Body of European Regulators for Electronic Communications

BEREC

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BEREC Report
Regulatory Accounting in Practice 2013

September 2013

1. Executive summary

This is the ninth annual report in a series summarising the findings of a detailed survey of regulatory accounting frameworks across Europe. The information has been gathered from National Regulatory Authorities (NRAs) and covers the implementation of regulatory cost accounting methodologies, which include allocation as well as annualization methodologies[1], systems and processes.

These regulatory accounting frameworks provide NRAs with financial information essential to facilitate some of their significant regulatory decisions such as setting price controls, monitoring compliance with *ex ante* obligations (such as cost orientation of charges and non-discrimination) and informing market reviews.

The document provides an up-to-date factual report on the regulatory accounting frameworks implemented by NRAs and an assessment of the level of harmonisation achieved. The report sets out an overview of the regulatory accounting frameworks updated to May 2013 and also illustrates, where possible, trends and comparisons with data collected each year from 2006.

The report develops a deeper analysis that concentrates on the following four key wholesale markets: Line Rental, Unbundled Access (M4), Broadband Access (M5) and Leased Lines Terminating Segments (M6). Moreover an analysis is given of the cost base and allocation methodologies used for fixed (M3) and mobile (M7) termination markets.

Furthermore, as in last year's report, to emphasise factors influencing NRAs regulatory strategy, additional structural data (e.g. population density etc.) have been collected from NRAs. Not surprisingly, considerable differences in the market/competitive situation as well as infrastructure can be observed between (and within) the responding countries reflecting different geographies which NRAs need to take into account. The report also looks at annualization methodologies provided by respondent NRAs.

Moreover this year the data collection includes two additional themes:

- accounting information for some products in market 4, such as copper access (including LLU, SA, SLU), fibre access (LLU, VULA), dark fibre access, duct access;

[1] The Report is more precise with regard to the "labelling" of the areas covered, however this does not imply a change of the cost (accounting) methodologies covered, i.e. continuity of the time series is ensured.

- motivations that induced NRAs to choose a particular costing methodology for the markets listed in 2007 EC Recommendation -.

Finally an Annex summarizing the results on the calculation of the cost of capital has been added. More or less all NRAs use the CAPM (Capital Asset Pricing Model) to calculate the WACC (more precisely the cost of equity). The differences in the cost of capital applied by regulators in the pricing decisions reflect therefore the differences in the financial markets of the different countries as they show in the parameters.

Key findings

The overall picture is relatively stable in comparison to last year with generally a small number of changes by NRAs since last year. There are clear preferences for price control methods (cost orientation alone or in combination with price cap), cost base (current cost accounting – CCA) and allocation methodologies (mainly long run incremental costs (LR(A)IC) with fully distributed costs (FDC) preferred only in a few – mainly retail – markets). The degree of consistent application of methodologies continues to be high and accommodates the use of elements or parameters that reflect national circumstances. These findings reflect the primary cost base or allocation methodology selected by an NRA but do not bring out situations where an NRA would strengthen its financial analysis by comparing outcomes from one principal methodology with alternative approaches such as comparing bottom-up models with top-down or incurred costs. For all markets except Market 1 the combination of CCA and (FL) LR(A)IC is the most favoured approach, in particular this combination is most explicitly preferred in the termination markets (Market 3 and Market 7).

The analysis over time of the key wholesale markets – Unbundled Access (Market 4), Broadband Access (Market 5) and Leased Lines Terminating Segment (Market 6) – has shown a clear preference for cost orientation, a trend towards CCA and a fairly even distribution of LRIC and FDC accounting methods. Slightly different results are observed for the Wholesale Line Rental, where retail minus is the most used price control method, HCA (historical cost accounting) and CCA are used quite in the same proportion and FDC is clearly the preferred choice of allocation methodology.

Taking into account the information detailed for different products in market 4, it results that cost orientation is the preferred price control method for all products under analysis,

together with CCA as cost base. As far as the allocation methodology is concerned, a clear preference in favour of FDC for duct access products is observed.

Overall the 2013 data confirmed the trend towards an increasingly consistent approach to regulatory accounting obligation among NRAs. We see signs of stabilisation in the application of particular methods for cost valuation or cost allocation by NRAs. The latter indicates that NRAs are providing predictable and stable regulatory environments in their countries.

Future development

Good progress has been made in developing effective regulatory accounting frameworks to meet the needs of NRAs. However, this is a complex and highly technical topic which requires regular maintenance and enhanced implementation of the regulatory accounting framework as competition develops, technology improves and new regulatory challenges emerge.

2. Introduction

2.1 Background

The ERG Regulatory Accounting Project Team (now the BEREC Regulatory Accounting EWG) has been gathering and reporting data from National Regulatory Authorities (NRAs) with the aim of describing how regulatory accounting systems were implemented in Member States with respect to cost-orientation or non-discrimination obligations or to assist price control decisions. This is the ninth annual report summarising the results of this survey.

The report has been updated since 2005[2] in order to monitor the level and trend in harmonisation of regulatory accounting systems across Europe over time. By the end of the first 2006 quarter several countries had completed the first round of their market reviews, therefore it was possible to start evaluating how various Member States implemented the obligations provided for by articles 10, 11 and 13 of the Access Directive (for wholesale markets), by article 17 of the Universal Service Directive (for retail markets) and the principles contained in the new European Commission Recommendation on Cost Accounting and Accounting Separation of September 2005.[3] The previous years' reports showed a clear trend towards an increasingly consistent approach to regulatory accounting obligation among ERG (now BEREC) countries. This trend is further confirmed by 2013 data, though with signs of stabilising at a high level of applying particular methods for cost valuation or cost allocation. The latter indicates that NRAs are providing predictable and stable regulatory environments in their countries.

[2] - IRG (05) 24 Regulatory accounting in practice 2005.
- ERG (06) 23 Regulatory accounting in practice 2006.
- ERG (07) 22 Regulatory accounting in practice 2007.
- ERG (08) 47 Regulatory accounting in practice 2008.
- ERG (09) 41 Regulatory accounting in practice 2009.
- BoR (10) 48 Regulatory accounting in practice 2010.
- BoR (11) 34 Regulatory accounting in practice 2011.
- BoR (12) 78 Regulatory accounting in practice 2012.

[3] Recommendation 2005/698/EC replacing Recommendation 98/322/EC on Accounting Separation and Cost Accounting of 8 April 1998. In September 2005 the ERG published a Common Position containing "Guidelines on implementing the EC Recommendation 2005/698/EC", cf. document ERG (05) 29. The Commission has worked on a new recommendation covering "Costing methodologies for key wholesale access prices". BEREC has provided detailed input to the public consultation, cf. Document BoR (11) 65. Furthermore it has submitted the BEREC Opinion on the draft recommendation on non-discrimination and costing methodologies on March 26th 2013, cf. Document BoR (13) 41. The Commission has published the new "Recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment" (C(2013) 5761) on 11 September 2013.

2.2 Current report

This report provides an update of the status of regulatory accounting systems across Europe. It monitors how regulatory accounting methods and models have been developed as a consequence of the adoption by NRAs of decisions regarding market analyses. This year's report confirms the trend towards the consistent implementation of accounting methods and models already observed during the last few years.

The report benefits from information collected from the 33 authorities (listed in Annex 1) with most NRAs responding to the majority of the questions providing a solid base for further analysis.

The information provided in this report refers to those markets for which the market analyses are either concluded or under consultation. The report reflects, therefore, also measures which are planned to be implemented by the end of 2013, although the final decisions may still be subject to outstanding consultations and may still therefore be part of the next market analysis rounds.

2.3 The data collection process

NRAs can, in principle, use a variety of objective and appropriate regulatory accounting methodologies depending on their market analysis[4], however NRAs should aim at following regulatory best practice.

In order to obtain a general view of cost accounting systems across Europe, the Regulatory Accounting EWG has collected a broad range of data since 2005, including, *inter alia*, a comparison between the cost-base (e.g. historical cost versus current cost) and the allocation methodology (e.g. fully distributed cost – FDC – or long run incremental cost – LRIC) chosen by different NRAs.

Such data, providing a valuable source of information, form an IRG (now BEREC) database, which is an informal data exchange tool among NRAs.[5] It includes, for each of the 18 markets identified by the old EC Recommendation[6] on relevant markets as susceptible of *ex ante* regulation, the following information:

- cost base;
- accounting system/allocation methodology;
- price control method;

[4] For an exhaustive explanation of how to implement a regulatory accounting system see the ERG (05) 29 "Common position on EC Recommendation on Cost accounting systems and accounting separation under the regulatory framework for electronic communications" (2005/6984/EC). Cf. also BEREC response to the Commission's questionnaire on costing methodologies for key wholesale access products in electronic communications, BoR (11) 65.

[5] The database contains confidential information therefore it is not published.

[6] Recommendation 2003/311/EC.

- auditing process;
- WACC calculation methodology; and
- remedies imposed on SMP operators.

In order to improve data comparability the following pre-defined options were included in the data request:

For the Cost base:

- *HCA Family (Historical Cost Accounting)*
- *CCA Family (Current Cost Accounting and Forward Looking – Current Cost Accounting)*
- *Other cost base methodologies that do not appear in the above definitions*

For the Accounting System / Cost Model[7]:

- *LRIC, LRAIC (Long Run Incremental costs, Long Run Average Incremental costs)*
- *FDC (Fully Distributed Costs)*

For the Price control method:

- *Cost orientation (alone)*
- *Price Cap (alone)*
- *Retail Minus*
- *Cost orientation and Price cap*
- *Benchmarking*
- *Other price methods that do not appear in the above definition.*

Besides the above mentioned data, countries provided further information regarding the approach used to develop cost models (e.g. Top-Down).

Finally, in order to simplify the data presentation and also to respect the confidentiality request made by some NRAs for certain data, this report, as in the previous years, does not present and comment all the data collected. The report concentrates on those markets listed in the 2007 EC Recommendation on relevant markets[8] as susceptible of *ex ante* regulation. These are markets typically subject to regulatory accounting remedies and, in most countries, the market analyses have been completed and remedies implemented. For those markets not listed in the new EC Recommendation as

[7] According to Recommendation 2005/698/EC "*The purpose of imposing an obligation to implement a cost accounting system is to ensure that fair, objective and transparent criteria are followed by notified operators in allocating their costs to services in situations where they are subject to obligations for price controls or cost-oriented prices."*

[8] Recommendation 2007/879/EC.

susceptible to *ex ante* regulation, the 2013 report presents data from 2008, therefore follows how the deregulation process is developing in Europe.

3. Outline of the Results

3.1 A snapshot of 2013 regulatory accounting data for markets listed in 2007 EC Recommendation

The information collected for the Regulatory Accounting Report has always been referred to the 18 markets listed in the Recommendation 2003/311/EC. This Recommendation was substituted by a new Recommendation (2007/879/EC) in December 2007 which, following the evolution observed in electronic communication markets over recent years, revised the list of relevant markets of the previous one and reduced the number of markets susceptible to *ex ante* regulation.

Seven markets are now identified, one at the retail level[9] and the other six at the wholesale level (Appendix A.5).[10]

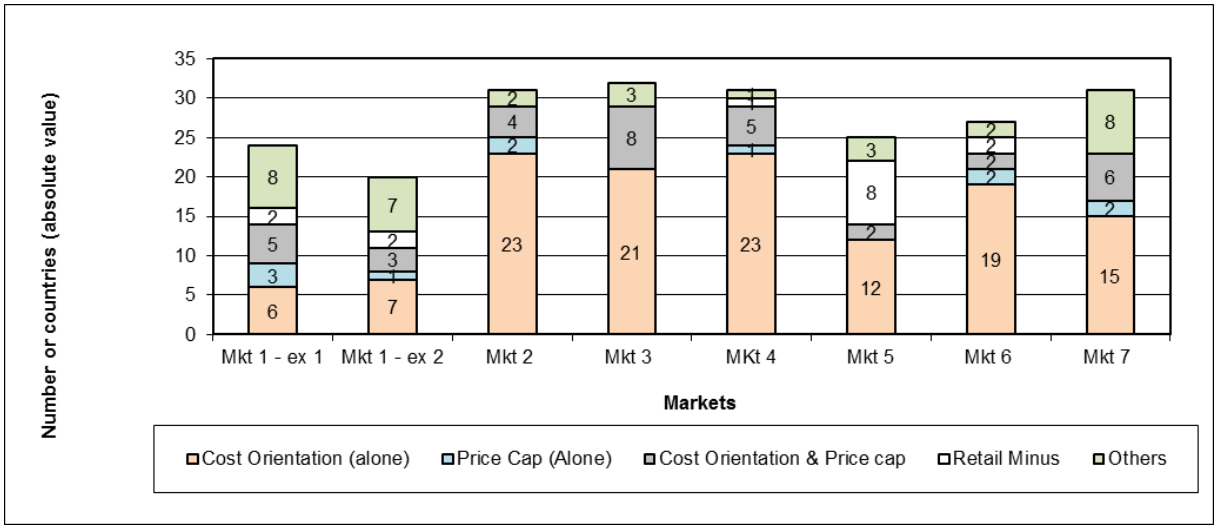
The following figures show a snapshot of the "Price control method", the "Cost base" (incl. the "Annualization methodology") and the "Allocation methodology" used in the year 2013 for regulating the markets listed in the Recommendation (2007/879/EC). The Commission is currently reviewing this Recommendation.

In this regard it has to be noticed that the 2009 framework that had to be transposed by Member States until 25 May 2011 did not bring much changes with regard to Art. 13 and Art. 11 Access Directive (2002/19/EC).

[9] Market 1: "*Access to the public telephone network at a fixed location for residential and non-residential customers*" (Markets 1 and 2 of 2003/311/EC Recommendation).

[10] Market 2: "*Call origination on the public telephone network provided at a fixed location*" (Market 8 of 2003/311/EC Recommendation) ; Market 3: "*Call termination on individual public telephone networks provided at a fixed location*" (Markets 9 of 2003/311/EC Recommendation); Market 4: "*Wholesale network infrastructure access at a fixed location*" (Markets 11 of 2003/311/EC Recommendation); Market 5: "*Wholesale broadband access*" (Markets 12 of 2003/311/EC Recommendation); Market 6: "*Wholesale terminating segments of leased lines*" (Markets 13 of 2003/311/EC Recommendation) and Market 7: "*Voice call termination on individual mobile networks*" (Markets 16 of 2003/311/EC Recommendation).

Figure 1 – Price control method used in 2013 in the markets listed in Recommendation 2007/879/EC



Source: BEREC RA database 2013

In particular, the Figure above gives an overview of the price control methods used to regulate the markets listed in the EC 2007 Recommendation in the year 2013.[11] In order to better reflect the actual price control methods in particular markets, as in last year's Report, BEREC has streamlined the possible price control options.

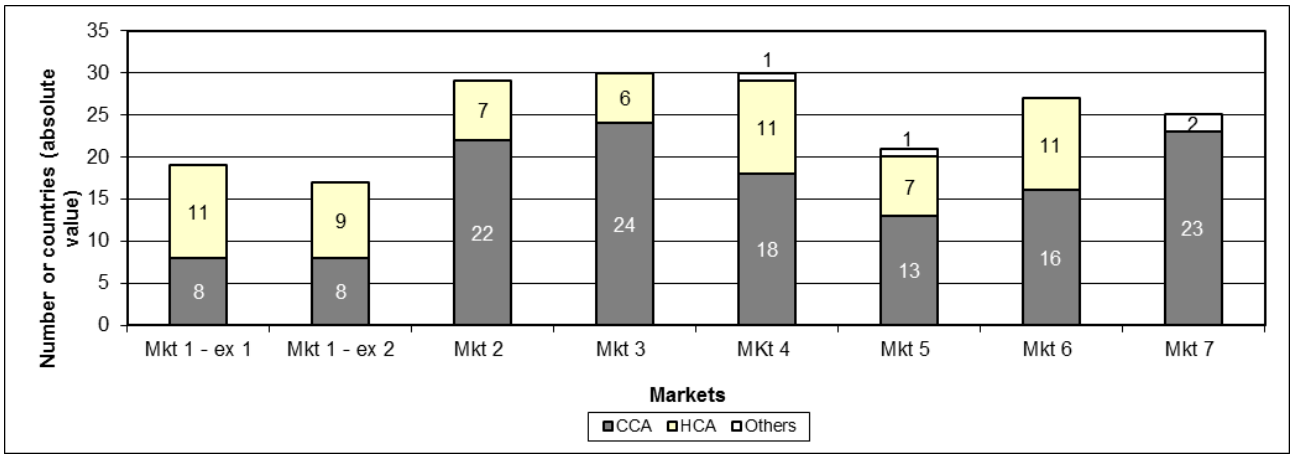
Figure 1 shows that cost orientation remains the most commonly used price control method in wholesale markets. In market 5 (WBA) also the Retail Minus method is spread among eight NRAs to set prices. Another common price control method used in wholesale markets is the cost orientation accompanied by a price cap. The situation is different for retail markets where other methods are mainly used.

Compared to 2012 data, where "Benchmarking" was applied by three NRAs in market 2, by four NRAs in market 3 and by seven NRAs in the market 7, in 2013 "Benchmarking" is adopted by two NRAs in market 2, by three NRAs in market 3 and by six NRAs in market 7.

As far as the cost base is concerned, Figure 2 shows that also in 2013 CCA is by far the most commonly used methodology, in particular for wholesale markets.

[11] The "Other" option also includes "Benchmarking" and "*ex-post* price control".

Figure 2 – Cost base used in 2013 in the markets listed in Recommendation 2007/879/EC



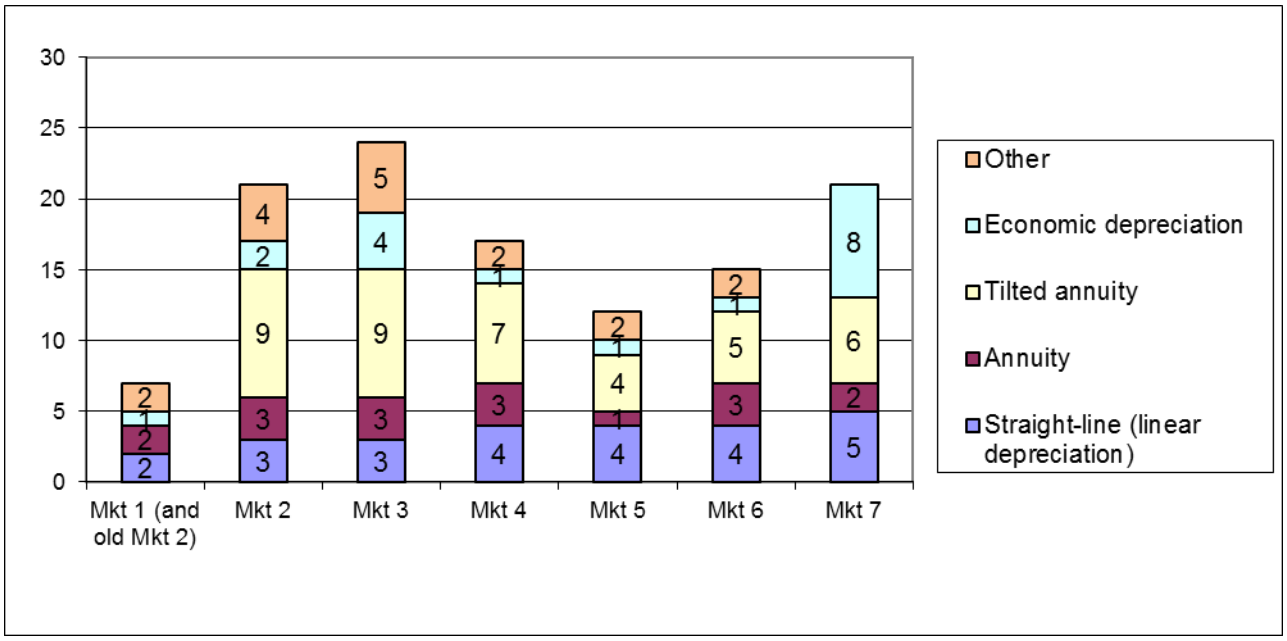
Source: BEREC RA database 2013

As last year NRAs were asked to provide information on the annualization methodologies chosen when using CCA as cost base (Figure 3). NRAs were able to choose among different options.[12]

Considering those countries with no missing data for this variable, it can be observed that the most widespread annualization methodology used by NRAs is, in general, the "tilted annuity".

[12] For an explanation of the terms see the Glossary in Annex A.4.

Figure 3 – Annualization methodologies used in 2013 in the markets listed in Recommendation 2007/879/EC when CCA is the cost base

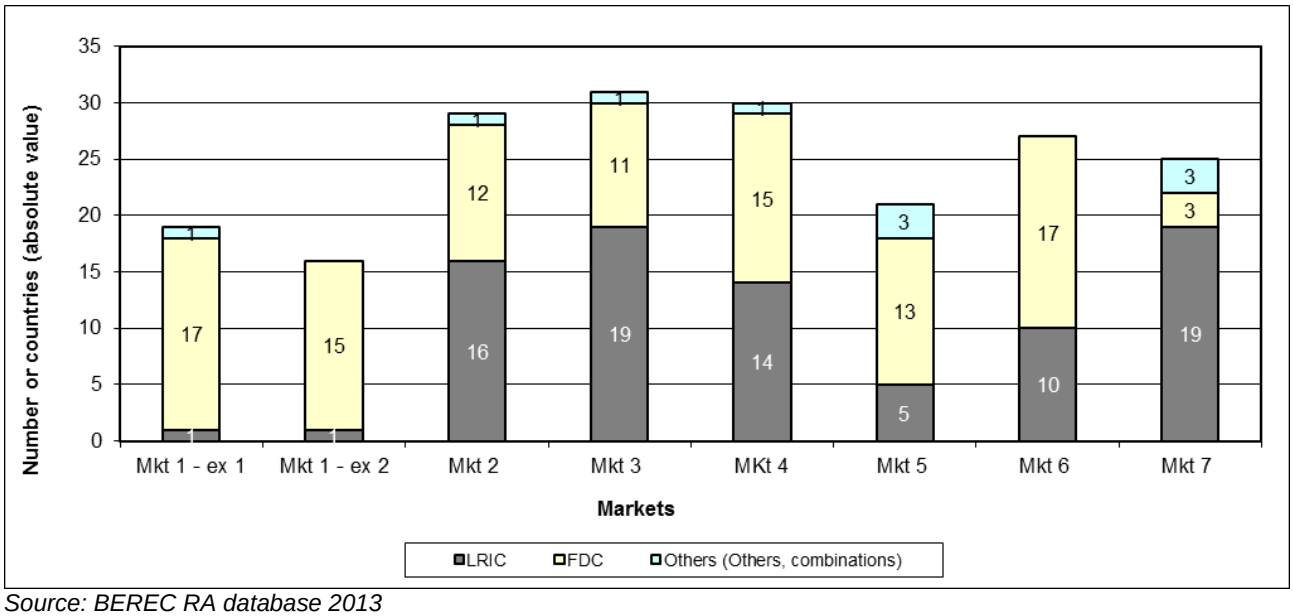


Source: BEREC RA database 2013

NRAs were also required to give details on the treatment of fully depreciated assets. In general it can be said that in many countries fully depreciated assets are not allowed or they are excluded from the cost base (since their value has already been recovered through past depreciation or because there is no mechanism to control whether there are depreciated assets in use by the SMP operator) or in the financial accounting they have a zero value or are replaced by new assets. For one country the case of assets being fully depreciated does not occur since in applying CCA, gross replacement costs are used and the efficient asset base is re-valued with current prices and then written off.

