our gearing assumption of 50% and the Dutch corporate tax rate (see paragraph 5.3.3).

5.3.1 Equity beta's comparator group

The first step to estimate the equity beta of the Dutch DSO's and TSO's is to estimate the equity beta's of the comparator group. The ACM methodology consists of estimating the beta on daily stock returns and the daily market index returns for a three year reference period. The equity betas reflect the correlation of the stock equity returns with the market returns. In line with earlier studies and the ACM methodology we apply broad market indices of the same currency as the stock. For the EURO-zone the broad EUROSTOXX TMI is used, for the US the S&P 500. We agree with the methodology reasoning that an investor in a Dutch TSO/DSO will be active in the Euro market instead of the narrow Dutch market, therefore making the EUROSTOXX TMI a better candidate index for the European stocks instead of national indices, as for instance the Dutch AEX.

In the following table we note the Ordinary Least Squares (OLS) equity betas for the three year reference period January 2013-December 2015 based on a simple CAPM regression[18]. OLS is the most straightforward unbiased beta estimate through linear regression and most efficient in the case of no heteroscedasticity and no autocorrelation. The statistical precision of the OLS beta estimates is measured by the standard error as reported.

Table 8: simple (OLS) equity beta's comparator group

	Company	Equity Beta (OLS)	Standard Error
1	Snam Reta Gas	0.79	0.04
2	Terna	0.73	0.03
3	REN	0.51	0.04
4	Red Electrica	0.70	0.04
5	Enagas	0.66	0.04
6	Elia	0.37	0.03
7	TC pipelines	0.67	0.09
8	Fluxys	0.07[19]	0.04

[18] Source: Six Financial Information.

[19] Not OLS but HAC – see Annex 2

In appendix 2 we present the results of standard diagnostic tests to assess if the errors of the stock beta regressions do not provide evidence to reject the required conditions underlying ordinary least squares regression to be the suitable regression technique (with the exception of Fluxys). Based on the results we do not reject hypotheses of homoscedasticity or zero (positive) autocorrelation and find the OLS statistics to be efficient. We therefore use the OLS beta estimates in order to determine the asset beta for the comparator group. For Fluxys we apply HAC as this is a more efficient estimator in presence of heteroscedasticity.

5.3.2 Vasicek correction

The ACM method prescribes the use of the Vasicek correction and Brattle (2013) applies Vasicek with a prior of 1 (the market Beta) and 0.36 (EU) / 0.39 (US) market standard error. The Vasicek correction is used in this context to correct for possible asymmetry in the estimation error of an OLS beta due to Bayes' rule.

Applying the Vasicek correction as such[20] leads to the following results:

	Company	Equity Beta (OLS)	Standard Error	Weighting [21] of prior (1)	Vasicek Beta
1	Snam Reta Gas	0.79	0.04	1.02%	0.79
2	Terna	0.73	0.03	0.67%	0.73
3	REN	0.51	0.04	0.96%	0.51
4	Red Electrica	0.70	0.04	1.14%	0.70
5	Enagas	0.66	0.04	0.96%	0.67
6	Elia	0.37	0.03	0.60%	0.37
7	TC pipelines	0.67	0.09	5.17%	0.68
8	Fluxys	0.07	0.04	1.24%	0.08

The impact of applying Vasicek as above on the numerical outcomes of the report is minor, so we proceed with the current ACM method/Brattle (2012) Vasicek approach.

5.3.3 Asset beta comparator group

The equity beta of comparators depends implicitly on the extent to which the company is financed by debt and equity. To compare the betas of the comparators, the asset beta is calculated. In calculating the asset beta, corrections are made for differences in gearing and corporate tax rates of comparators. The Miller – Modigliani method is applied as following:

[20] We note that given the extensive research over the last decade of CAPM-type betas within this specific sector in The Netherlands and many other jurisdictions, it should be possible to improve on the generic 'prior = 1' approach in the application of Vasicek correction. However, such research is beyond the scope of the current report. The impact of applying Vasicek as above on the numerical outcomes of the report is minor, so we proceed with the current ACM method/Brattle (2012) Vasicek approach.

[21] Weighting is equal to SE of OLS BETA ^2 / (SE or OLS BETA ^2 +SE of MARKET ^2)

Asset Beta = Equity Beta / (1 + (1 – Tax Rate) x Debt / Equity

In table 9 hereunder we present the results of the asset beta calculation of the comparator group, as well as the assumptions on which this calculation is based.

Table 9: asset beta's

	Company	Equity Beta (simple OLS)	Equity Beta (Vasicek)	Tax Rate	Debt/ Equity per end 2014[22]	Asset Beta (Simple OLS)	Asset Beta (Vasicek)
1	Snam Reta Gas	0.79	0.79	31.4%	95%	0.48	**0.48**
2	Terna	0.73	0.73	31.4%	117%	0.40	**0.41**
3	REN	0.51	0.51	23.0%	337%	0.14	**0.14**
4	Red Electrica	0.70	0.70	30.0%	58%	0.50	**0.50**
5	Enagas	0.66	0.67	30.0%	74%	0.44	**0.44**
6	Elia	0.37	0.37	34.0%	116%	0.21	**0.21**
7	TC pipelines	0.67	0.68	40.0%	37%	0.55	**0.56**
8	Fluxys	0.07	0.08	34.0%	77%	0.05	**0.05**

We note that on the basis of the peer group analysis and the individual asset betas as presented, the following median and average betas are estimated:

Table 10: average and median asset beta's comparator group

	Comparator group (OLS)	Comparator group (Vasicek)
Average Asset Beta	0.35	0.35
Median Asset Beta	0.42	**0.42**

As indicated we opt for the application of the median asset beta as it is less prone to outliers than the average, which is more important in the relatively smaller peer group of 8 peers. As such we estimate the asset beta to be 0.42.

5.3.4 Equity beta Dutch TSO's and DSO's

In order to determine the equity beta of Dutch TSO's and DSO's we re-lever the asset beta of the comparator group using our gearing assumption of 50% and the Dutch corporate tax rate. The resulting equity beta for Dutch TSO's and DSO's is 0.74 (see chapter 7).

[22] Source: Six Financial Information, annual reports 2014 comparators, Rebel analysis.

6 Inflation and tax

6.1 Inflation

Recently ACM specified their methodology to determine the inflation. The methodology prescribes that inflation will be based on historical inflation rates in The Netherlands and Germany during the reference period for setting the cost of debt (50 percent), and inflation forecasts of authorities (50 percent). The historical inflation rates are presented in paragraph 6.2. expectations on inflation are presented in paragraph 6.3.

6.2 Historical inflation rate

The historical inflation rates in The Netherlands and Germany in the past three years are presented in table 11. The historical inflation rate in The Netherlands is somewhat higher in all years.

Table 11: historical inflation rates in NL and DE[23]

	Netherlands	Germany
December 2015- December 2014	0.70%	0.28%
December 2014- December 2013	0.70%	0.19%
December 2013- December 2012	1.70%	1.42%
Average	1.03%	0.63%
Average NL-DE	0.83%	

6.3 Expected inflation

When looking at expected inflation, we take inflation forecasts of relevant Dutch, German and EU authorities as well as market evidence (inflation swaps) into account.

6.3.1 Forecasts of authorities

There is a number of authorities that forecast the inflation rate (HICP) in The Netherlands or Germany for the period 2015-2017. We take the forecasts of CPB, DNB, Bundesbank and the ECB into account. With the exception of ECB, these authorities do not forecast long term inflation.

The forecasts are presented in table 12. Authorities expect the inflation rate to rise over time, towards the long term ECB target of (below) 2 percent 5 year ahead. The expected inflation for 2017 and 2018 is expected to be substantially lower. We note that some forecasts are recently updated, others are dated December 2015. The forecasts as presented below might not include the view of authorities on the effect of the recent decision of ECB[24] to further lower the interest rate on inflation expectations.

[23] http://nl.inflation.eu/inflatiecijfers/nederland/actuele-cpi-inflatie-nederland.aspx,
http://nl.inflation.eu/inflatiecijfers/duitsland/historische-inflatie/cpi-inflatie-duitsland.aspx

[24] Monetairy policy decision, March 10 2016, www.ecb.europa.eu/press/pr/date/2016/html/pr160310.en.html

Table 12: forecast inflation rates in NL, GER and Eurozone

	2016	2017	2018	5 year ahead
CPB[25]	0.30%	1.00%		
DNB[26]	0.70%	1.40%		
Bundesbank[27]	1.10%	2.00%		
ECB (staff)[28]	0.10%	1.30%	1,60%	
ECB (survey)[29]	0.70%	1.40%	1.60%	1.80%
Bandwidth	0.70% - 1.10%	1.00%-2.00%	1.60%	1.80%
Average		**1.42%**	**1.60%**	**1.80%**

6.3.2 Market forecasts

We may also look at market expectations on inflation. The implied market expectations can be derived from traded inflation derivatives as for instance the presented HICP ex. Tobacco swap quotes. An inflation swap is a product that hedges inflation risk. These swap quotes provide information on what market assumes that future inflation will be. The rates roughly provide for market estimates of inflation for the number of years of the derivatives, starting from the trading date. For example: the bid ask spread of the three year inflation swap is 0,375% - 0,475%, which roughly means that the market trades on an average inflation expectation in these three years of around 0,375% - 0,475% per year.