Figure 4 below shows the allocation methodology used in the different markets. As in the case of the price control method a difference can be observed between retail and wholesale markets: while all respondent NRAs use FDC for retail markets (apart from two NRAs declaring LRIC and others), they mainly use LRIC in wholesale markets (except markets 5 and 6).

Figure 4 – Allocation methodology used in 2013 in the markets listed in Recommendation 2007/879/EC



Source: BEREC RA database 2013

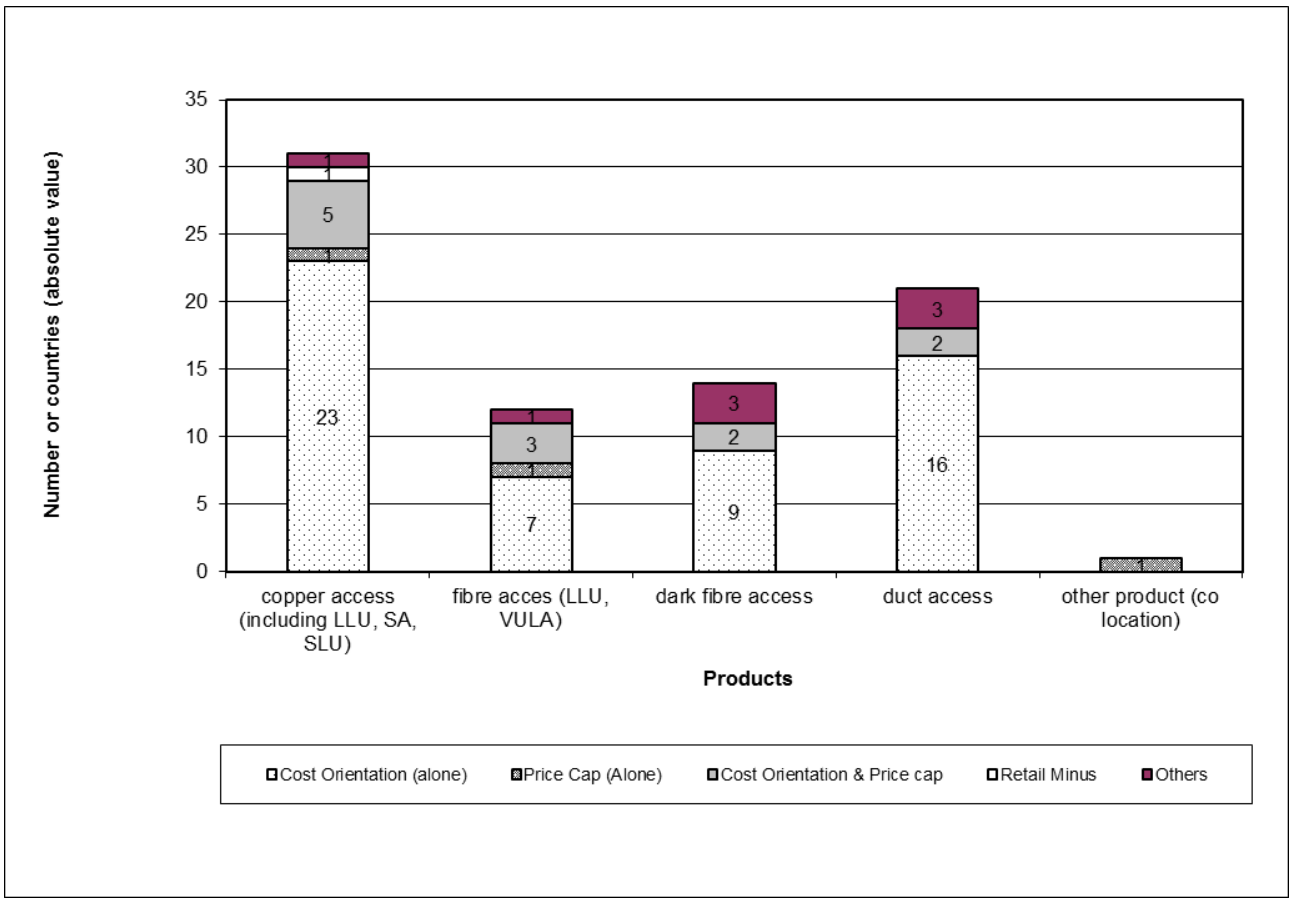
3.2 Focus on market 4

This year the data collection has also focused on some products for market 4: 1) copper access (including LLU, SA, SLU), 2) fibre access (LLU, VULA); 3) dark fibre access and 4) duct access.

NRAs were asked to detail the price control method, the cost base and the allocation methodology for the above products.[13] Taking into account only those countries with no missing data for the detailed products, cost orientation is the most commonly used price control method for all products. In some cases there is currently no price regulation for fibre access or dark fibre access. One country declaring other methods for dark fibre access and duct access specified that price is primarily subject to commercial negotiation.

[13] One country referred all the answers of next three figures co location, while for another country VUA (virtual unbundled access) is not included in market 4, but in market 5.

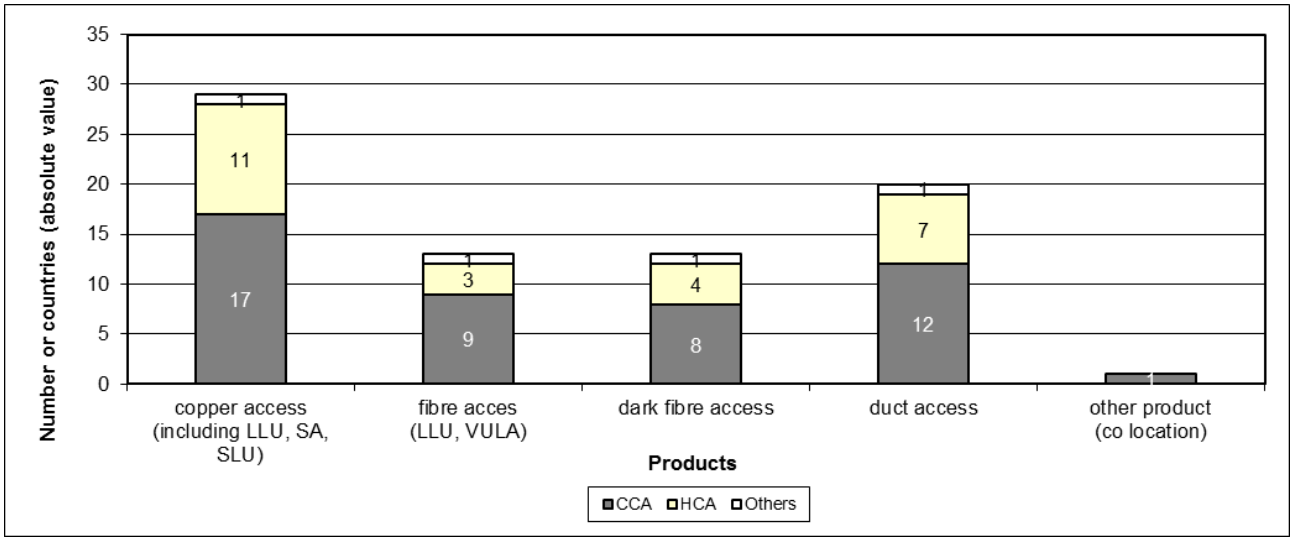
Figure 5 – Price control method declared in 2013 for some products in market 4



Source: BEREC RA database 2013

From Figure 6 it results that the most commonly used methodology for all products in market 4 is CCA. Also HCA is popular among NRAs for copper access and duct access.

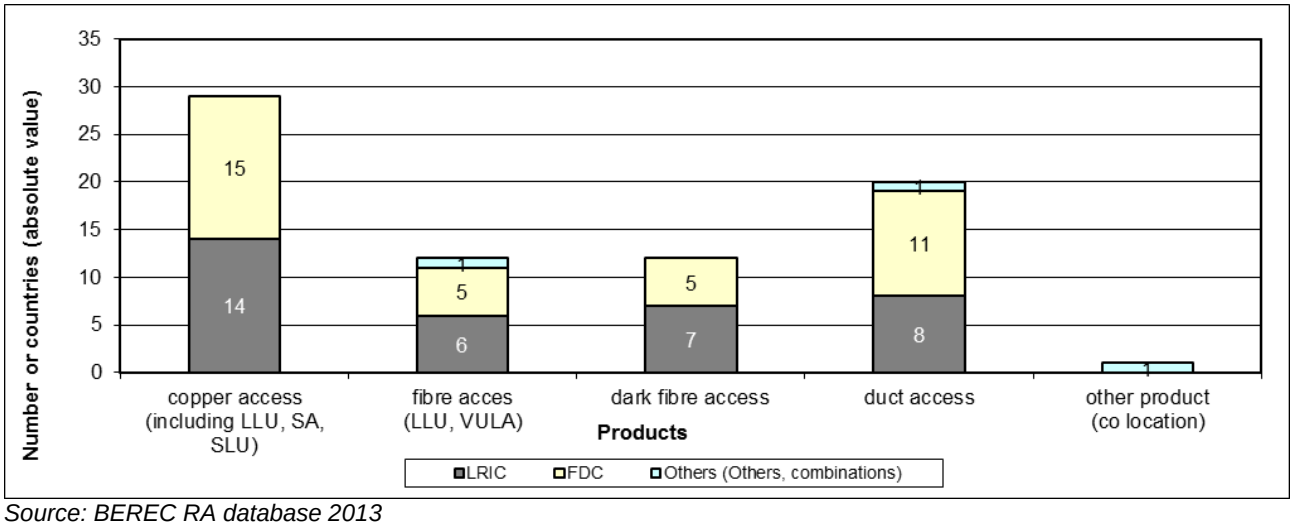
Figure 6 – Cost base declared in 2013 for some products in market 4



Source: BEREC RA database 2013

As far as the allocation methodology for different products in market 4 is concerned, data analysis shows that FDC is popular for copper access and duct access while for fibre access and dark fibre access LRIC and FDC are spread more or less in the same proportion.

Figure 7 – Allocation methodology declared in 2013 for some products in market 4



Source: BEREC RA database 2013

3.3 A snapshot of 2013 regulatory accounting data for markets outside the scope of 2007 EC Recommendation

Table 1 shows markets listed in the 2003 EC Recommendation which, according to the Commission, are not susceptible to *ex ante* regulation any longer.[14]

As the remedies referred to these markets were adopted before the new Recommendation became effective, data referred to them have still been collected and monitored. It has also been taken into account that in some countries these markets are still regulated as NRAs assessed that they are not yet competitive.

Moreover, in order to monitor the process of deregulation of markets not included in the EC Recommendation any longer, Table 1 shows the number of countries with some price control[15] or accounting obligation[16] still in place since 2008.[17]

[14] NRAs deciding to maintain/modify/eliminate existing remedies in these markets have to run the so called "three criteria test" to proof if the relevant market is still susceptible of *ex ante* regulation. See ERG (08) 21 Report on Guidance on the application of the three criteria test.
[15] Art. 13 Access Directive, Art. 17 Universal Service Directive.
[16] Art. 11 and Art. 13 Access Directive.
[17] The number of countries on which table 1 is based on, varies from year to year.

Table 1 – Number of Countries with price control and/or accounting obligation over time

List of Markets susceptible to *ex ante* regulation according to Recommendation 2003/311/EC	2008	2009	2010	2011	2012	2013
Market **3:** National fixed Residential Services	15	15	9	10	14	12
Market **4**: International fixed Residential Services	9	9	4	5	7	6
Market **5**: National fixed Non-Residential Services	13	11	10	11	14	11
Market **6:** International fixed Non-Residential Services	10	10	6	7	10	7
Market **7:** Leased Lines	17	15	13	13	12	8
Market **10:** Fixed Transit Services Wholesale	19	16	14	12	11	10
Market **14:** Trunk Segments Wholesale	12	12	11	11	13	12
Market **15:** Mob. Access and Origination Services	3	3	4	4	6	5
Market **17:** International Roaming	1	1	0	0	0	1
Market **18:** Broadcasting Services	13	14	13	11	12	11

Source: BEREC RA database 2013

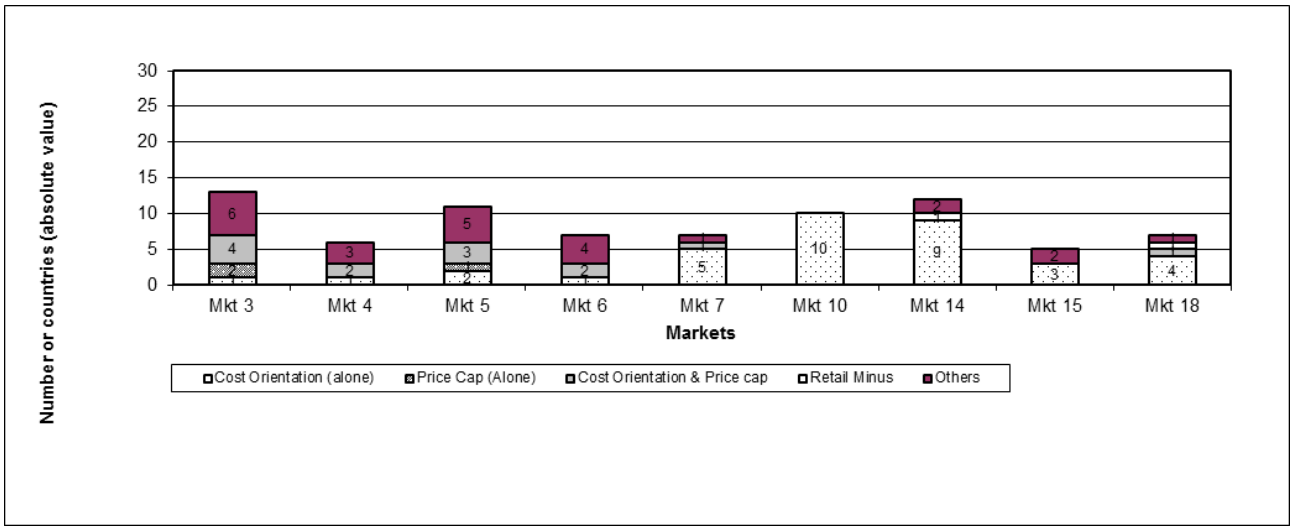
Table 1 shows that the number of countries in which some price control and/or accounting obligations are in place, in general, decreased over time[18], confirming that some NRAs have consolidated the liberalisation process envisaged by the 2007 Recommendation.

Figure 8 shows the price control method used in the markets listed only in the 2003 Recommendation. In this case the evidence is mixed particularly for retail markets (Markets 3, 4, 5, 6 and 7). Here NRAs adopted the different price control methods more

[18] The increase in number of countries with price control and/or accounting obligation in 2011 and 2012, is due to the inclusion in the survey of countries not included in the previous years.

or less in equal proportion, with the exception of market 7 for which the prevailing price control method is clearly cost orientation, the same as in all the remaining wholesale markets.

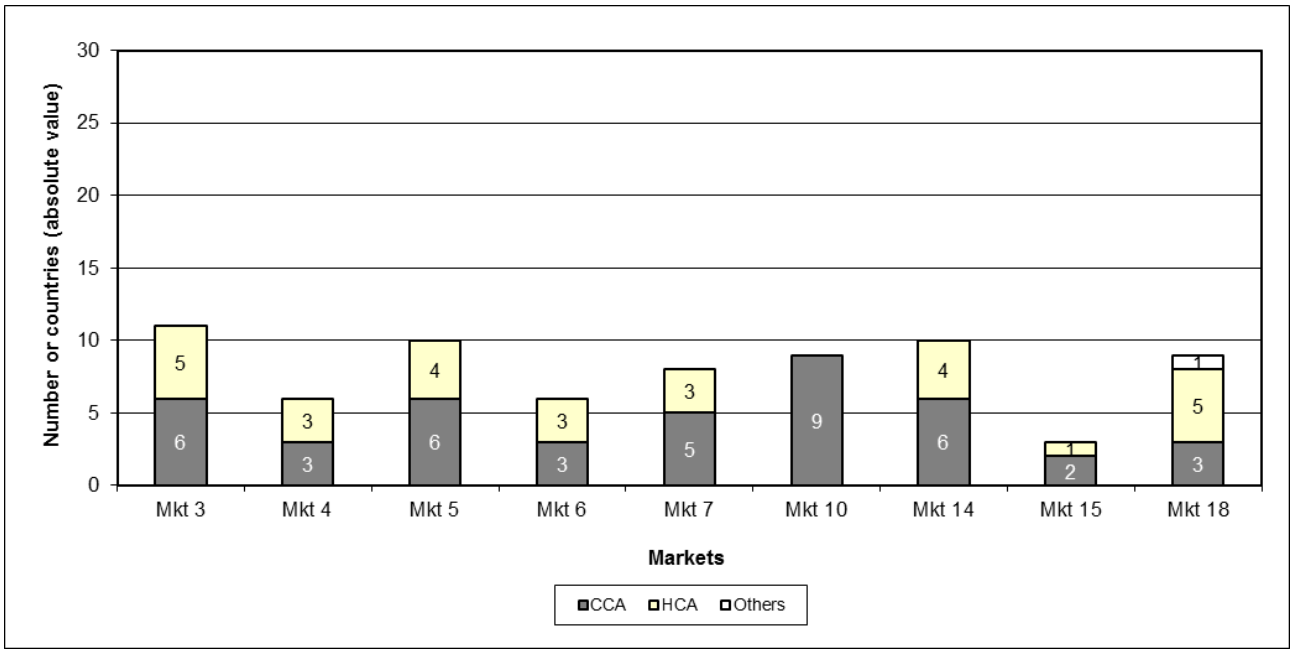
Figure 8 – Price control method used in 2013 in the markets listed only in Recommendation 2003/311/EC



Source: BEREC RA database 2013
Market 17 (International Roaming) has been excluded from this figure because it is under EU regulation.

Figure 9 below shows a variable picture for the cost base used in the analysed markets. As for wholesale markets, in market 10, CCA is the only cost base declared by NRAs, while in market 18, the prevailing cost base is HCA. In retail markets CCA and HCA seem to be used in similar proportions, with a prevalence of CCA.

Figure 9 – Cost base used in 2013 in the markets listed only in Recommendation 2003/311/EC

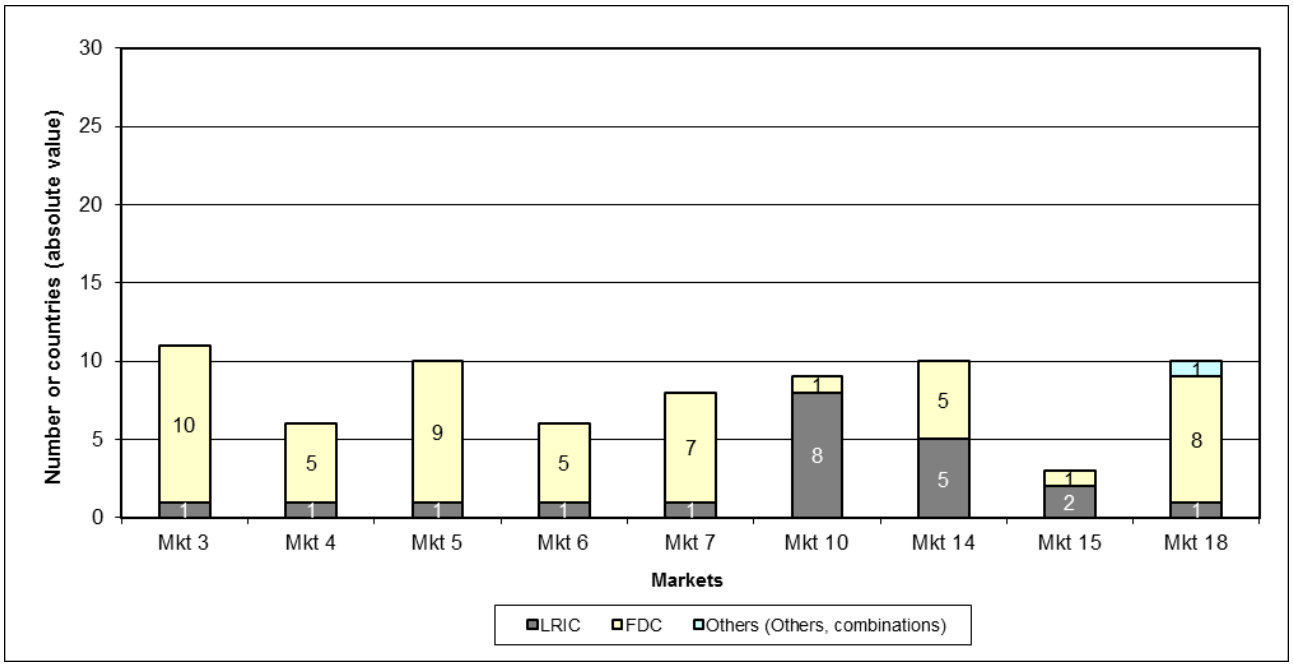


Source: BEREC RA database 2013
Market 17 (International Roaming) has been excluded from this figure because it is under EU regulation.

A clear pattern can be identified for the allocation methodology used in the 9 markets listed only in the old Recommendation. As shown in Figure 10, FDC is by far the most used allocation methodology in retail markets and in market 18, while several countries also use LRIC in wholesale markets.

Finally, it is interesting to observe that in the markets outside the scope of 2007 EC Recommendation mainly HCA/FDC were used as cost base and allocation methods.

Figure 10 – Allocation methodology used in 2013 in the markets listed only in Recommendation 2003/311/EC



Source: BEREC RA database 2013
Market 17 (International Roaming) has been excluded from this figure because it is under EU regulation.

3.4 Cost base, allocation methodology and price control method over time

While in the previous paragraphs a snapshot of the current situation (year 2013) in the various markets has been illustrated as far as price control, cost base, allocation methodology, annualization methodologies and treatment of fully depreciated assets are concerned, the following paragraphs illustrate the development of regulatory accounting practices across Europe over time. To put it another way, the paragraphs illustrate the evolution of accounting and price control remedies over time, concentrating on WLR services and on the following three wholesale markets listed in the new EC Recommendation as still susceptible to *ex ante* regulation: Wholesale physical access network infrastructure (including shared of fully unbundled access) at a fixed location (market 4), Wholesale Broadband Access (market 5) and Wholesale terminating segments of leased lines (market 6).

In order to present a reliable trend analysis, data have only been included where respondent NRAs provided information for at least six years. Therefore the number of countries analysed may vary[19] and differ from the number of countries taken into account in the previous paragraphs.

[19]The actual number of countries considered is reported in the footnote below each figure.

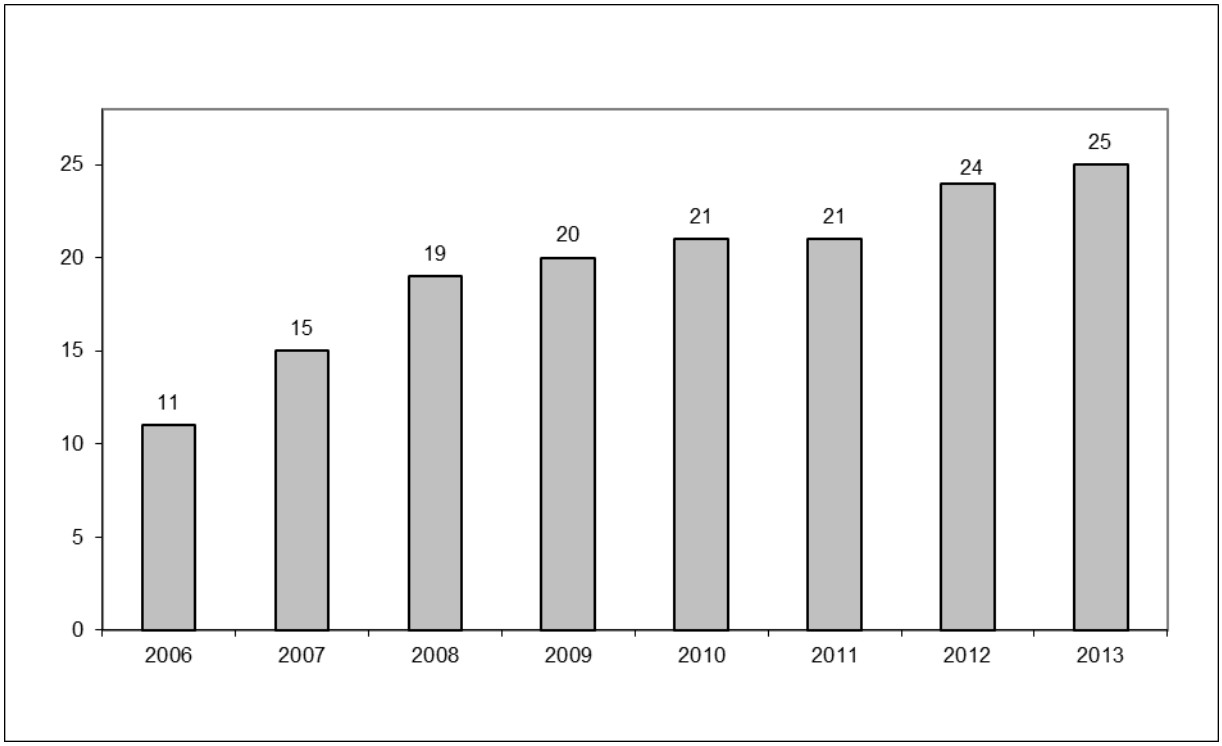
As far as the cost base and the allocation methodology are concerned, it is often the case that an NRA, when setting up its regulatory accounting framework for the fixed notified operator/s, will apply a consistent cost base and accounting methodology to all regulated fixed markets. In the following paragraphs it is therefore to be expected that those countries that moved for example from HCA to CCA, did that for all relevant markets.

3.4.1 Wholesale Line Rental

Wholesale Line Rental services are those services enabling alternative operators to enter the retail narrowband access market without sustaining the high investments required by ULL services, hence bearing a lower risk. Moreover, the WLR obligation benefits final customers allowing them a larger choice among different access providers.

The number of countries in which the WLR obligation is in force increased over time. In 11 out of 30 countries providing information[20], the WLR obligation has been in place since 2006, but the number had more than doubled (20 countries) three years later. As a result, in 2013 25 countries have a WLR offer (Figure 11).

Figure 11 – Number of Countries with WLR obligation by year



Source: BEREC RA database 2013
Number of countries: From 30 in 2006 to 31 in 2013.

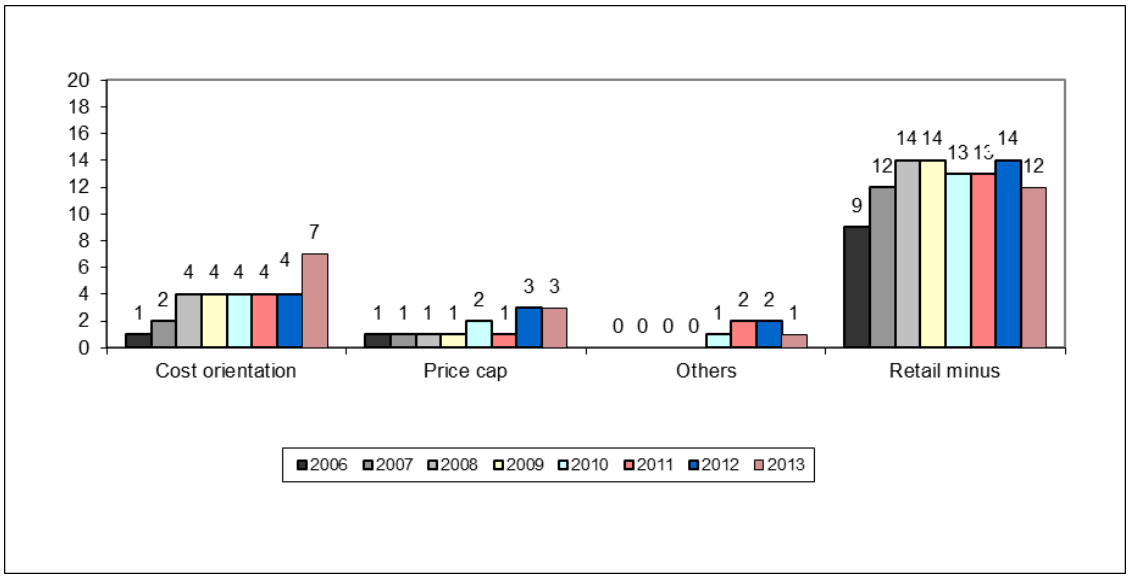
[20] One country has not been included in the elaborations for this paragraph since data on WLR have not been provided for some of past years.

Trend analysis:

Price control method

The most used price control method for WLR is retail minus, declared in 2013 by 12 NRAs out of 23. It was also the most common methodology in previous years (Figure 12). Taking into account the last few years, in 2012 three countries changed the price control method (two countries from “retail minus” to “price cap” and “others” and one NRA from “others” to “retail minus”). Moreover three NRAs declared to have changed the price control method in 2013 (one from “price cap” to “cost orientation”, two countries passed to “price cap” from “others” and “retail minus”).

Figure 12 – Price Control Method for Wholesale Line Rental

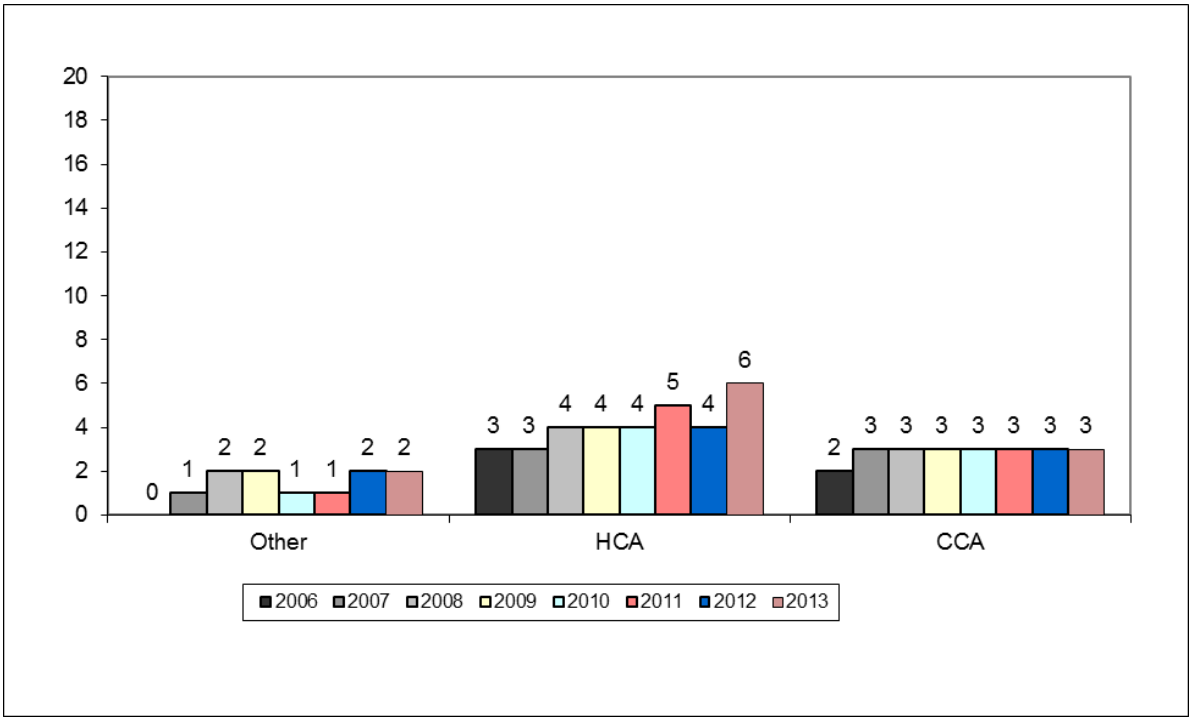


Source: BEREC RA database 2013
Number of countries: From 11 in 2006 to 23 in 2013.

Cost base

Taking into account only those NRAs declaring to impose the WLR obligation with retail minus as price control method, it can be observed that, as far as the cost base is concerned, the preferred cost base in 2013, as in previous years, is HCA, while the trend for CCA has been stable (three countries) since 2007 (Figure 13).

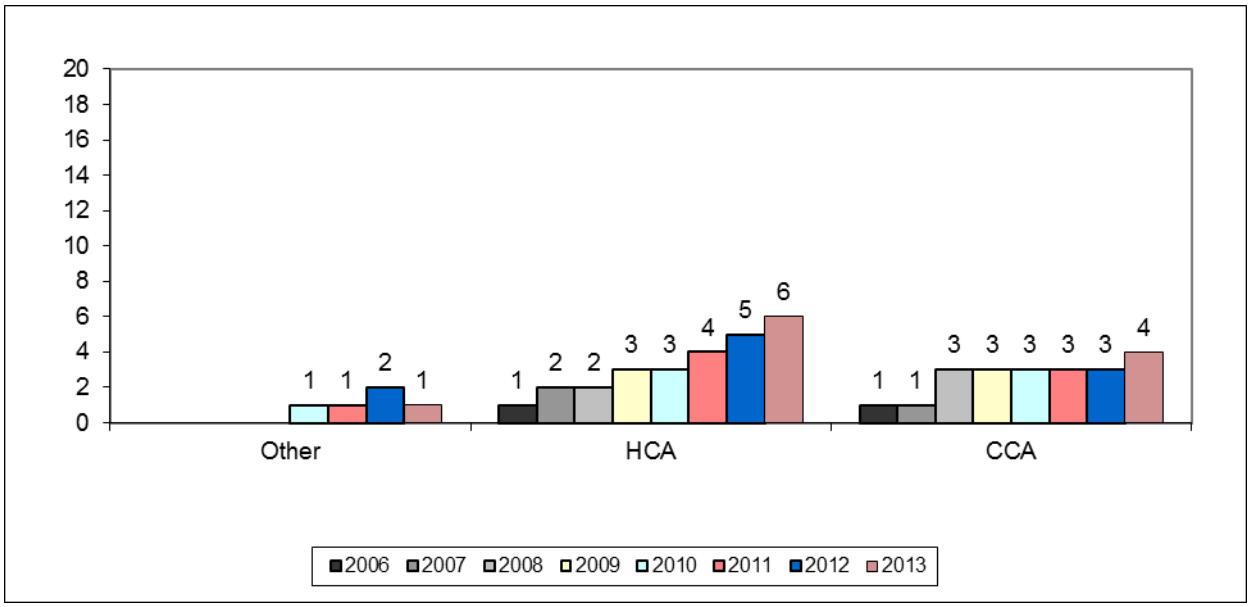
Figure 13 – Cost Base for WholesaleLine Rental for countries with Retail Minus as Price Control Method



Source: BEREC RA database 2013
Number of countries: From 9 in 2006 to maximum 14 in 2012. Missing countries for this variable vary between 1 and 5.

Considering only those NRAs declaring the remaining kinds of price control method (i.e. cost orientation, price cap and others) for the WLR obligation, it can be observed that since 2011 the countries adopting HCA as cost base have exceeded those adopting CCA (Figure 14).

Figure 14 – Cost Base for Wholesale Line Rental for Countries with other kinds of Price Control Method

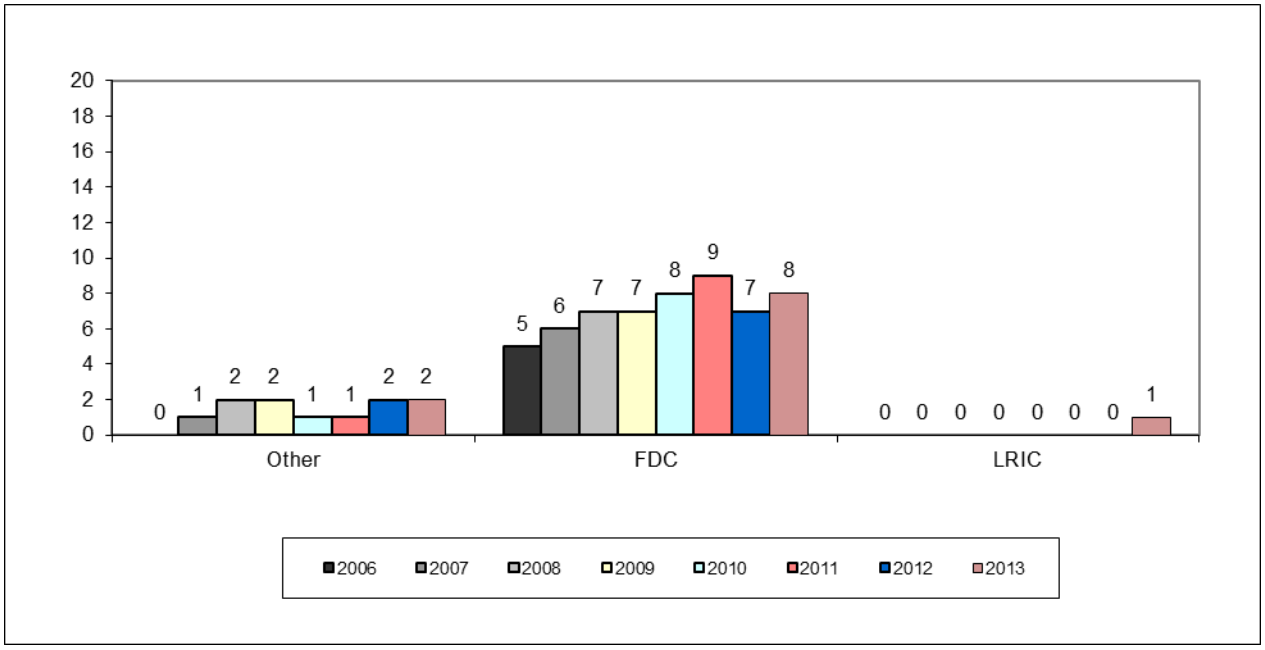


Source: BEREC RA database 2013
Number of countries: From 2 for 2006 to 11 for 2013. Missing countries for this variable vary between 1 and 2.

Allocation methodology

There is clear evidence that FDC is the preferred allocation methodology (Figure 15) for those countries with retail minus as price control method. As a matter of fact its use has increased since 2006. Other allocation methodologies have also been declared.

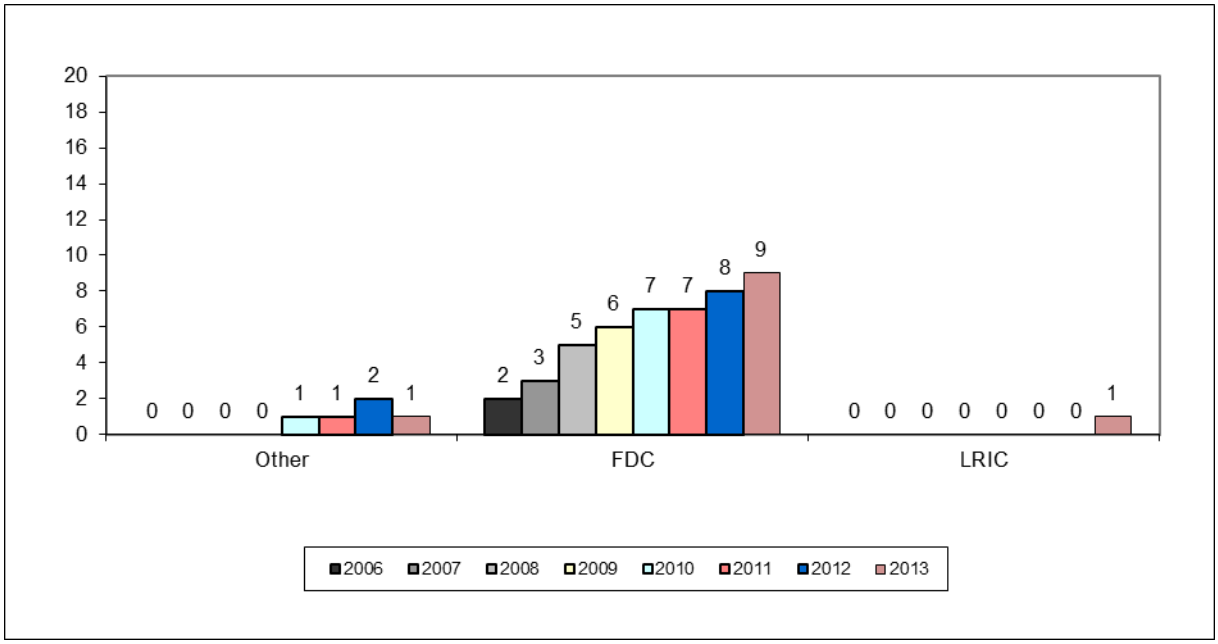
Figure 15 – Allocation Methodology for Wholesale Line Rental for countries with Retail Minus as Price Control Method



Source: BEREC RA database 2013
Number of countries: From 9 in 2006 to maximum 14 in 2012. Missing countries for this variable vary between 1 and 5.

Taking into account those NRAs declaring to impose the WLR obligation with other kinds of price control method, it can be observed that also in this case FDC is the preferred allocation methodology and its use has increased over time (Figure 16).

Figure 16 – Allocation Methodology for Wholesale Line Rental for countries with other types of Price Control Method



Source: BEREC RA database 2013
Number of countries: From 2 in 2006 to 11 in 2013.

<u>Key points for Wholesale Line Rental:</u> FDC and retail minus are the most popular allocation methodology and price control method, respectively. The number of countries using HCA as cost base exceeds those using CCA. Generally it is important to mention the fact that for WLR retail minus is the preferred price control method.

3.4.2 Wholesale (physical) network infrastructure access at a fixed location (Market 4)

The new EC Recommendation on relevant markets defines Market 4 as the market for "*wholesale (physical) network infrastructure access (including shared or fully unbundled access) at a fixed location*".

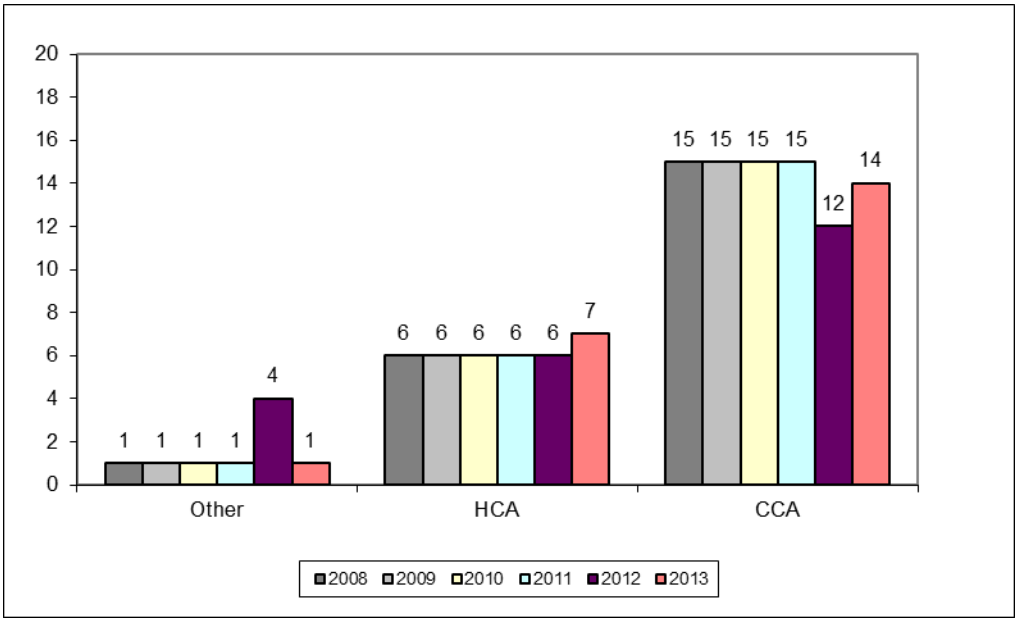
In this market all countries notified at least one operator. Typically the SMP operator is the national incumbent with the exception of two NRAs that defined sub-national geographic markets identifying the corresponding local incumbent operators as having SMP.