Table 13: Inflation Swaps Eurozone HICP ex Tobacco[30]

	Bid	Ask
1 year	-0.150%	0.050%
2 year	0.2175%	0.3675%
3 year	0.3750%	0.4750%
4 year	0.4800%	0.5800%
5 year	0.5650%	0.6650%
6 year	0.6375%	0.7375%
7 year	0.7300%	0.8300%
15 year	1.2275%	1.3275%
30 year	1.4875%	1.5875%

We note that the market is expecting quite low inflation with an average inflation under 1% for the medium term (5-7 years).

[25] CPB Policy brief 2016/03, Raming CEP 2016 , www.cpb.nl.

[26] Economische ontwikkelingen en vooruitzichten, December 2015 nummer 10, www.dnb.nl

[27] Monthly report December 2015, vol. 67 no. 12, www.bundesbank.de. No official update available. However in its monthy report February 2016 Bundesbank states that if one were to update the December 2015 projections, the HICP growth rate for 2017 would be 1,75%.

[28] Eurosystem staff macroeconomic projections for the Euro area, March 2016, www.ecb.europa.eu.

[29] ECB survey of professional forecasters 2016 Q1, www.ecb.europa.eu.

[30] Source: ICAP – February 2016

6.4 Conclusion

We note a gap between the historical inflation and markets expectations on future inflation on the one hand versus the expected future inflation for 2017 and further by authorities on the other hand. The expected future inflation for 2017 and further by authorities is materially higher.

From a methodological point of view we find it appropriate to determine inflation rate using historical inflation of the past three years, since this reference period has been used to determine nominal risk free rate. The inflation rate is set at 0.83% and is lower compared to forecasts of authorities but comparable to market forecasts.

As described the ACM methodology prescribes that inflation will be based on historical inflation rates in The Netherlands and Germany during the reference period for setting the cost of debt (50 percent), and inflation forecasts of authorities (50 percent). Using this methodology the inflation is determined at 1,26%.

Table 14: Inflation determination

Historical inflation reference period	0.83%
Current Inflation forecasts of authorities[31]	1.68%
Average	**1.26%**

In order to determine market expectations on the *nominal risk free rate* we use EURIBOR Interest Rate Swap (IRS) derivatives as those are providing for a liquid traded term structure for analysis. For market expectations on the *inflation* the HICP ex. Tobacco swap quotes has been used. This product provides for a rather liquid long term structure for analysis.

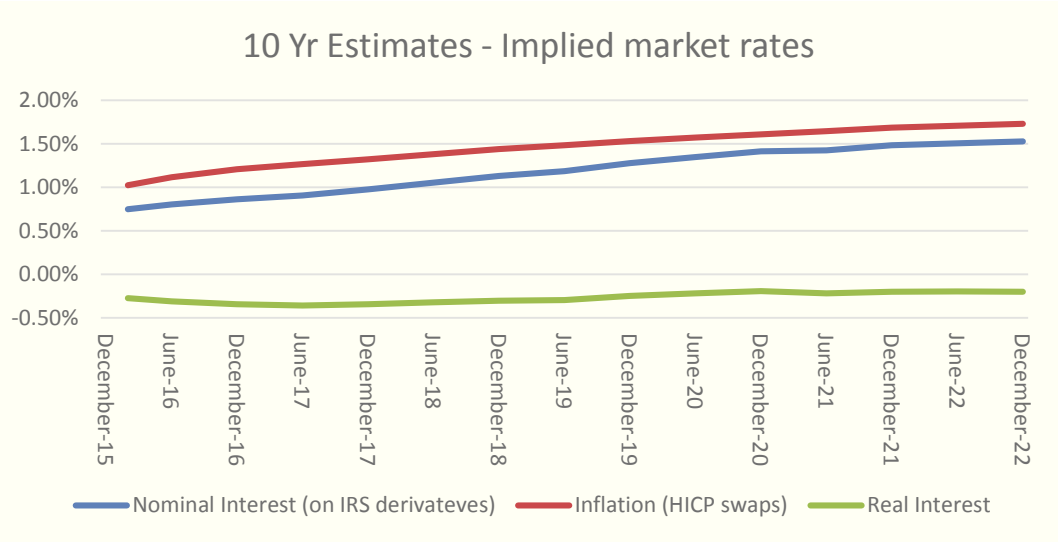
For starting dates in the period February 2015-December 2022 we calculated the expected nominal risk free rate and inflation as constant annual percentage for a 10 year term[32]. This to align with the 10 year tenor of the bonds used to estimate the risk free rate in line with the ACM methodology. For example, the implied market rate on the nominal risk free rate and inflation with a 10 year maturity and December 2015 as a starting date is around 0.75% respectively 1.03%[33].