Trend analysis:

Cost base

CCA is the cost base declared by 18 NRAs taking part in the survey for year 2013 (see Figure 2). Unlike Figure 2, which is based on data for the countries that answered the 2013 BEREC questionnaire, the figure below gives an insight into how the choice of cost base has changed over time, taking into account only data provided by 22 NRAs each year since 2008. Figure 17 shows a quite stable and sustainable situation. In this market, CCA is by far the most commonly used cost base methodology and the number of countries using this method has been stable since 2008, with a slight decrease in the last years. Also the number of countries using HCA has been stable since 2008.[21]

Figure 17 – Cost Base for Wholesale physical network infrastructure access at a fixed location (Mkt 4)



Source: BEREC RA database 2013
Number of countries: 22

It is important to observe that the change of cost base (from HCA to CCA) is particularly relevant for this market. Unlike other markets where a high percentage of total costs is represented by network equipment subject to technical progress, in the wholesale physical access network infrastructure at a fixed location market the highest percentage of costs is related to duct civil engineering which inherently has a very long economic life and is not subject to significant technological progress. Broadly speaking this may imply

[21] The change of two countries in 2012 to "other" is due to the treatment of data. In particular one country declared to use CCA to determine capital costs (depreciation and return on capital employed) and HCA for operational costs and has been treated as "other". Another country declared to use different cost base according to the different products in market 4 and has been treated as "other".

that the expected reduction in real terms of asset values - which is normally observed in other markets when adopting a CCA approach, mainly, due to technical progress reducing equipment costs (e.g. routers are generally cheaper than switches)[22] - is not necessarily observed in the unbundled access market. In addition, it has to be taken into account that recently copper prices have been fluctuating significantly and the picture is still showing a real price increase over time; this price increase could be a further element determining higher service prices when moving from HCA to CCA. In this regard, according to some observers, the use of CCA is likely to remain relevant in a time of roll-out of fibre access networks and could send better investment signals to promote infrastructure-based competition as well as investment in infrastructure. Finally, the effect of declining copper lines will impact on the level of costs.

If these considerations are correct they may have an impact on all the other access services that use the same assets to provide ULL services.

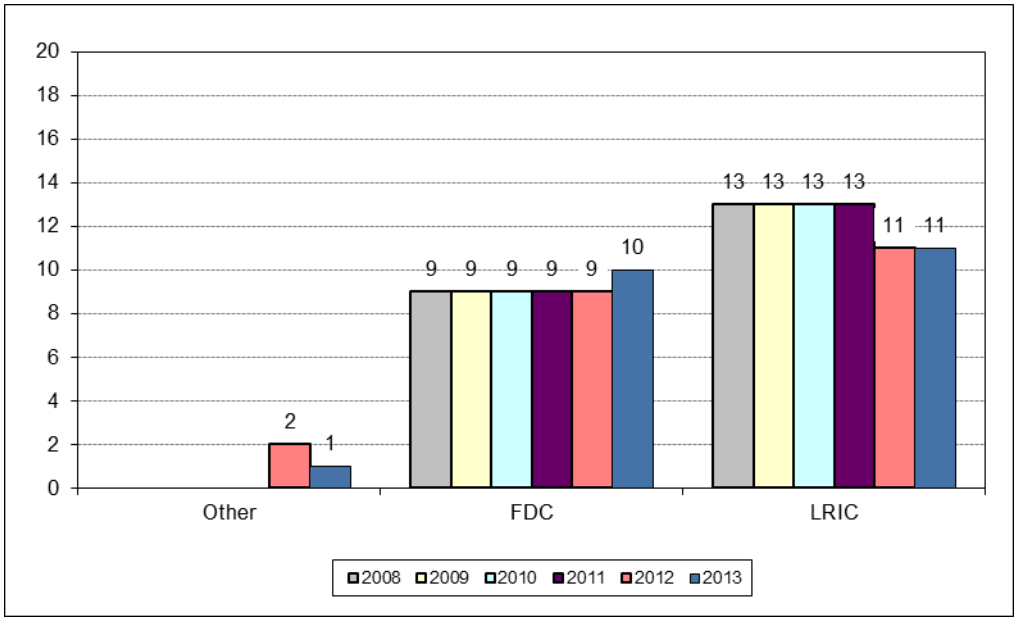
Generally speaking, countries still using HCA in this market, use the same cost base for other fixed wholesale markets.

Allocation methodology

Figure 4 shows that LRIC and FDC seem to be used in similar proportions in market 4. Taking into account only those countries providing information since 2008 (which is less than the number of countries in Figure 4) in Figure 18 an apparently stable and sustainable situation, starting from 2008, can be observed. It has to be noted that the number of countries using LRIC changed from 13 countries in 2011 to 11 in 2012 and the number has remained stable until 2013. Correspondingly, a slight increase in the number of countries using FDC is observed: from 9 in 2012 to 10 in 2013.

[22] For the NGN core network it is generally acknowledged that NGN technology has produced cost savings to a considerable extent (cf. e.g. ERG IP-Interconnection Report 2007 and ERG Common Statement on Regulatory Principles of IP-IC/NGN Core – A work program towards a Common Position, ERG (08)26 – Oct 2008, pp. 21, pp. 82).

Figure 18 – Allocation Methodology for Wholesale physical network infrastructure access at a fixed location (Mkt 4)



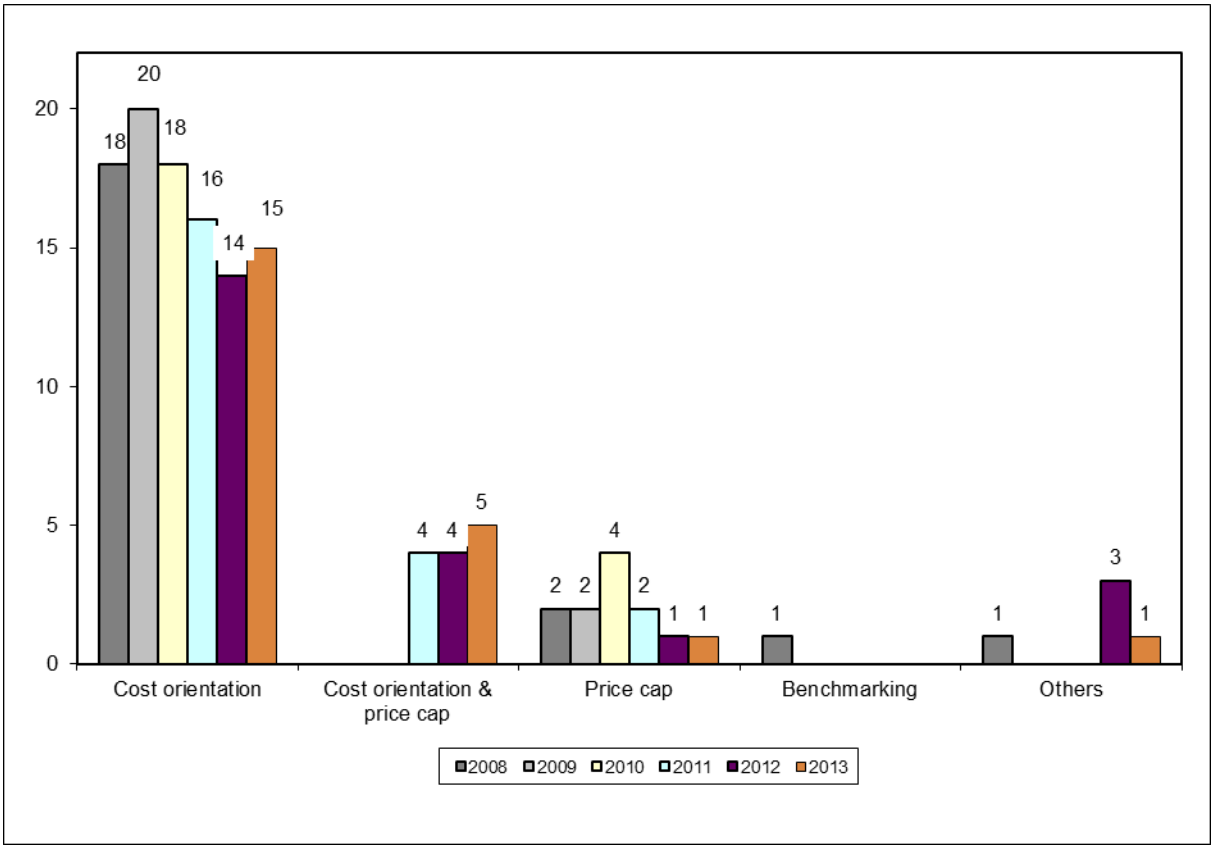
Source: BEREC RA database 2013
Number of countries: 22

Price control method

The most common price control method for 2013 in the Wholesale physical network infrastructure access at a fixed location market is by far cost orientation (Figure 1), which is declared by 23 NRAs (although for 5 NRAs it is combined with price cap).

Figure 19 provides a picture of how this method changed over time, taking into account 22 countries participating in the data collection since 2008. It can be observed that cost orientation alone or together with price cap is also the preferred price control method by NRAs over time.

Figure 19 – Price Control Method for Wholesale physical network infrastructure access at a fixed location (Mkt 4)



Source: BEREC RA database 2013
Number of countries: 22

<u>Key points for Market 4:</u> CCA is the preferred cost base combined with LRIC as the allocation methodology and cost orientation as the price control method. This trend has been confirmed by the NGA Recommendation adopted in September 2010. It remains to be seen whether the 2013 Recommendation on consistent non-discrimination and costing methodologies will reinforce this trend.

3.4.3 Wholesale broadband access (Market 5)

The 2007 EC Recommendation on relevant markets defines Market 5 as the market for *"wholesale broadband access"*.[23]

In this market all the analysed countries also notified at least one operator (typically the national incumbent) in the first and second rounds of market analysis, although in the

[23]The Recommendation clarifies that "*This market comprises non-physical or virtual network access including 'bit-stream' access at a fixed location. This market is situated downstream from the physical access covered by market 4 listed above, in that wholesale broadband access can be constructed using this input combined with other elements*".

fourth round of market analysis two NRAs defined sub-national geographic markets in which no operator had Significant Market Power.

Trend analysis:

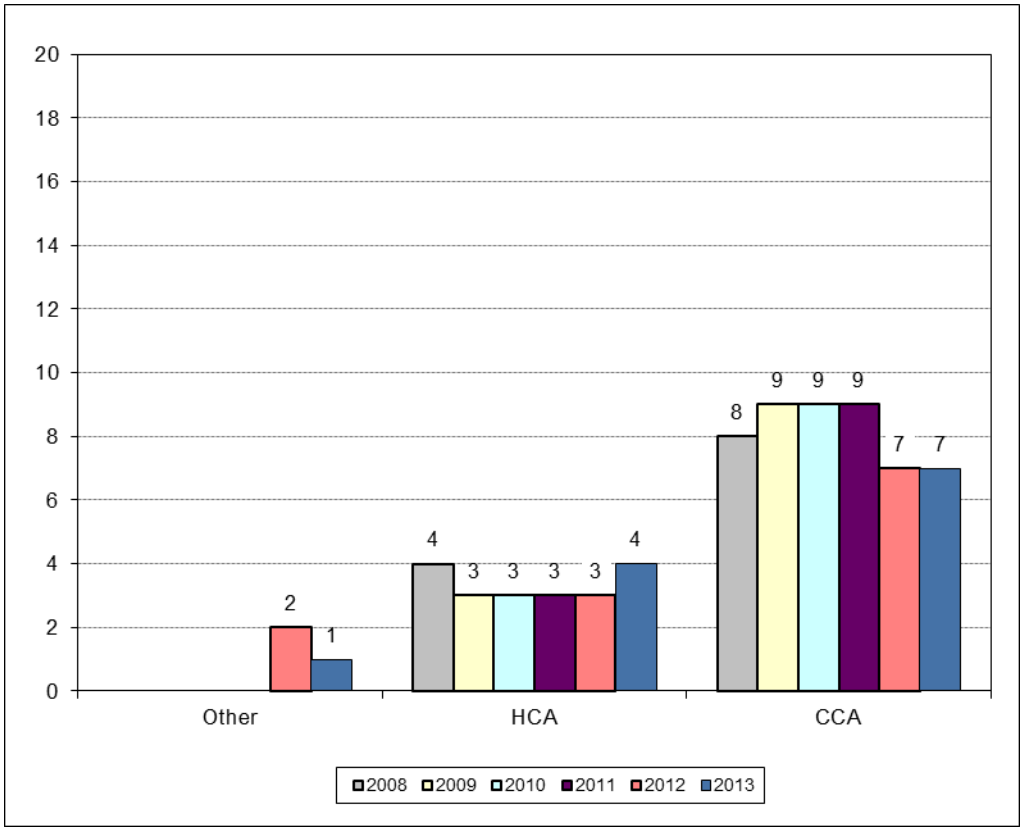
Cost base

Figure 20 shows data for 12 countries that have provided relevant information since 2008 and, as such, this is less than the number of countries in Figure 2.

The market for wholesale broadband access shows a similar trend to that of the unbundled local loop market in terms of the cost base used. Furthermore, it can be observed that CCA is by far the most commonly used cost base methodology, despite an observed decrease from 2012. The HCA method has remained stable since 2009, with one NRAs declaring to pass from CCA to HCA in 2013.

This market is characterised by the prevailing use of network elements subject to rapid technological change, whose asset value in real terms can be expected to decrease over time using a CCA cost base.

Figure 20 – Cost Base for Wholesale Broadband Access (Mkt 5)

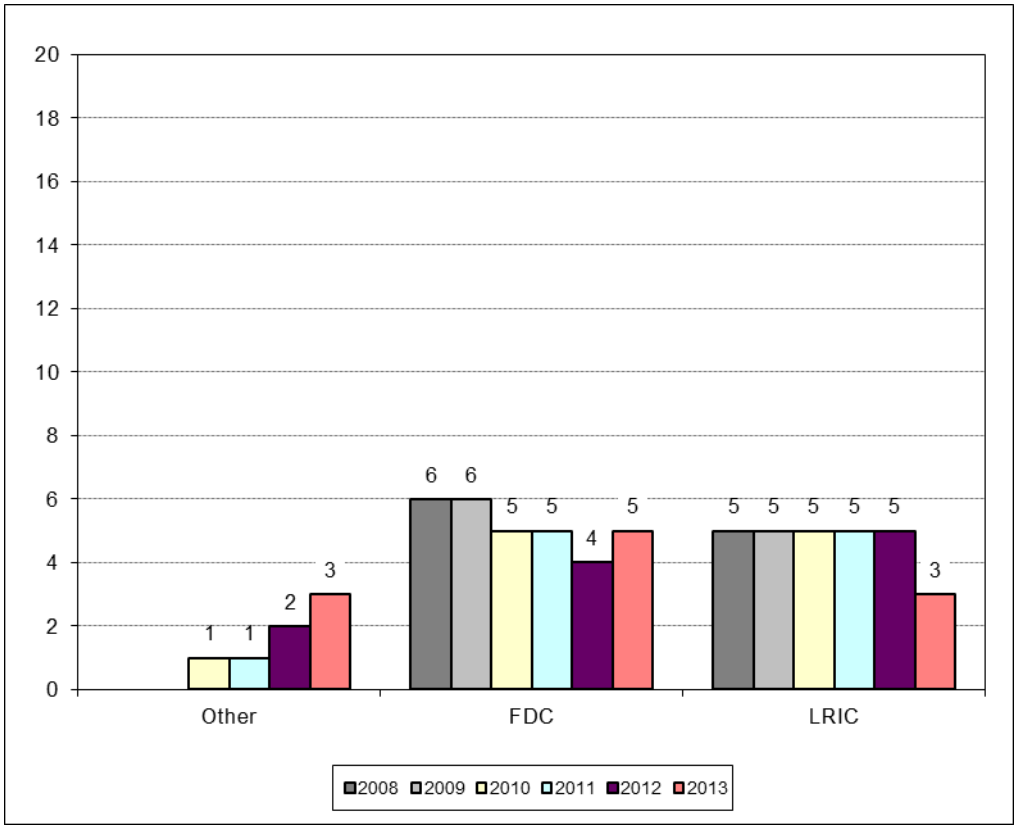


Source: BEREC RA database 2013
Number of countries: 12

Allocation methodology

Figure 21 shows the allocation methodology used in the wholesale broadband access market by 11 countries since 2008. It can be seen that the number of countries using FDC has increased by one unit in the last year (two changes from LRIC/LRAIC to FDC and one change from FDC to another allocation methodology).

Figure 21 – Allocation Methodology for Wholesale Broadband Access (Mkt 5)

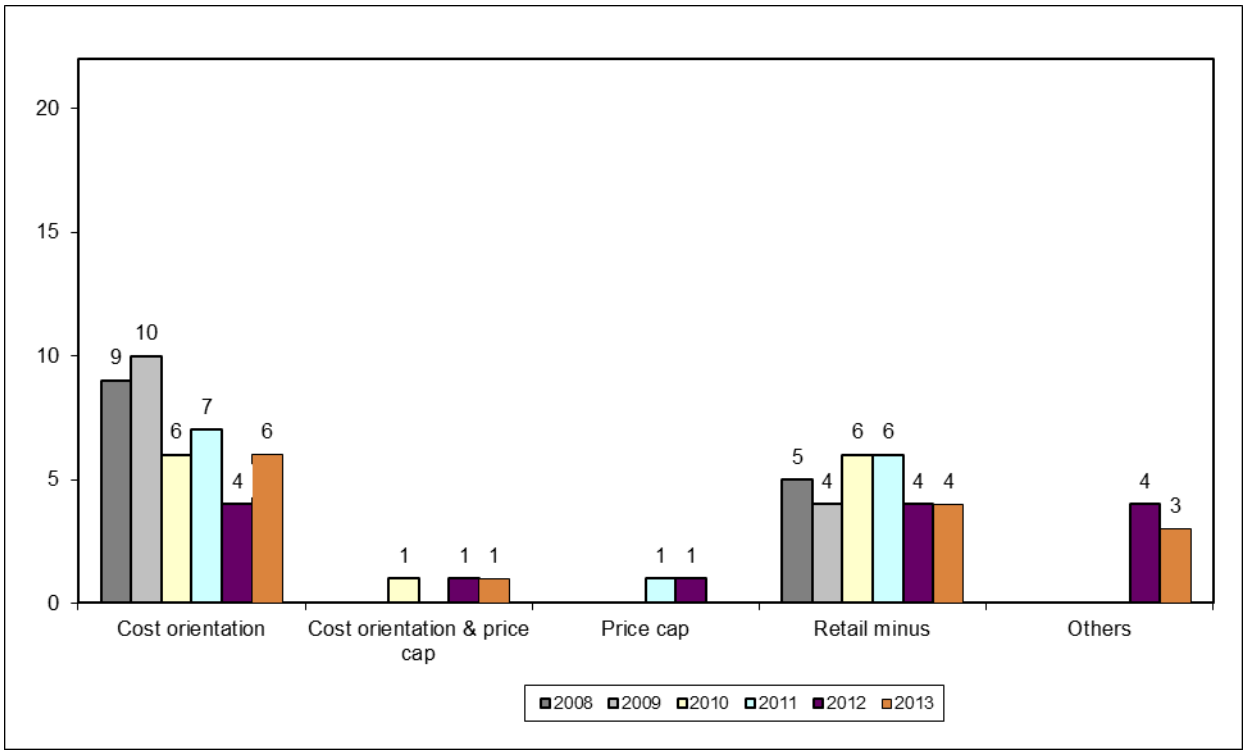


Source: BEREC RA database 2013
Number of countries: 11

Price control method

The most used price control methods in 2013 in the wholesale broadband access market are cost orientation and retail minus (Figure 1), declared by 12 and 8 NRAs, respectively. However, taking into account 14 countries answering the questionnaire since 2008 (Figure 22), it becomes apparent that two countries changed to cost orientation in 2013.

Figure 22 – Price Control Method for Wholesale Broadband Access (Mkt 5)



Source: BEREC RA database 2013
Number of countries: 14. In 2010 the number of countries is 13 since for one NRA there is no price control obligation due to court ruling.

<u>Key points for Market 5:</u> CCA is, by far, the most common cost base over time. As far as the allocation methodology is concerned, the number of countries using LRIC is almost the same as those using FDC, while cost orientation is chosen as price control method.