[31] The inflation forecast is calculated by determining the average of 2017, 2018 and 2019-2021 forecast of authorities. For the 2019-2021 forecast the results of the ECB survey have been used(1,8%)

[32] source: Six Financial Information, Rebel analysis. Markets expectations as per February 12th 2016. .

[33] In paragraph 6.3.2 we presented swap quotes that represented markets expectations on average inflation in a particular time period. For example: market expectations on an average inflation in the next three years is around 0,38%-0,48%. In this analysis we identify market expectations of future inflation for a 10 year maturity and a particular starting date.

Figure 4 presents market expectations on the nominal risk free rate, inflation and real risk free rate.



The nominal risk free rate as well as the inflation show a typical upward trend in the period 2015-2022. This trend is towards the ECB target of 2% annual inflation. Currently the implied market expectation of the *real risk free rate* for 10 year tenor products as priced within nominal risk free rate and inflation derivatives is relatively stable but negative for the coming years. We therefore find that the real risk free rate as per the ACM approach is somewhat higher compared to markets expectations of the real risk free rate.

6.5 Tax

The tax rate relates to the average rate of corporate tax applicable to Dutch companies. The current corporate tax rate is 25%. We are not aware of any corporate tax rate changes planned and therefore apply the 25%.

7 WACC calculation

On the basis of the previous chapters we may fill out the WACC formulas as per below in table 13. The WACC (nominal pre-tax) is estimated 4.32%. After 1.26% inflation correction, 3.02% real pre-tax WACC remains.

Table 14: WACC calculation

Building Block	Estimate[34]	Remark
Nominal risk free rate (%)	1.19%	
Debt premium	0.77%	
Non Interest Debt Costs	0.15%	
Cost of debt	2.11%	= Risk Free Rate + Debt Premium + Non Interest Debt Costs
Equity risk premium	5.00%	
Equity beta	0.74	= Asset Beta (0.42) * (1 + (1 – tax Rate) * debt / equity)
Cost of equity (post tax)	4.89%	= Risk Free Rate + Equity Beta * Equity Risk Premium
Gearing	50%	= (Debt / (Debt + Equity))
Tax	25%	Dutch Tax Rate
Nominal pre-tax WACC	4.32%	= (1 – gearing) * Cost of Equity / (1 – tax rate) + gearing * Cost of Debt
Inflation	1,26%	
Real pre-tax WACC	3,02%	= (1 + Nom Pre-tax WACC)/ (1 + inflation) - 1

[34] Rounded figures in the table, in the WACC calculation we used unfinished figures.

Annex 1: Market capitalization equity markets Eurozone

Table 15: Market capitalization calculation

Country	Market capitalisation	% Market cap EU zone
Austria	100,168.80	1.6%
Belgium	374,059.34	5.8%
Finland	198,543.63	3.1%
France	1,935,090.75	30.2%
Germany	1,837,847.38	28.7%
Ireland	140,410,98	2.2%
Italy	561,294.50	8.8%
Netherlands	398,313.09	6.2%
Portugal	61,380.74	1.0%
Spain	724,417.88	11.3%
Greece	53,952.22	0.8%
Slovenia	7,309.47	0.1%
Cyprus	4,317.09	0.1%
Malta	3,742.01	0.1%
Slovakia	6,159.54	0.1%
Estonia	2,012.07	0.0%
Latvia	1,033.85	0.0%
Lithuania	4,029.49	0.1%
Total	6414082	100%
% Small markets		1,3%

Annex 2: statistical tests OLS beta's

To test whether the OLS beta estimates are valid and efficient estimators we provide 2 test statistics;

1. The Breusch-Pagan Godfrey (BPG) Heteroscedasticity test
2. Durbin Watson (DW) Statistic on autocorrelation

Table 16: results statistical tests OLS beta's

	Company	BPG F-statistic	BPG P-Value	DW - Statistic
1	Snam Reta Gas	450	0.00	2.32
2	Terna	580	0.00	2.14
3	REN	199	0.00	2.04
4	Red Electrica	345	0.00	2.22
5	Enagas	342	0.00	2.10
6	Elia	171	0.00	2.16
7	TC pipelines	53.6	0.00	2.00
8	Fluxys	2.84	0.09	2.36

We note that all Durbin Watson statistics are above the 1% DU boundary of 1.84 (maximum critical value of the test at 1%) and no BPG P-Values above 0.01 are noted other than Fluxys. We therefore do not reject hypotheses of homoscedasticity or zero (positive) autocorrelation and find the OLS statistics to be efficient (other than heteroscedasticity in case of Fluxys). We use the OLS beta estimates in order to determine the asset beta for the comparator group. In case of Fluxys we estimate using Newey-West standard errors to accommodate for the heteroscedasticity and yield a Beta of 0.07.