3.4.4 Leased Lines Terminating Segment (Market 6)

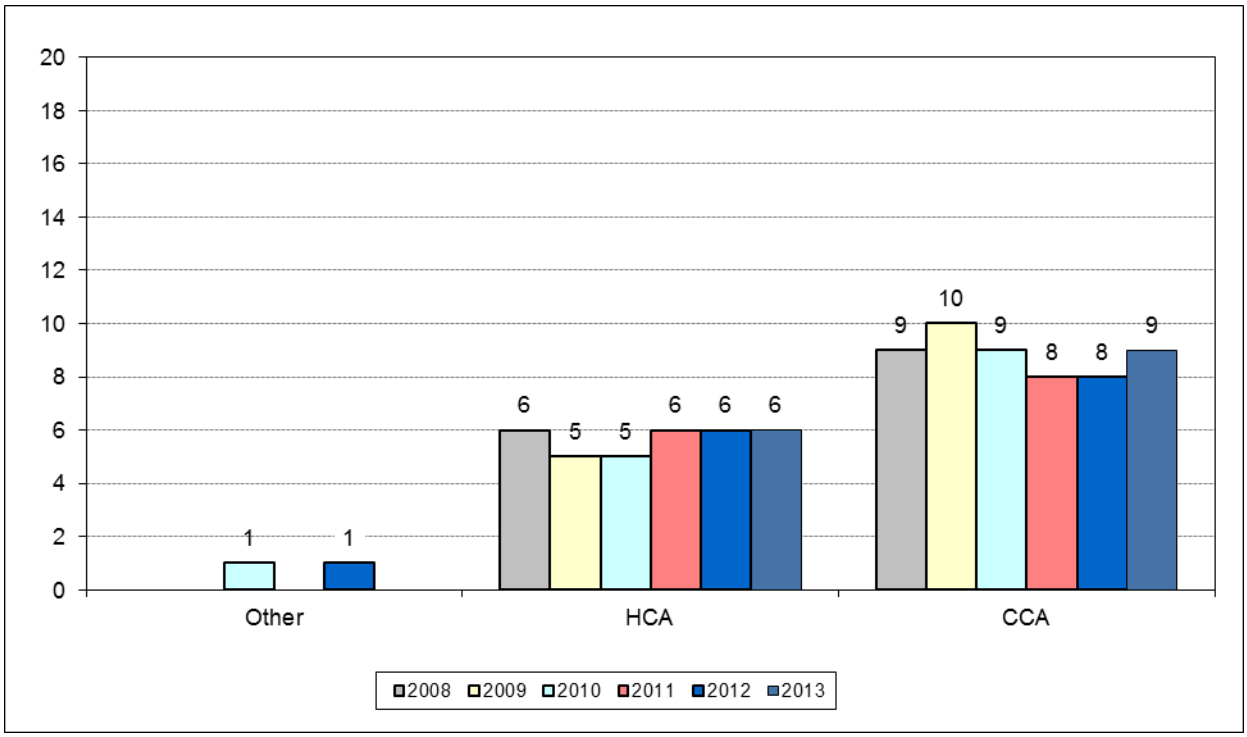
The new EC Recommendation on relevant markets defines Market 6 as the market for "*Wholesale terminating segments of leased lines, irrespective of the technology used to provide leased or dedicated capacity*".

Trend analysis:

Cost base

Figure 23 shows the countries adopting CCA, HCA or a combination of other methodologies to set leased line charges for the terminating segments from 2008 to 2013. It could be said that in 2013 one NRA moved from other to CCA while the number of NRAs declaring to use HCA has remained stable over time.

Figure 23 – Cost Base for Leased Lines Terminating Segment (Mkt 6)



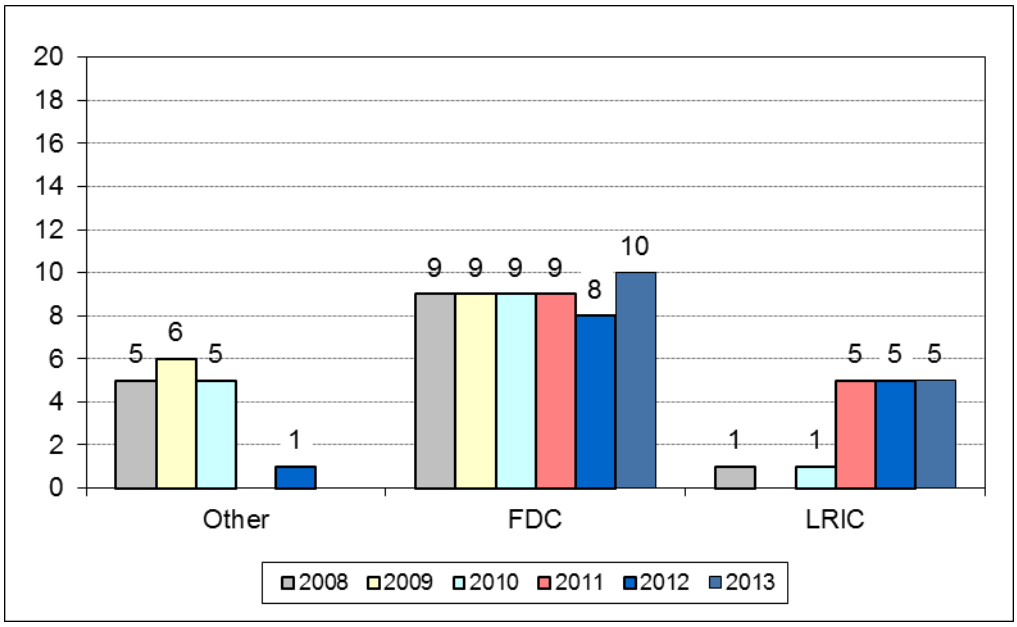
Source: BEREC RA database 2013
Number of countries: 15. One country not regulated in 2011.

Allocation methodology

Figure 24 shows the number of countries adopting LRIC, FDC or other mixed allocation methodologies in the leased line (LL) wholesale terminating segment for the six year period under analysis.

The most common accounting methodology in the leased line wholesale terminating market for the countries observed since 2008 is FDC. At the same time, the number of countries using LRIC has remained stable since 2011.

Figure 24 – Allocation Methodology for Leased Lines Terminating Segment (Mkt 6)

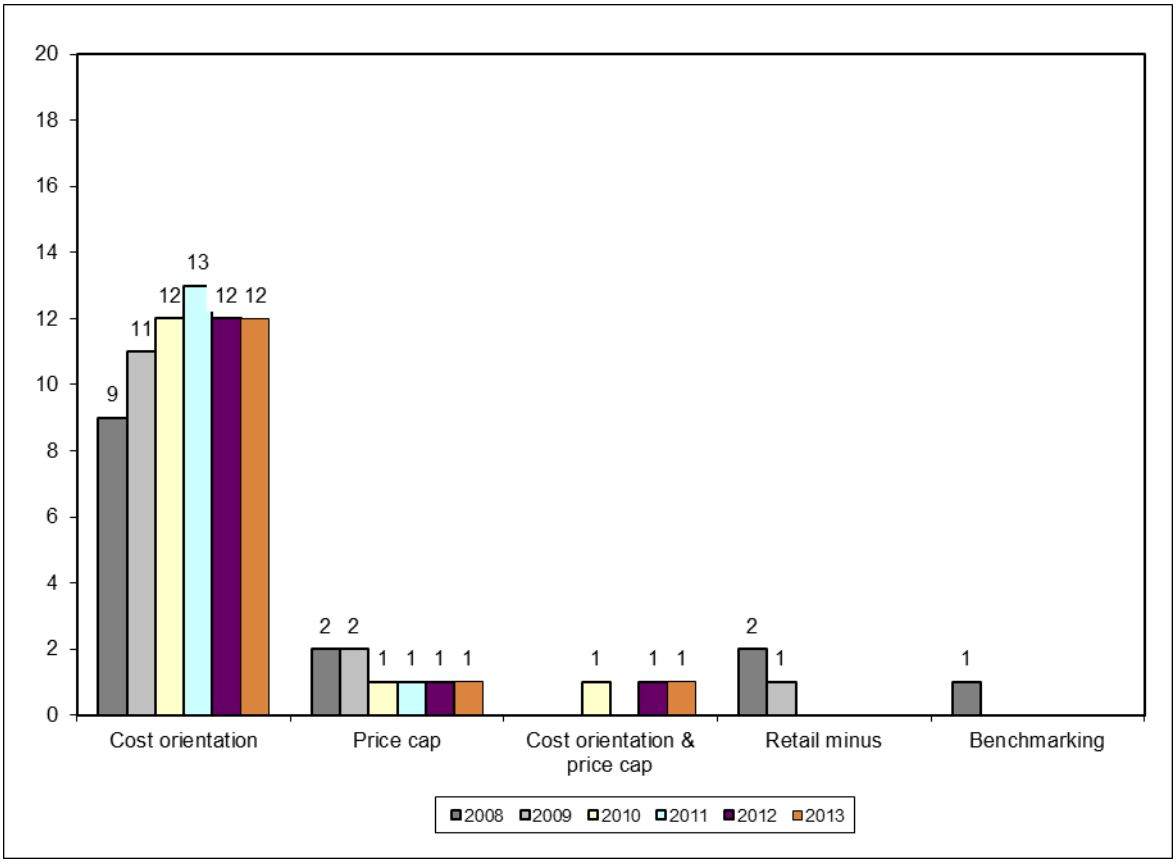


Source: BEREC RA database 2013
Number of countries: 15. One country not regulated in 2011 and another one with a draft decision in 2012.

Price control method

Taking into account the 14 countries whose data have been collected since 2008, it can be observed in Figure 25 that cost orientation increased in 2009 (from 9 to 11 countries) due to the change of two NRAs respectively from benchmarking and retail minus; therefore in 2009 retail minus disappeared from the 14 countries under observation. The trend for price cap has been stable since 2010.

Figure 25 – Price Control Method for Leased Lines Terminating Segment (Mkt 6)



Source: BEREC RA database 2013
Number of countries: 14

<u>Key points for Market 6:</u> FDC is the prevailing allocation methodology over time. Cost orientation is the recurrent price control methodology in this market both in the current year and over time. CCA is the preferred cost base.

3.5 Termination Markets

3.5.1 Fixed call termination (Market 3)

The 2007 EC Recommendation on relevant markets defines Market 3 as the market for "*Call termination on individual public telephone networks provided at a fixed location*" and identifies a relevant market for each operator. It is common, therefore, to see both incumbents and alternative operators having been notified as SMP operators.

However, as clearly explained in the ERG Common Position on symmetry[24], a clear distinction can be observed between remedies imposed on incumbents on one side, and remedies imposed on other authorised operators (OAOs) on the other side. In particular,

[24] ERG (07) 83 Common Position on symmetry of fixed call termination rates and symmetry of mobile call termination rates.

OAOs are often regulated less strictly than the incumbent and are not usually subject to accounting separation, price control and cost accounting obligations. The obligations related to tariff setting for OAOs often take the form of “fair and reasonable”, “non-abusive” prices or “delayed reciprocity”.

However, the data on cost base and price control evolution over time in this section refers to incumbent operators. Unlike Figures 2 and 4, which show data only for those countries participating in the 2013 survey with no missing information, the figures below show data for those NRAs that have provided the relevant information since 2008.

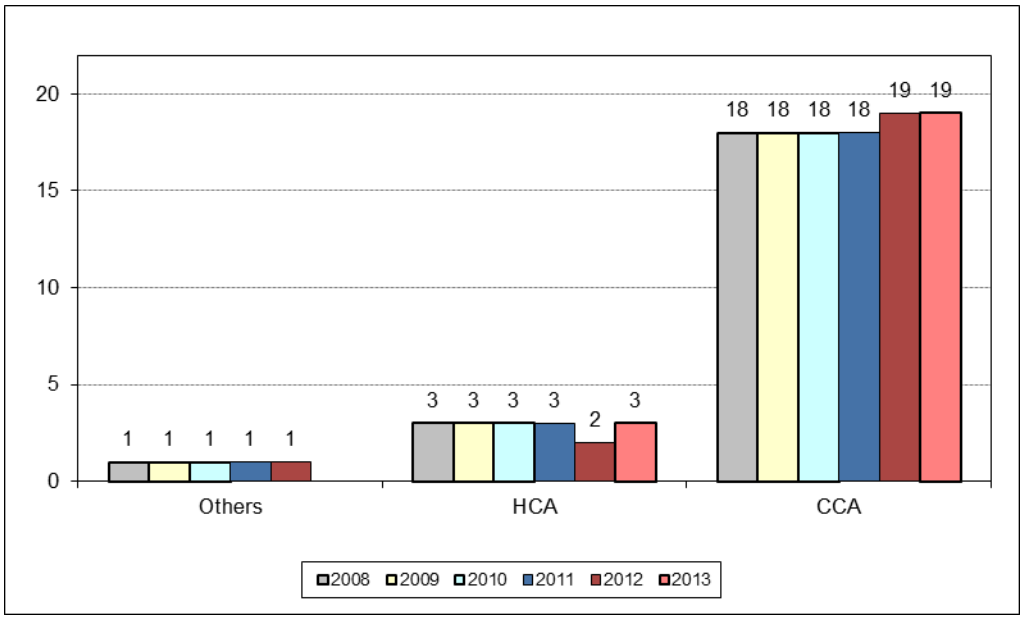
Trend analysis:

Cost base

Figure 26 shows the absolute number of countries adopting CCA, HCA or a combination of methodologies to set incumbent’s fixed terminating charges in the six year period under observation.

It shows that the most common cost base for fixed networks is CCA. It has to be noted that such a result is stable over time, as in fixed networks HCA had already been replaced with CCA by the majority of Member States since 2005. It has to be noted that although the number of NRAs with CCA as cost base in 2013 is equal to 2012, there are some changes in 2013 since one country moved from “others” to CCA and another one from CCA to HCA.

Figure 26 – Cost Base for Fixed Call Termination (Mkt 3)



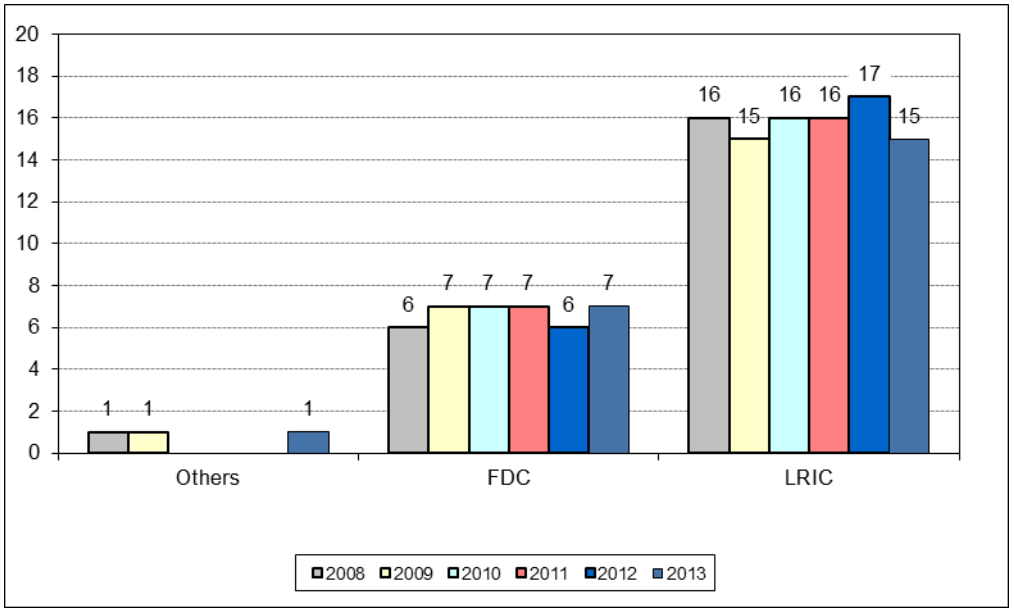
Source: BEREC RA database 2013
Number of countries: 22

Allocation methodology

Figure 27 shows the number of countries using LRIC, FDC or other mixed methodologies for fixed termination services from 2008 to 2013.

In particular it can be observed that a significant number of countries have used LRIC for determining fixed termination tariffs since the beginning of the observation period. In 2013 two countries declared a change in the accounting methodology respectively from LRIC to FDC and to other allocation methodology.

Figure 27 – Allocation methodologies for Fixed Call Termination (Mkt 3)



Source: BEREC RA database 2013
Number of countries: 23

<u>Key points for Market 3:</u> CCA is the preferred cost base for this market combined with LRIC as the allocation methodology. This trend is more evident now that a greater number of countries is implementing the EC Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC).

3.5.2 Mobile call termination (Market 7)

The new EC Recommendation on relevant markets defines Market 7 as the market for "*Voice call termination on individual mobile networks*" and identifies a relevant market for each operator. In all countries all mobile operators have been found to be SMP in the termination market and from the second round of market analysis, in some countries also MVNOs (Mobile Virtual Network Operators) have been declared SMP operators.

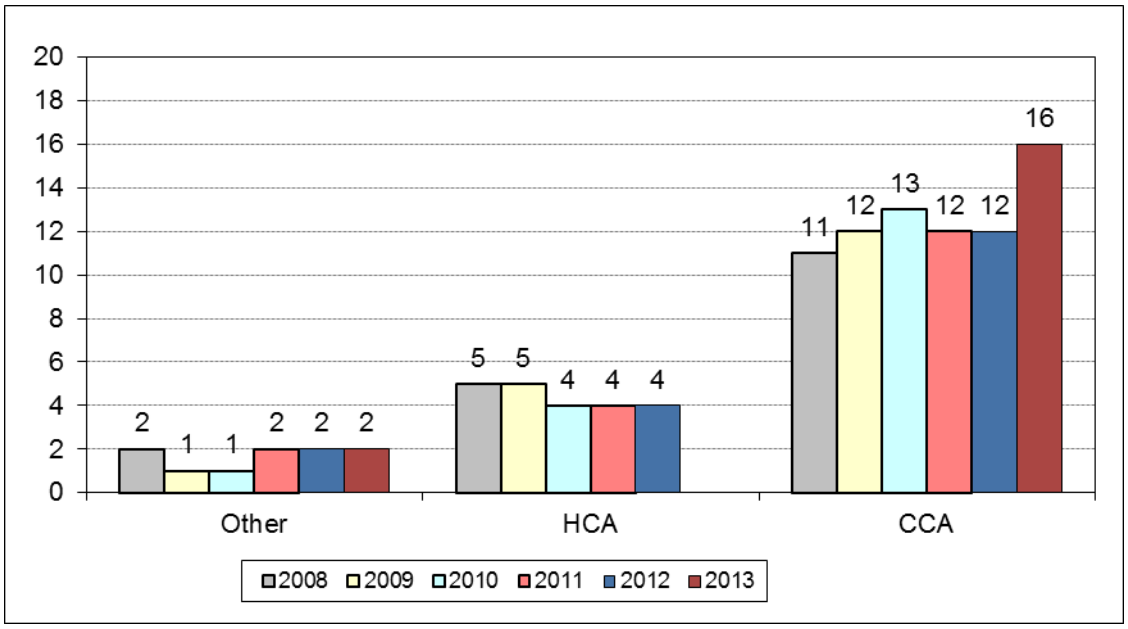
Unlike Figures 2 and 4, the figures below show data for those NRAs that have been providing the relevant information since 2008, therefore they show data for 18 countries.

Trend analysis:

Cost base

Figure 28 shows the number of countries adopting CCA, HCA or a combination of methodologies to set mobile interconnection terminating charges from 2008 till 2013. Since 2008 the most commonly used cost base for mobile networks has been CCA. In 2013 this number has increased from 12 to 16 NRAs out of 18. Application of HCA also remained stable till 2012. The overall trend shows a decrease in the use of HCA in favour of CCA.

Figure 28 – Cost Base for Mobile Call Termination (Mkt 7)



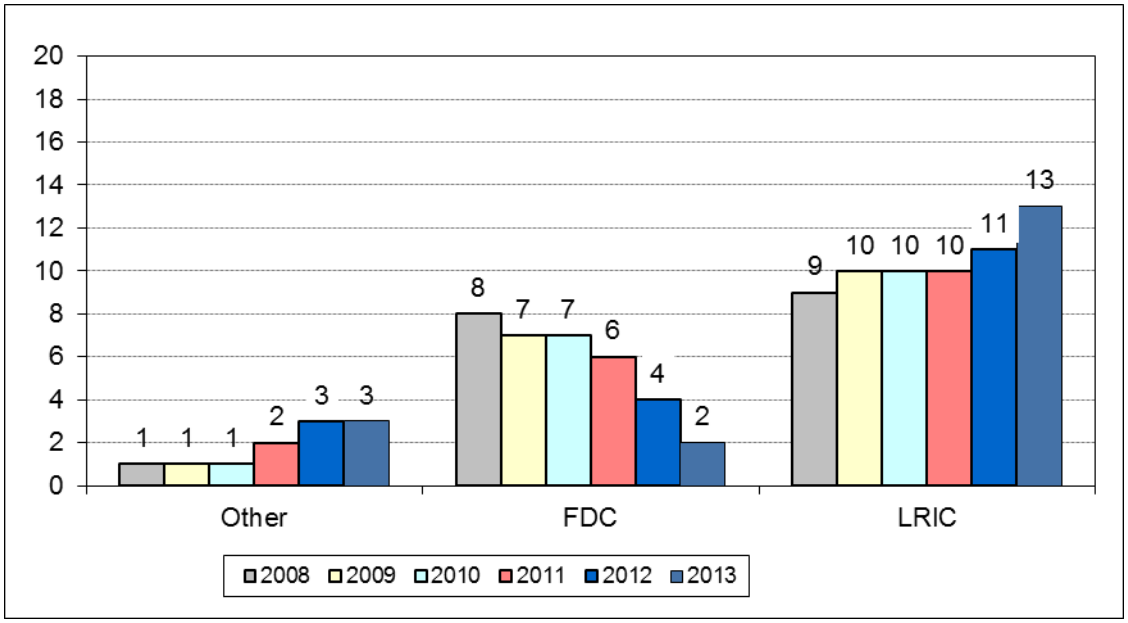
Source: BEREC RA database 2013
Number of countries: 18

Allocation methodology

Figure 29 shows the number of countries using LRIC, FDC or other mixed methodologies for call termination in mobile networks during the six year period.

In the mobile sector the most commonly used allocation methodology is LRIC. The number of countries using LRIC methodology increased from 9 countries in 2008 to 10 countries in 2009 and has remained stable since 2011, showing an increase in 2012 and 2013. Over the same period, the number of countries using FDC has been decreasing.

Figure 29 – Accounting methodology for Mobile Call Termination (Mkt 7)



Source: BEREC RA database 2013
Number of countries: 18

In conclusion, the analysis of the mobile termination market shows a stabilisation at a high level in the use of both CCA and LRIC.

<u>Key points for Market 7:</u> CCA is the preferred cost base for this market combined with LRIC or LR(A)IC variant as the main allocation methodology. The trend analysis suggests that the development of costing tools is still relatively new, but is in the process of being reinforced with the implementation of the EC Recommendation on the Regulatory Treatment of Fixed and Mobile Terminations Rates in the EU (2009/396/EC) where CCA and LR(A)IC (and more specifically BU-LRIC) is foreseen as a first option.

3.6 Combination of cost base and allocation methodology – all markets

This paragraph analyses the possible combinations of cost base and accounting methodology used by NRAs in the seven relevant markets susceptible to ex ante regulation listed in the EC Recommendation. When looking at how NRAs combine cost base and allocation methodologies the following three combinations may arise:

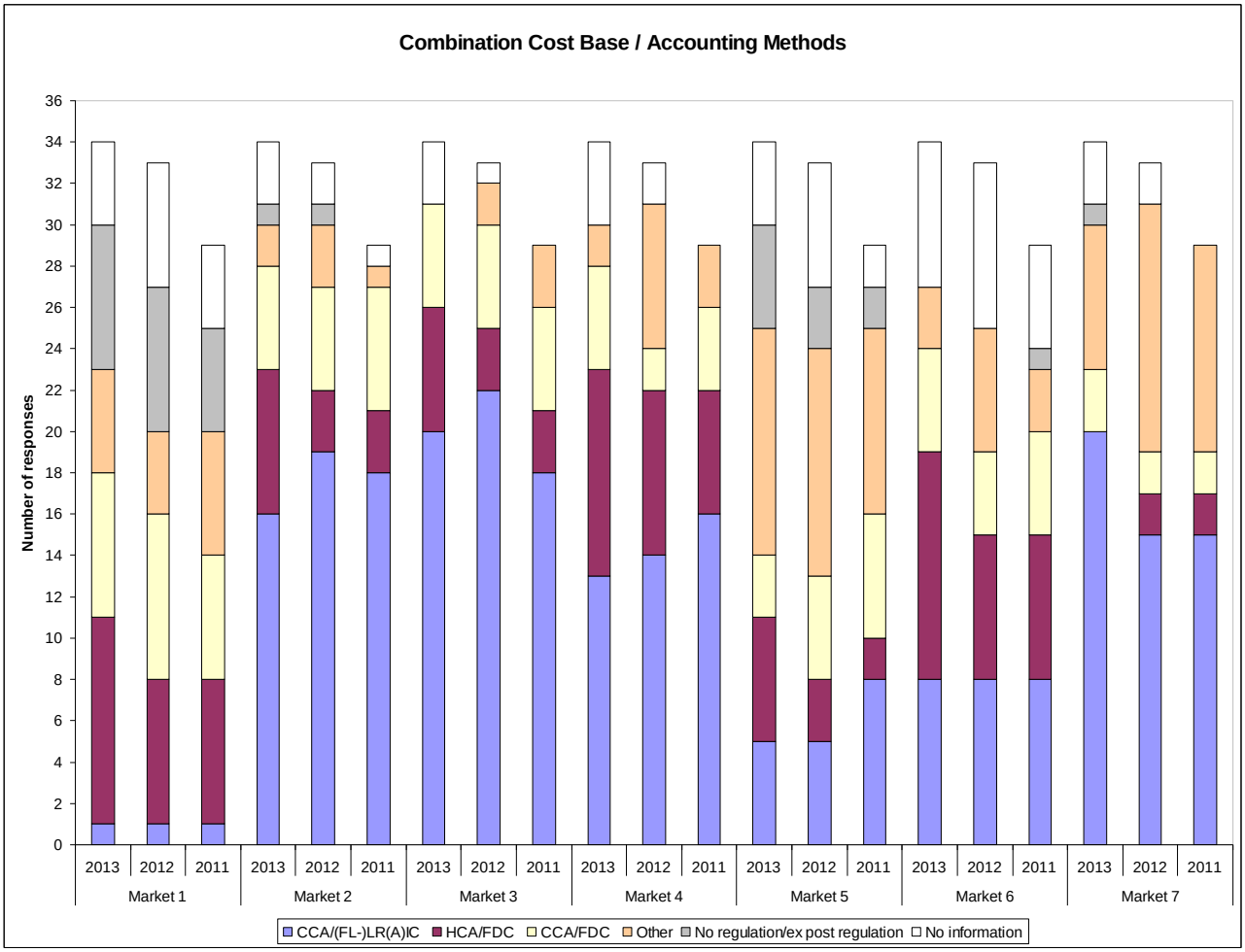
- CCA and (FL)-LR(A)IC;
- CCA and FDC;
- HCA and FDC.

Figure 30 shows that for most markets - except markets 1 and 5 - the preferred combination is CCA and (FL) LR(A)IC. In 2013 the choice for CCA and (FL) LR(A)IC has decreased slightly or remained stable while the choice of HCA/FDC has increased in markets 2, 3, 4 and 6.

In market 1, which, in 2013, is not regulated (or ex-post regulated) in seven countries, the most popular combination remains HCA or CCA in combination with FDC; only one country uses CCA/LR(A)IC. In markets 2, 3 and 4[25] – in the year 2013 – most countries use the combination CCA/LR(A)IC; however HCA/FDC is increasing compared to previous years. A note on market 3: in line with the EC Recommendation 2009/396 on Termination Rates several NRA will be implementing a pure BU-LRIC model during the course of 2013 or alternatively benchmarking with pure LRIC tariffs. In market 5 the combination of CCA/LRIC has remained unchanged in 2013 in comparison to 2012; most NRAs use “other” cost base/accounting methods, e. g. retail minus (eight NRAs). In 2013 this market is not regulated in five countries (in comparison to three in 2012 and two in 2011). In market 6 the dominant choice of CCA/LRIC remains unchanged in 2013; HCA/FDC is increasingly applied (eleven NRAs compared to eight NRAs in previous years). In market 7 a majority of NRAs apply CCA/LR(A)IC; increasingly – like in market 3 – pure LRIC in line with the EC Recommendation 2009/396. In 2013 six NRAs apply benchmarking (based on a benchmark of countries which have adopted a BU pure LRIC methodology) in market 7.

[25] Since there are several products/services and therefore different methods used in market 4, the analysis has been restricted to “copper access (including LLU, SA, SLU)”.

Figure 30 – Combination Cost Base / Allocation Methods



Source: BEREC RA database 2011, 2012 and 2013
Note that the number of responses recorded varies within the years: 34 in 2013, 33 in 2012 and 29 in 2011.

4. Additional Information: structural data

This section serves to identify main structural differences within European countries, for example the competitive and market situation in each country, population and population density indicators as well as existing telecommunications infrastructure. These structural differences may have an influence on NRAs regulatory strategy and therefore the choice of price control method.

However, it has to be pointed out that there may be a number of other important factors influencing the regulatory strategy that are confidential or unattainable by NRAs. Data collected from NRAs are shown below:

Table 2 - Information Requirements Structural Data

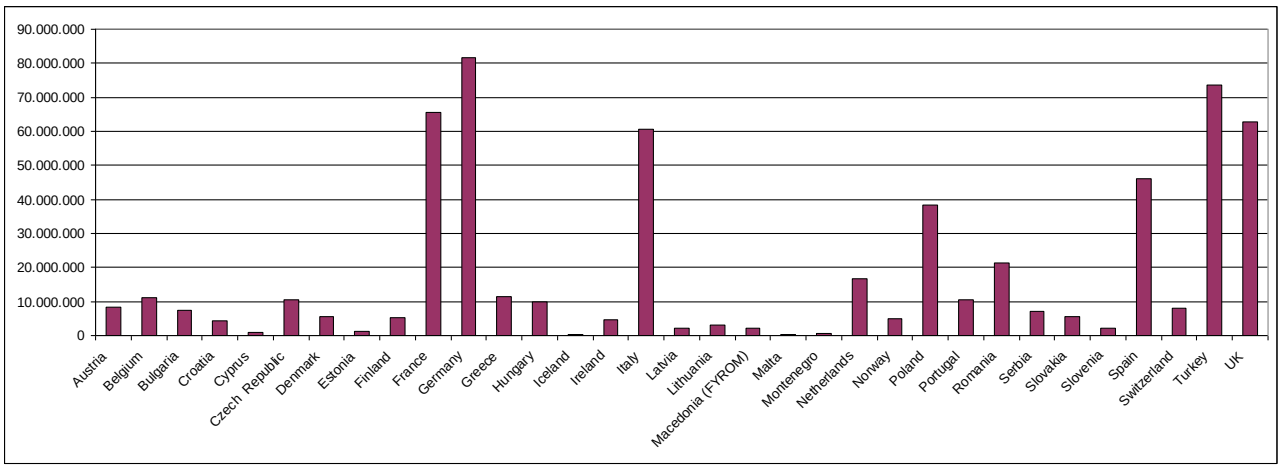
1	Market situation
1.1	% of cable subscriptions per total broadband lines = market share of cable subscriptions
1.2	% of fixed broadband lines per household or inhabitants = fixed broadband penetration: copper, fibre
1.3	% of mobile broadband lines per household or inhabitants = mobile broadband penetration[26]
1.4	% of SIM cards per total population = mobile penetration
2	Population and surface area per country[27]
2.1	number of inhabitants
2.2	number of inhabitants biggest city
2.3	% of total population (main metropolis population density)
2.4	number of inhabitants three biggest cities
2.5	% of total population (metro population density)
2.6	country area in sqkm
2.7	number of inhabitants per sqkm
3	Subscriber lines[28]
3.1	total number of active physical lines
3.2	ITU fixed telephone lines (active) 2011[29]
3.3	ITU fixed telephone lines per 100 inhabitants 2011[30]
4	MDF
	total number
5	Street cabinets
	total number
6	Local loop
6.1	total average length in m (total copper pair m per active access)
6.2	average trench m per active subscriber line (total length of cable conduit + buried cable / active physical lines)
7	Distribution cable
	total average length in m (total copper pair m per active access)
8	Civil engineering
8.1	% of feeder cable: cable conduit / buried cable[31]
8.2	% of distribution cable: cable conduit / buried cable[32]
8.3	% feeder / distribution cable (proportion of copper pair m) [33]
9	Duct / infrastructure sharing
9.1	% of duct sharing with other services
9.2	% of duct sharing per feeder / distribution cable
9.3	average cost saving (estimate)

[26] Measured by dedicated data services: cards, modems, keys.
[27] Data source: Fischer Weltalmanach 2013 (same for all countries).
[28] The publicly available ITU information serves as a reality check on 3.1.
[29] Source: International Telecommunication Union (ITU), 2011 data. Definition: number of active (registered activity in the last 3 months) lines connecting the subscriber's terminal equipment to the PSTN.
Statistics provided by the International Telecommunication Union (ITU). Data of 2011.
[30] Source: International Telecommunication Union (ITU), 2011 data.
[31] Within the feeder cable: the relation of cable conduit in a cable canal/cable duct to cable conduit in the ground without a cable canal (i.e. 40 % of cable is in a cable canal, 60 % is not in a cable canal).
[32] Within the distribution cable: the relation of cable conduit in a cable canal/cable duct to cable conduit in the ground without a cable canal (i.e. 40 % of cable is in a cable canal, 60 % is not in a cable canal).
[33] Calculated as follows: (1) Length of the local sub-loop/length local loop = percentage of the distribution-part of the local loop (local sub-loop) (2) Percentage of the feeder-part of the local loop = 1 – the percentage of the distribution-part of the local loop.

A total of thirty-three countries have provided information on structural data. Some countries have not provided up-to-date figures for 2013; in these cases the latest available data have been used (whenever this occurs it will be mentioned in a footnote).

When looking at total population data (figure 31), in particular the number of inhabitants, nineteen countries have less than 9 million inhabitants (the lowest being Iceland with 319.000 inhabitants), six have between 9 and 20 million inhabitants and eight have more than 20 million inhabitants (the highest being Germany with almost 82 million inhabitants).

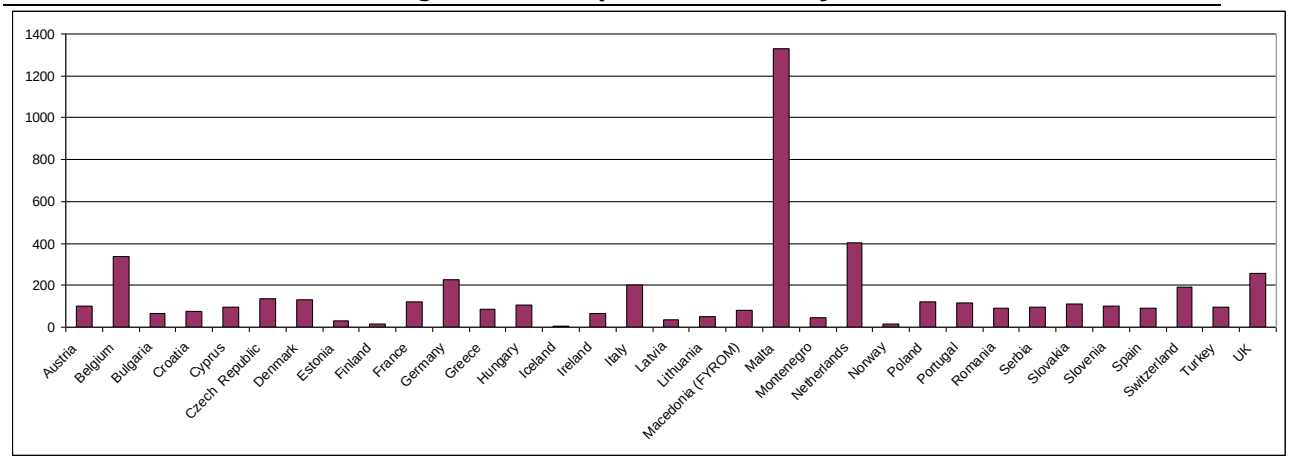
Figure 31 – Total Population



Source: BEREC RA database 2013

In terms of population density (figure 32), thirteen countries have less than 90 people per square km (the lowest being Iceland with 3.1 people per square km), fourteen countries have 90 to 200 people per square km and six countries above 200 people per square km (the highest being Malta with 1.328 people per square km).

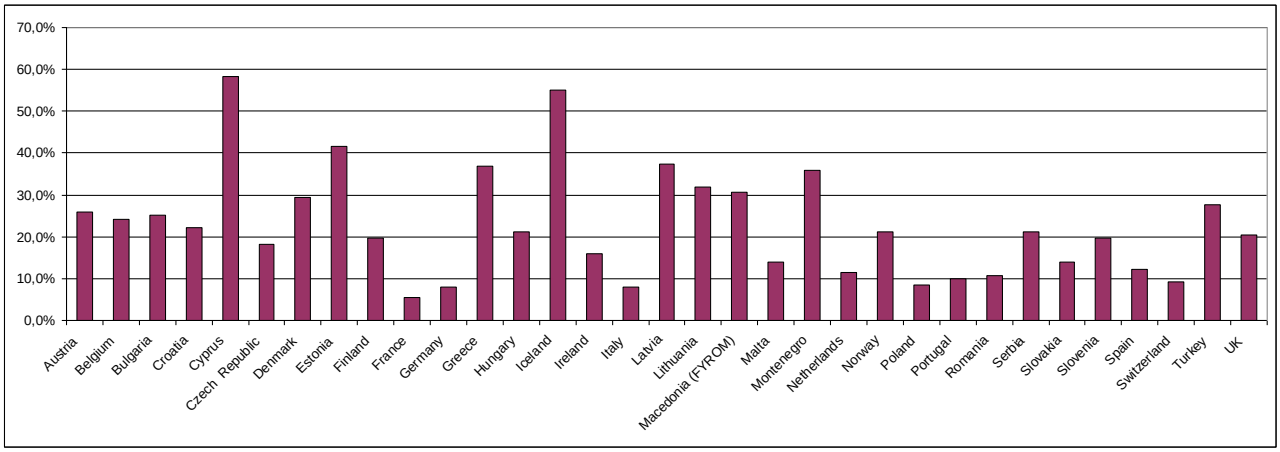
Figure 32 – Population Density



Source: BEREC RA database 2013

Looking at the population density of the main metropolitan areas (metro population density), i.e. the number of inhabitants in the three biggest cities as a percentage of the total population (figure 33), we have the following picture: fifteen countries have a metro population density of less than 20 per cent (the lowest being France with 5.4 per cent), ten countries between 20 and 30 per cent and eight countries above 30 per cent (the highest being Cyprus with 58.4 per cent).

Figure 33 – Metro Population Density



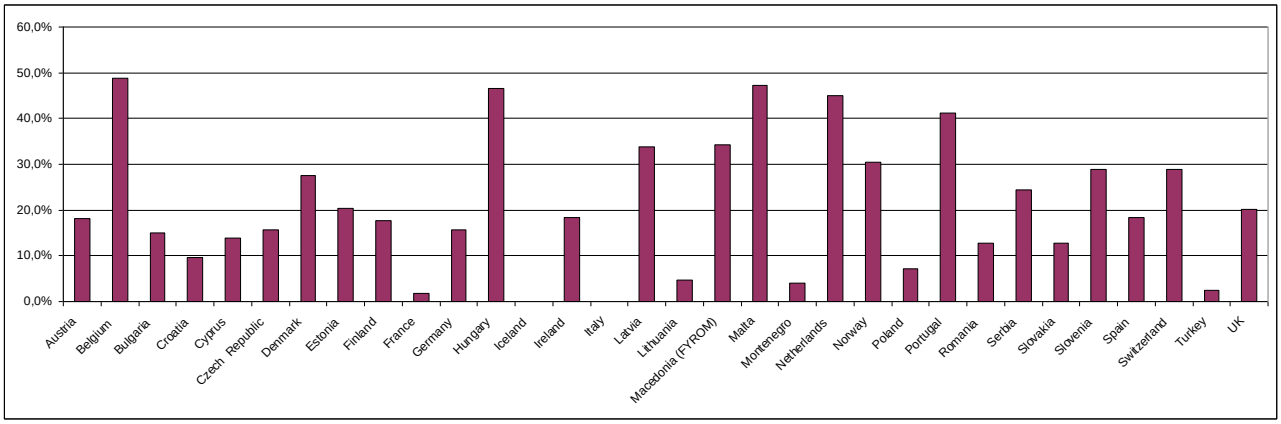
Source: BEREC RA database 2013

The market and competitive situation of the different countries shows considerable disparity, e.g. the presence of cable infrastructure varies between countries.

The percentage of cable subscriptions per total broadband lines[34] (figure 34), representing the market share of cable subscriptions, varies between 0 per cent (Iceland and Italy) to 48.7 per cent in Belgium. Eight countries have a penetration rate above 30 per cent (Belgium, Hungary, Latvia, Macedonia, Malta, Netherlands, Norway and Portugal).

[34] Greece did not provide information, while Latvia, Montenegro and UK data are 2012 data.

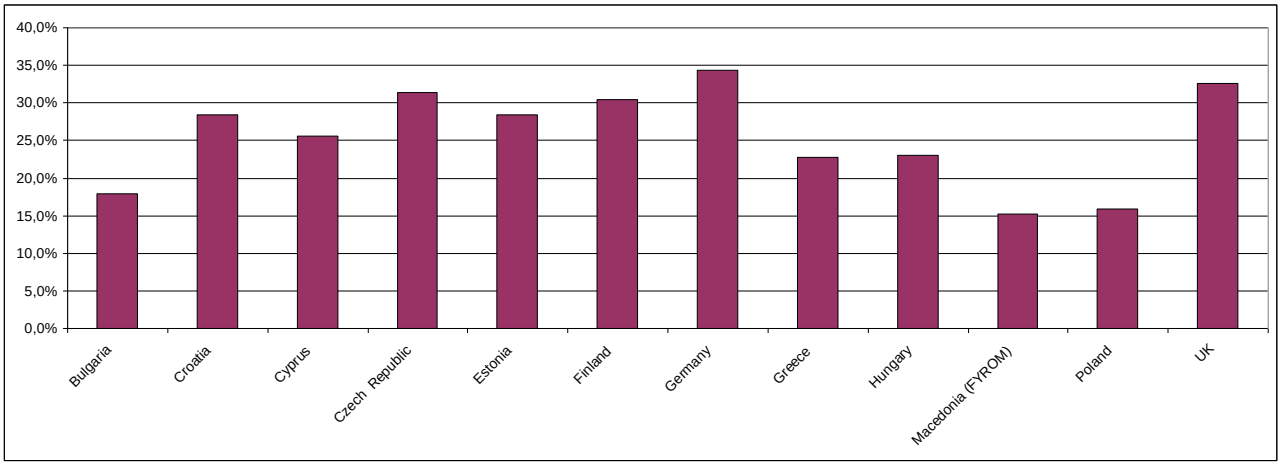
Figure 34 – Market Share Cable Subscriptions



Source: BEREC RA database 2013

The percentage of fixed broadband lines per inhabitant (figure 35)[35], representing fixed broadband penetration, ranges from 15.2 per cent in Macedonia to 34.3 per cent in Germany. Seven countries have a fixed broadband penetration of above 25 per cent.

Figure 35 – Fixed Broadband Penetration



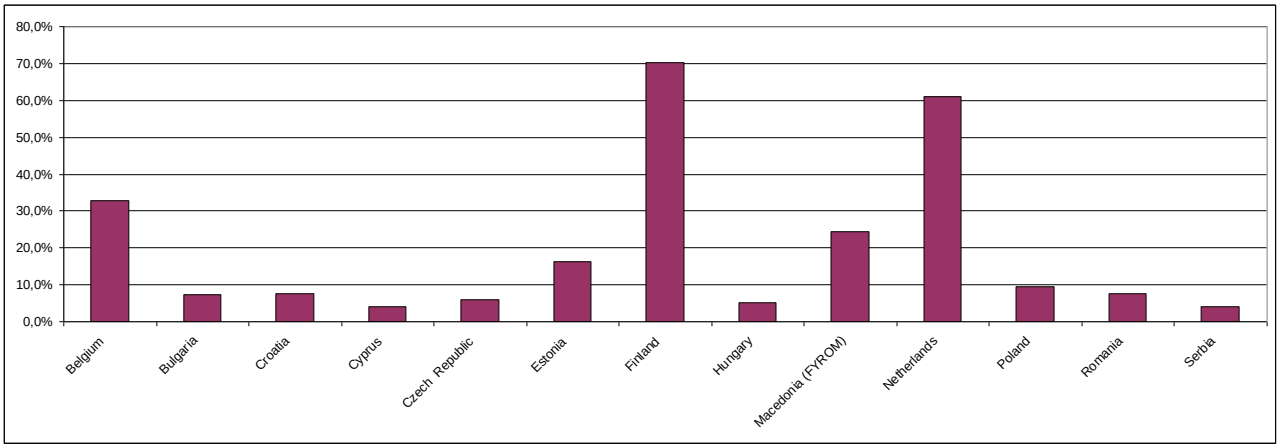
Source: BEREC RA database 2013

The percentage of mobile broadband lines per inhabitant[36] (figure 36), representing mobile broadband penetration, ranges from 4.1 to 61 per cent. Four countries have a penetration of above 20 per cent.

[35] Twelve countries specified that their fixed broadband penetration is per inhabitant, three countries only provided a penetration per household and eighteen countries did not specify if the figure provided is per household or per inhabitant. Therefore only data of the fixed broadband penetration per inhabitant is shown.

[36] Thirteen countries specified that their mobile broadband penetration is per inhabitant, one country provided a penetration per household and nineteen countries did not specify if their figure provided is per household or per inhabitant. Therefore only data of the mobile broadband penetration per inhabitant is portrayed.

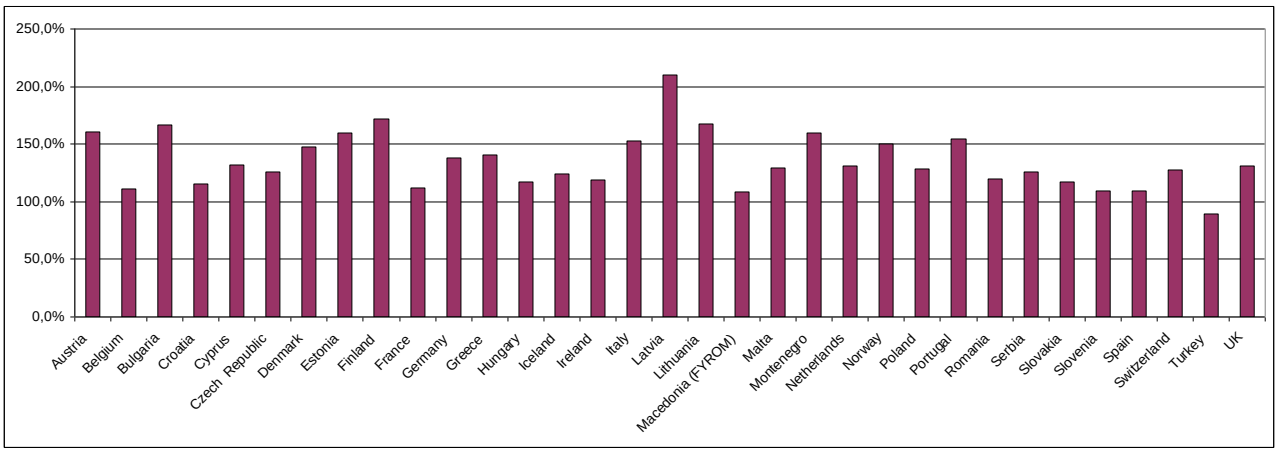
Figure 36 – Mobile Broadband Penetration



Source: BEREC RA database 2013

In all but one (Turkey) of the thirty three countries the percentage of SIM cards per total population[37](figure 37), representing mobile penetration, is greater than 100 per cent, in Latvia it is greater than 200 per cent.

Figure 37 – Mobile Penetration



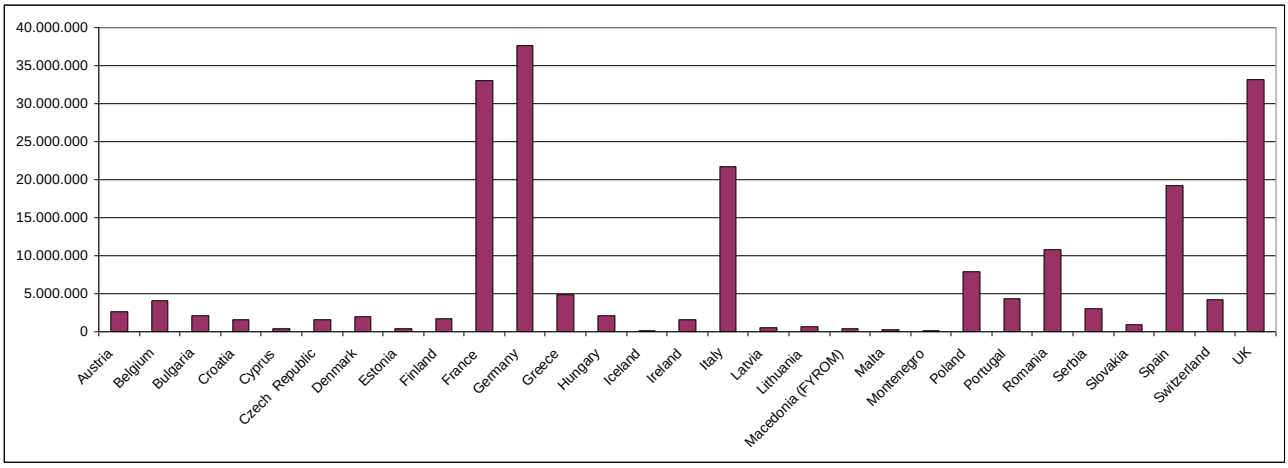
Source: BEREC RA database 2013

Typically in correlation with the size of the country, the total number of active physical subscriber lines[38] (figure 38) ranges from 155.105 in Iceland to more than 37 million in Germany.

[37] Latvia and the UK's figures stem from 2012

[38] Hungary, Latvia, Montenegro, Poland, Serbia and the UK's data stem from 2012. Netherland, Norway, Slovenia and Turkey have not provided information.

Figure 38 – Active Physical Lines

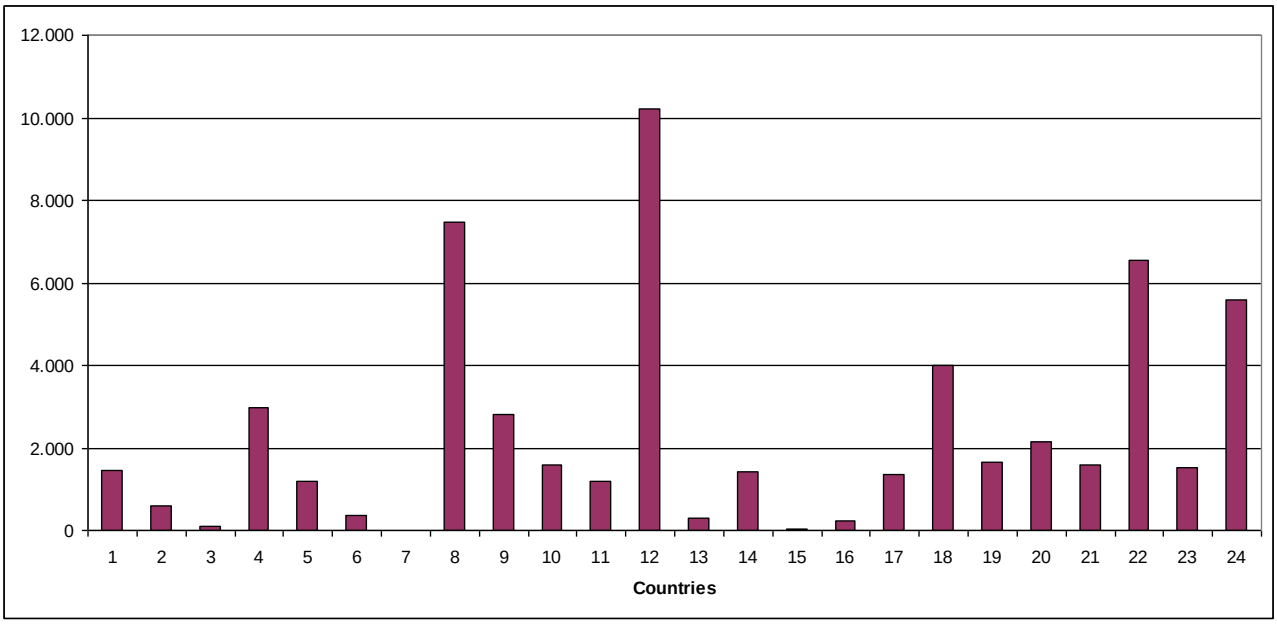


Source: BEREC RA database 2013

Not all countries have provided information on the network infrastructure, i.e. the numbers of MDF, street cabinets, local loop or distribution cable. This data is highly dependent on the size of the country and the number of its inhabitants as well as the infrastructure in use. Large variations are observed between countries.

The total number of MDF[39] (figure 39) ranges from a minimum of 21 to a maximum of more than 10.000 MDF nation-wide.

Figure 39 – Number of MDF

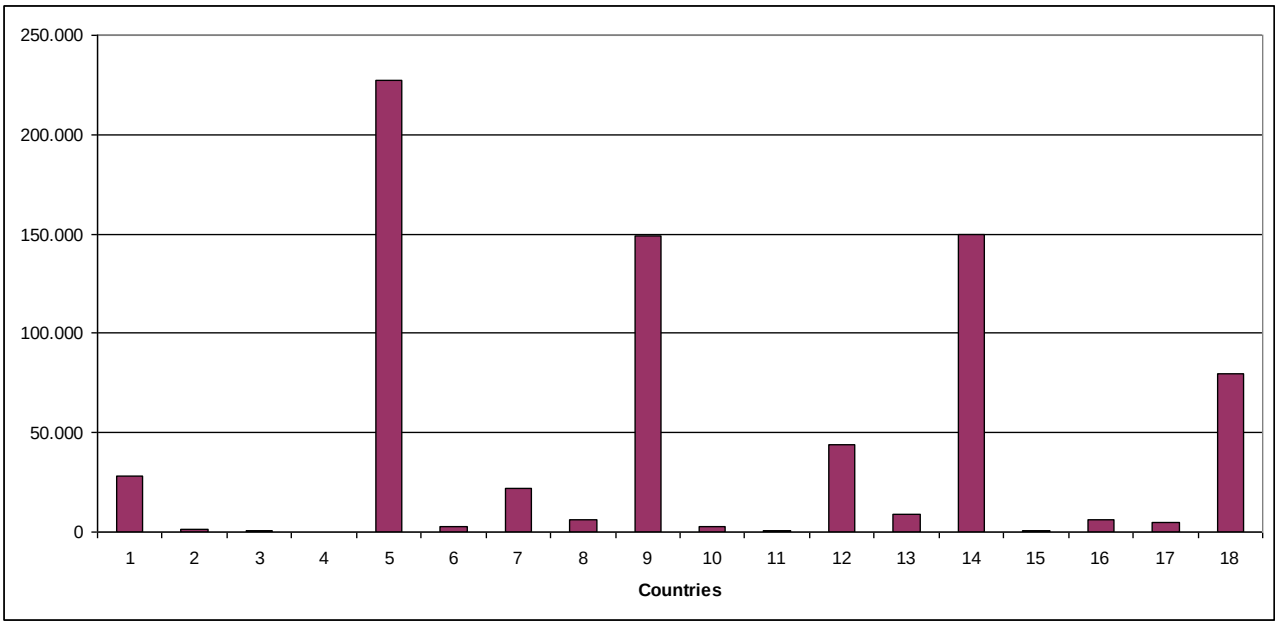


Source: BEREC RA database 2013

The number of street cabinets[40] (figure 40) range from a minimum of 600 to a maximum of more than 200.000 cabinets nation-wide.

[39] Nine countries have not provided information. Three countries' data are from 2012. One country's data has been left out because it seems implausibly high.

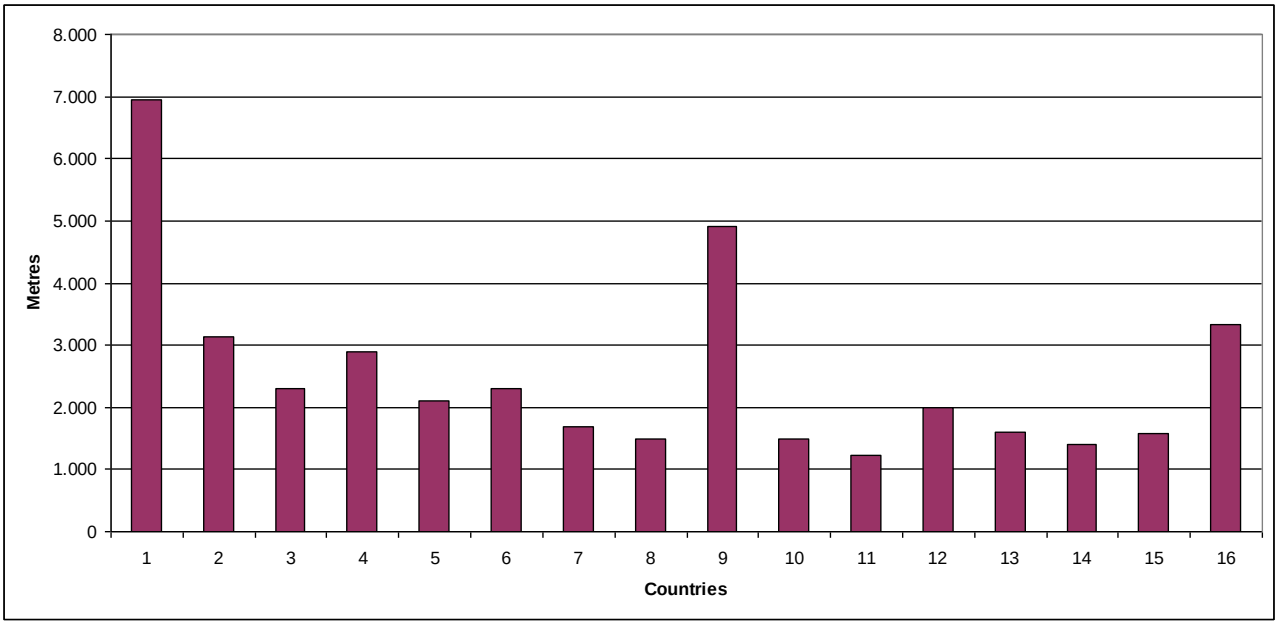
Figure 40 – Number of Street Cabinets



Source: BEREC RA database 2013

The total average length of the local loop[41] (figure 41) is between a minimum of 1.218 and a maximum of almost 7.000 metres.

Figure 41 – Local Loop: Average Length

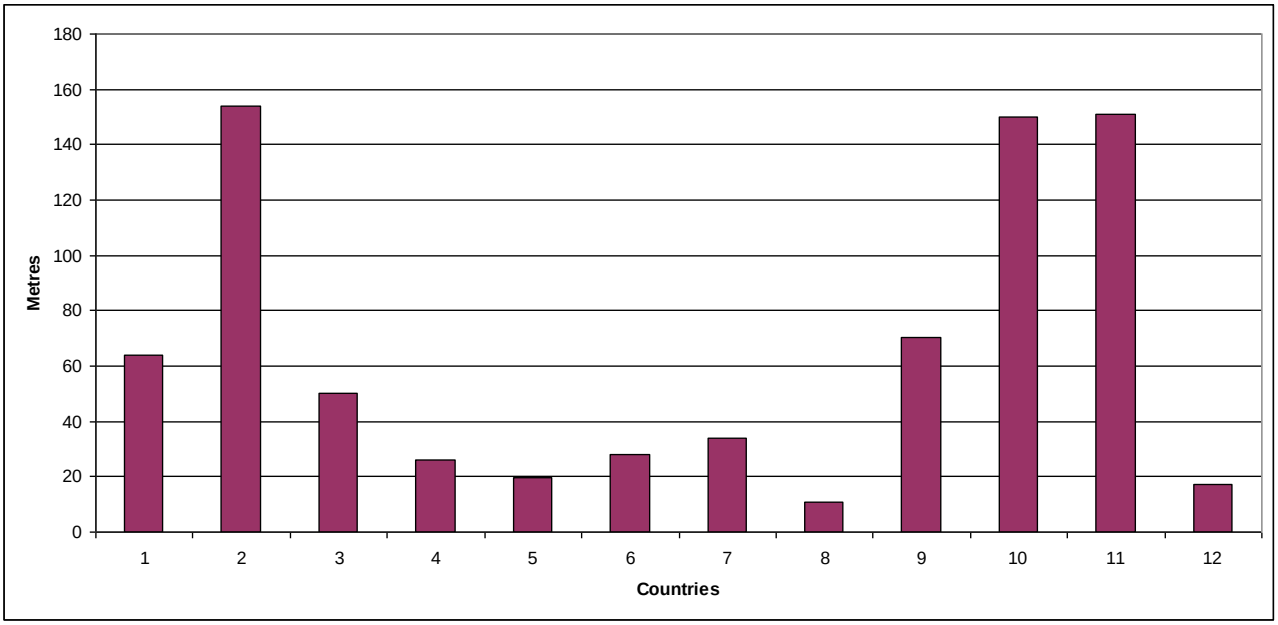


Source: BEREC RA database 2013

The average trench metre per active subscriber line[42] (figure 42) is between a minimum of 11 and a maximum of more than 150 metres.

[40] Fifteen countries have not provided information on the number of street cabinets. For three countries only 2012 data is available. One country's data has been left out because it seems implausibly high.
[41] Fifteen countries have not provided information on the length of the local loop. Two countries have provided a range (not shown). Two countries have not provided an update from 2012.
[42] Twenty-one countries have not provided information. One country's data stems from 2012.

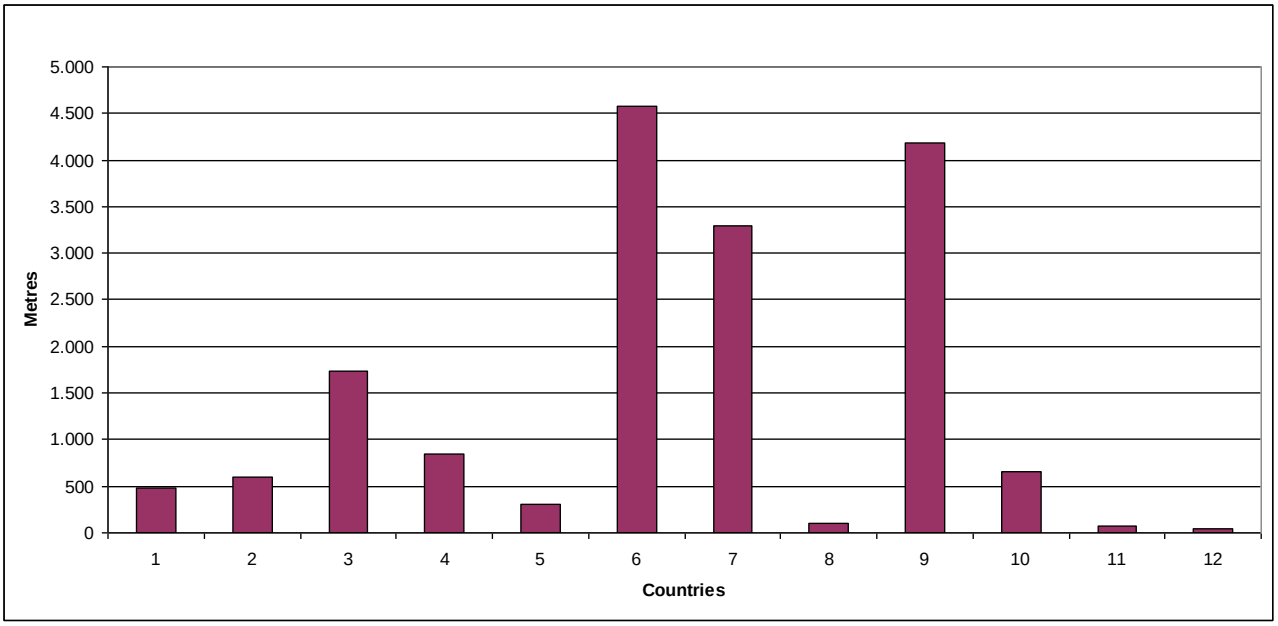
Figure 42 – Average Trench Metre



Source: BEREC RA database 2013

The total average length of the distribution cable[43] (figure 43) is between a minimum of around 50 and a maximum of around 4.500 metres.

Figure 43 – Distribution Cable: Average Length



Source: BEREC RA database 2013

Last but not least we look at two important cost components within the telecommunications industry: civil engineering and duct sharing. Unfortunately only few

[43] Twenty countries did not provide information on the total average length. One country provided a range which is not shown in the graph. Two countries' data are from 2012.

NRAs have provided information on these topics, limiting the representativeness of the analysed values.

When looking at the proportion of cables laid in cable ducts to cables laid in the ground within the feeder cable, the percentage of cables in cable ducts ranges from 0 per cent to 100 per cent, i.e. in one country all cables are buried and in another all cables are in cable ducts. Two NRAs specified the proportion to be 25/75 per cent or 15/85 per cent. One NRA specified that there is a difference between copper and fibre: fibre is predominantly run in cable ducts whereas copper is not. Another NRA specified that the proportion changes considerably depending on urban and rural areas. The same disparity is observed when looking at the proportion of cables laid in cable ducts to cables laid in the ground within the distribution cable, i.e. the percentage of cables in cable ducts ranges from 0 per cent to 100 per cent. In two countries the relation is stated to be 75/25 per cent and 4/96 per cent.

The proportion of feeder to distribution cables ranges from 5/95 per cent to around 30/70 per cent.

Duct sharing with other services was stated to be insignificantly low or unavailable by four NRAs. In two countries the sharing rate is between 19 and 25 per cent. In one country it is 80 per cent due to the availability of a common duct for all services.

The questions concerning the percentage of duct sharing per feeder and distribution cables and the average cost saving did not provide conclusive answers.

5. The main motivation behind the choice of the costing methodology

There may of course be several objectives that an NRA has to balance, in arriving at a choice of approach. For a fuller explanation of these and the reasons for choosing them, readers should refer to the relevant statements/ publications from each NRA. However, this year for the first time data concerning the "main" motivation behind the choice of the costing methodology has been included in the report.[44] In practice this data was collected by adding another variable to each market sheet in the questionnaire. However, in order to make the new data useful and allow for comparisons and statistics some predefined alternatives were given from which NRAs could choose. These predefined alternatives were: "promote strict cost orientation", "promote infrastructure replicability", "avoid unit cost increase", "provide visibility", "avoid margin squeeze", "being in line with EU–average" and "others" (in cases where the NRA chose this alternative, they were asked to give more detailed comments).

The analysis has been carried out by focusing on the relevant markets 1 to 7 of the Recommendation of Relevant Markets. Answers were given by 15 to 23 NRAs depending on the market in question.

As can be seen in figure 44, many NRAs chose the "others" alternative as the main motivation behind the chosen costing methodology. On the basis of the detailed comments it seems that in most of these cases the motivation behind the choice of costing methodology was a combination of the given list of alternatives. For example "cost orientation" instead of "promote strict cost orientation" or some combination with two or more predefined alternatives. In some cases motivations outside the predefined list have been provided.

It is interesting to note that the objective "to promote strict cost orientation" is the main motivation for the choice of the costing methodology in almost every market (except in markets 1 and 5). To give an example: this alternative has been chosen by 11 NRAs in market 7 and 10 NRAs in market 3.

On the basis of respondent's answers a strict cost orientation as an objective covers all three combinations of cost base and accounting methodology used by most NRAs (CCA

[44] Cf. also BEREC input to the consultation on "costing methodologies", doc. BoR (11) 65.

and LR(A)IC, CCA/FDC, HCA/FDC). Generally it seems that there were multiple ways to achieve a certain regulatory objective.

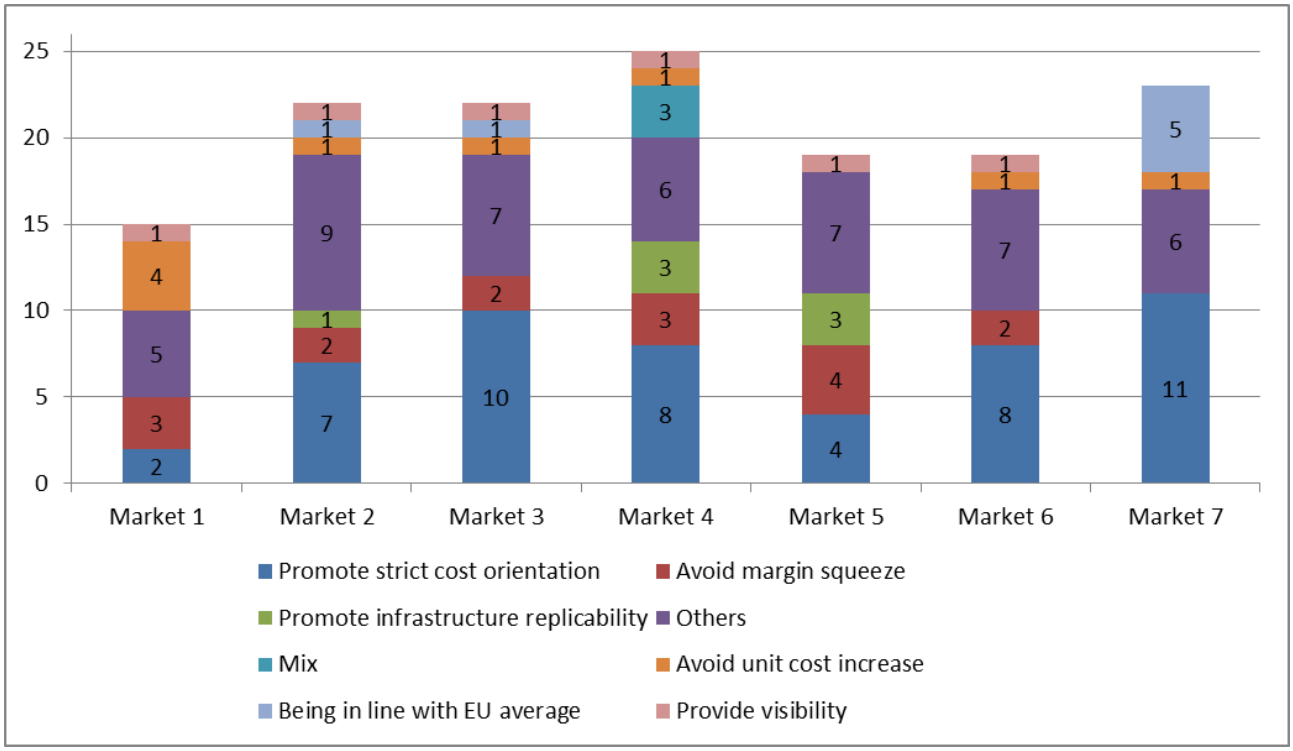
Other main motivations in choosing a costing methodology especially in markets 4 and 5 are to “avoid margin squeeze” and “promote infrastructure replicability”.

The alternative “be in line with EU-recommendation” was chosen by 5 NRAs in market 7, when in other markets it was hardly selected at all.

The alternatives “avoid unit cost increase” and “provide visibility” were not so common; they were chosen only by one NRA in all markets except for market 1 as 4 NRAs answered that the main motivation behind the choice of costing methodology was to “avoid unit cost increase”.

Overall it can be concluded that NRAs pursue the objective of effective price control measures mainly by setting strict cost-oriented prices as this is considered to be the best way to achieve the overarching objectives of Art. 8 Framework Directive (2002/21/EC). Hardly any NRA motivated its choice of costing methodology with the option “avoid unit cost increase” which shows clearly that NRAs are not thinking from the end (“*reverse engineering*”, i.e. setting a fixed price not allowing cost variations), but are rather setting prices following a cost concept they consider the best to reach the objectives of the Regulatory Framework (even if this includes allowing cost increases). Although, cost-orientation may be interpreted differently, it has to be mentioned that NRAs consider different cost concepts appropriate to achieve the objectives of the Regulatory Framework exercising their discretion in order to regulate effectively their national markets.

Figure 44 – The main motivation behind the choice of the costing methodology in the markets listed in Recommendation 2007/879/EC



Source: BEREC RA database 2013

Appendices

A.1 Countries participating in the 2013 survey

1.	Austria
2.	Belgium
3.	Bulgaria
4.	Croatia
5.	Cyprus
6.	Czech Republic
7.	Denmark
8.	Estonia
9.	Finland
10.	France
11.	Germany
12.	Greece
13.	Hungary
14.	Iceland
15.	Ireland
16.	Italy
17.	Latvia
18.	Lithuania
19.	Malta
20.	Montenegro
21.	Norway
22.	Poland
23.	Portugal
24.	Republic of Serbia
25.	Romania
26.	Slovakia
27.	Slovenia
28.	Spain
29.	Switzerland
30.	The Former Yugoslav Republic of Macedonia
31.	The Netherlands
32.	Turkey
33.	United Kingdom

A.2 References

- COMMISSION RECOMMENDATION of 19 September 2005 on accounting separation and cost accounting systems under the regulatory framework for electronic communications (2005/698/EC).
- ERG (05) 29 Common position on EC Recommendation on Cost accounting and accounting separation, published in September 2005, available on http://berec.europa.eu/documents/erg/index_en.htm.
- ERG (06) 23 Regulatory accounting in practice 2006.
- ERG (07) 22 Regulatory Accounting in Practice Report 2007.
- ERG (08) 47 Regulatory Accounting in Practice Report 2008.
- ERG (09) 41 Regulatory Accounting in Practice Report 2009.
- BoR (10) 48 Regulatory Accounting in Practice Report 2010.
- BoR (11) 34 Regulatory Accounting in Practice Report 2011.
- BoR (12) 78 Regulatory Accounting in Practice Report 2012.
- BoR (11) 65 BEREC's response to Commission public consultation on costing methodologies.
- BoR (13) 41 BEREC Opinion on the Commission draft recommendation on non-discrimination and costing methodologies.
- ERG (07) 83 ERG CP on symmetry of fixed call termination rates and on symmetry of mobile call termination rates.
- IRG (05) 24 Regulatory accounting in practice 2005, available on http://www.irg.eu/template20.jsp?categoryId=260350&contentId=543311.

A.3 Treatment of data

For market 4 one Country provided answers for fibre and those inputs have been considered in the Report.

Figure 1 – Price control method used in 2013 in the markets listed in Recommendation 2007/879/EC

- One Country, declaring for market 5 “retail minus”, “cost orientation” and “others” according monthly rental for access or dark fibre/Ethernet/other services or bundles, has been counted as “others”.

Figure 2 – Cost base used in 2013 in the markets listed in Recommendation 2007/879/EC

- In market 5, one NRA declaring “CCA” and “Others” respectively for dark fibre/Ethernet/other services and bundles, has been counted as “Others”.

Figure 3 – Annualization methodologies used in 2013 in the markets listed in Recommendation 2007/879/EC when CCA is the cost base

- One Country declared two different annualization methodologies according to different products of market 4. In this figure it has been taken into account only the answer – titled annuity – given for all products except dark fibre access.

Figure 4 – Allocation methodology used in 2013 in the markets listed in Recommendation 2007/879/EC

- In market 5, one NRA declaring “LRIC”, “FDC” and “Others” respectively for dark fibre/Ethernet/other services and bundles, has been counted as “Others”.

Figure 5 – Price control method declared in 2013 for some products in market 4

- For one NRA the Shared Access (SA) is not included in copper access. The answer provided by this NRA is taken into account only for Figure 4.

Figure 6 – Cost base declared in 2013 for some products in market 4

- For one NRA the Shared Access (SA) is not included in copper access therefore the answer given for copper access is referred only to LLU and SLU.

Figure 7 – Allocation methodology declared in 2013 for some products in market 4

- For one NRA the Shared Access (SA) is not included in copper access therefore the answer given for copper access is referred only to LLU and SLU.

Figure 9 – Cost base used in 2013 in the markets listed only in Recommendation 2003/311/EC

- One NRA in market 18 applies “HCA” for digital and “Others” for analogue and has been counted as “Others”.

Figure 10 – Allocation methodology used in 2013 in the markets listed only in Recommendation 2003/311/EC

- One NRA in market 18 applies “FDC” for digital and “Others” for analogue and has been counted as “Others”.

Figure 20 – Cost Base for Wholesale Broadband Access (Mkt 5)

- One NRA declaring “CCA” since 2008, had declared both “CCA” and “Others” in 2012 e 2013 respectively for dark fibre/Ethernet/other services and bundles, therefore has been counted as “Others” in 2012 and 2013.

Figure 21 – Allocation Methodology for Wholesale Broadband Access (Mkt 5)

- One NRA declaring “FDC” since 2008, had declared “FDC”, “LRIC” and “Others” in 2012 e 2013 respectively for dark fibre/Ethernet/other services and bundles, therefore has been counted as “Others” in 2012 and 2013.

Figure 22 – Price Control Method for Wholesale Broadband Access (Mkt 5)

- “Other” includes also “ex post price control method”.
- One Country, declaring “retail minus” since 2008, in 2012 e 2013 had declared “retail minus”, “cost orientation” and “others” according monthly rental for access or dark fibre/Ethernet/other services or bundles, therefore has been counted as “others” for the last two years.

A.4 Glossary of terms

General terms

1. **Regulatory cost accounting:** Regulatory cost accounting is an accounting system with specific regulatory rules and conditions under which the costs, the revenues and the capital employed of services and activities have to be recorded. Regulatory cost accounting is often derived from the statutory accounting system of the regulated operator but includes specific regulatory rules and standards in addition to the rules and standards provided for by the Generally Accepted Accounting Principles. The regulatory cost accounting system must respect the principles of cost causality, objectivity, consistency and auditability. A regulatory cost accounting obligation may be imposed by the regulator on operators with significant market power.

2. **Accounting separation:** An accounting separation system is a comprehensive set of accounting policies, procedures and techniques that demonstrates compliance with non-discrimination obligations and the absence of anticompetitive cross-subsidies from a vertically integrated regulated operator. The outputs from such a system must be capable of independent verification (auditable) and fairly present the financial position and relationship (transfer charge arrangements) between the wholesale and retail activity of the vertically integrated operator. As the regulatory cost accounting system, the accounting separation system must respect the principles of cost causality, objectivity, consistency and auditability. An accounting separation obligation may be imposed by the regulator, together with a regulatory cost accounting obligation, on operators with significant market power.

3. **Forward looking cost:** The economic cost of an activity is the actual forward-looking cost of accomplishing that activity in the most efficient possible way, given technological, geographical, and other real world constraints that exist. In contrast to embedded costs, forward-looking costs are those associated with present and future uses of the firm's resources. Only these costs are relevant for making present and future production and investment decisions, for placing resources in alternative uses, and for setting prices for the services to be provided at current time or in the future (Remark: This definition comes directly from the ITU Regulatory Accounting Guide).

4. **Cost model / Costing methodology:** The cost model / costing methodology contains all the rules and guidelines on how to derive the relevant cost (cost base, depreciation methodology) for regulatory purposes and how to attribute those costs (allocation methods) to the regulated services.

Terms related to the cost base and asset valuation methodologies

5. **Cost base:** The cost base is the relevant set of costs that can be attributed, directly or indirectly to a given activity or to the production of a service. Two main approaches exist in terms of assessment of the cost base: top-down and bottom-up.

6. **Top-down:** In a top-down (TD) approach, the accounted costs of the operator's regulatory accounts are used in order to assess the relevant regulatory cost base for a given activity or service or for a set of activities or services. A top-down approach usually implies that the actually incurred costs are taken into account, i.e. without efficiency adjustments.

7. **Bottom-up:** In a bottom-up (BU) approach, an engineering model which satisfies the expected demand in terms of subscribers and/or traffic for a given service or for a set of services is used in order to assess the relevant regulatory cost base for such service or set of services. A bottom-up approach usually implies calculating the costs an efficient operator would incur.

8. **Capital expenditures (CAPEX):** Capital expenditures are investments in fixed, physical, non-consumable assets, such as infrastructures and equipment.

9. **Capital costs:** Capital costs are the annual costs originated by capital expenditures (CAPEX) and recorded in firm's accounts in the form of annuities. Annuities include two components: depreciation, which correspond to the depreciation of the value of the asset, and cost of capital employed, which corresponds to the cost of holding the capital i.e. the opportunity cost of the sum invested.

10. **Operating expenditures (OPEX):** Operating expenses or operating expenditures are the on-going costs for running a product, business, or system by the firm. In firm's accounts or in bottom-up models, those expenses are the sum of the expenses made on a period of time, generally a year.

11. **Gross replacement costs:** Gross replacement cost is the price that would be paid on a given date for an asset bought in the past. It is calculated based on the recorded technical progress rate for such asset. The net replacement cost is equal to the gross replacement cost net of accumulated depreciation.

12. **HCA:** In an historical cost accounting (HCA) approach, the actually incurred costs recorded in the regulated operator's statutory accounts, most often annualized following a straight-line depreciation methodology, are used in order to assess the relevant regulatory cost base. As historical costs may include inefficient investments, incorporate tax optimization and may especially lack of data for the pre-liberalization era, adjustments might be applied.

13. **CCA:** In a current cost accounting (CCA) approach, operator's asset base is annualized based on the gross replacement cost of the assets. CCA belongs to the family of constant annualization methodologies where the depreciation share is stable and the cost of capital share decreases over time, resulting in decreasing annuities.

Nevertheless, unlike historical cost accounting, in current cost annualization methods the amortization is adjusted according to variations in the price of the assets being considered due to technical progress and general variations in price (inflation). Two main kinds of CCA exist:

13.1. **FCM:** Financial capital maintenance (FCM): CCA FCM aims to maintain the enterprise's financial capital: whatever transpires, the sum of the discounted annuities must be equal to the initial investment

13.2. **OCM:** Operating capital maintenance (OCM): under CCA OCM it is the gross replacement value in other words the current price of an asset with the same productive output, expressed in constant euros, which is amortized.

13.3. **MEA:** Modern equivalent asset (MEA): refers to assessing costs of a network rolled-out today, i.e. reflecting modern least cost technology instead of legacy technology as this would be the cost relevant in a competitive market.

Terms related to cost annualization methodologies

14. **Annualization methodology:** As capital expenditures are intended to create future benefits for the firm, they are annualized in firm's accounts by means of annualization methodologies. Annualization methodologies spread investment costs over time based on regulatory assets lives and, for every asset, they result in a series of annualised costs (called annuities), each of which corresponds to the portion of the investment cost allocated to the year.

15. **Straight-line (linear) depreciation:** Straight line depreciation belongs to the family of constant depreciation methodologies. In these methodologies, the depreciation share is stable and the cost of capital share decreases over time which results in decreasing annuities. Constant depreciations not readjusted for price evolution are usually referred to as "linear depreciation".

16. **Annuity:** The annuity methodology calculates the charge that, after discounting, recovers the asset's purchase price and financing costs in equal annual costs. At the beginning, the payment will consist more of capital payments and less of depreciation charges, while over time it will be the opposite, resulting in an upward sloping depreciation schedule (increasing depreciation charges).

17. **Tilted annuity:** The tilted annuity methodology is an annuity methodology where the annuity value changes from year to year at the same rate as the price of the asset is expected to vary. When asset's price is expected to change over time, a tilted annuity methodology would be more appropriate than a flat annuity methodology.

18. **Economic depreciation:** The economic depreciation methodology takes into account both price changes and output changes. It becomes more appropriate when, besides asset's price changes, there is an expectation of changes in output which may affect unit costs evolution.

Terms related to cost allocation methodologies

19. **Allocation methodology:** Allocation methodologies are used to assess the cost of individual services/products in the context of a multi-product firm. The choice of a particular method depends on the objectives and the competitive environment. The implementation of one particular allocation methodology has a significant impact on the costs of a service/product and, therefore, on the regulated wholesale prices as well.

20. **Fully distributed cost (FDC) / fully allocated cost (FAC):** Using the fully distributed cost or fully allocated cost approach, the total costs of a product or service are taken into account, i.e. the costs actually incurred by the operator. These include a share of the joint and overhead costs, arrived at by applying certain allocation bases. Thus, in contrast to the marginal cost approach, fixed costs independent of output are also taken into consideration. Usually also parts of joint and common cost are included in the calculation.

21. **Long run incremental cost (LRIC):** Long run incremental cost is the cost of producing a specific additional increment of a given service in the long run (the period over which all costs are variable) assuming at least one other increment is produced. Includes all the directly assignable variable economic costs of a specific increment of service, which usually is less than the whole service. In principle, there are an infinite number of different sized increments that could be measured. However, these increments can effectively be grouped into three different categories: 1. a small change in the volume of a particular service; 2. the addition of a whole service; or 3. the addition of a whole group of services.

22. **Long run average incremental cost (LRAIC):** Long run average incremental cost is a form of LRIC where the Increment is a whole group of services. In the context of telecommunications, LRAIC has often been used to set interconnection charges with the increments usually defined as the whole group of services using the core network. These services (PSTN, leased lines, etc.) include those provided by the operator with significant market power, as well as those of interconnecting operators. The costs of the network providing this wider group of services are then divided by all the traffic to produce the average incremental cost.

23. **LRIC and its several variations:** The LR(A)IC acronym is also used in conjunction with Forward-Looking (FL) and the plus sign (+). In principle this additions lead to a more specific description of all the elements which add up to the cost model as a whole. In this sense the FL would imply the bottom-up cost base according to a current cost accounting is used and the + would imply that joint and common costs are taken into account in the cost allocation process, too. Incremental costs are generally calculated for an efficient operator.

24. **Stand alone cost (SAC):** Measures the cost of providing a service provided by the operator separately from the other services of the company. SAC includes all directly attributable costs and all shared cost categories related to production of the service,

thus including direct variable costs, direct fixed costs, common and joint costs. Under this allocation method, the shared costs are totally supported by the service that is to be provided in isolation.

25. **Embedded direct cost (EDC):** Considers the directly attributable and indirectly attributable volume sensitive and fixed costs as recorded in the books and records of a firm. It therefore measures the embedded cost provided by the statutory accounts and does not question the efficiency involved.

Terms related to price control methodologies

26. **Price control methodology:** The price control methodology designates the approach that regulators adopt in order to set tariffs of regulated services. The most common approaches are cost orientation, retail minus, price-cap and benchmarking.

27. **Cost orientation:** Under cost orientation, the regulated price charged for the provision of a service reflects the underlying relevant regulatory costs, as defined by the regulator.

28. **Retail minus:** Under retail minus, the wholesale price charged for a given service is set in relation to the price of the underlying retail service rather than calculating the wholesale price on the basis of the costs incurred in producing the wholesale service.

29. **Price-cap:** Under price-cap, the regulator sets a cap on the price that the regulated operator can charge for a given service or for a basket of services. The cap may be set based on a top-down or on a bottom-up approach and may evolve according to several economic factors. The basic formula employed to set price caps is CPI – X, where the expected efficiency savings X are subtracted from the rate of inflation, measured by the Consumer Price Index. This price control methodology is intended to provide incentives for efficiency savings, as any savings above the predicted rate X can be kept by the operator and passed on to shareholders. In Europe, price-caps are generally reviewed every three years, corresponding to the length of validity of market analysis.

30. **Benchmarking:** Under benchmarking, the price of a given service is set in relation to the prices of comparable services charged in other countries.

A.5 Markets identified by Recommendation 2007/879/CE

1. Access to the public telephone network at a fixed location for residential and non-residential customers.

2. Call origination on the public telephone network provided at a fixed location.

3. Call termination on individual public telephone networks provided at a fixed location.

4. Wholesale (physical) network infrastructure access (including shared or fully unbundled access) at a fixed location.

5. Wholesale broadband access.

6. Wholesale terminating segments of leased lines.

7. Voice call termination on individual mobile networks.

ANNEX

Cost of Capital in Europe

Cost of Capital Parameters of 27 European countries

Data contained within this document is valid as of 01 January 2012

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1 Overview

Costs linked to the investment in network infrastructure are of special interest within the regulation of telecommunication markets. They have a major impact on wholesale prices whenever cost orientation is applied to services that are based on fixed or mobile network infrastructure, e. g. local loop unbundled or mobile termination.

In general, the costs of investment depend on the asset's annualised value and the cost of capital that is deemed to be appropriate by the regulatory authority. Therefore market players take a special interest in how cost of capital value is estimated. As the methods used to determine the asset base are dealt with already in this report (cf. chapter 3.4), the following section focuses on the cost of capital calculation itself. However, it has to be born in mind that the cost of capital and the asset base to which it is applied need to correspond with each other.

BEREC carried out a survey on this subject during the course of 2012. For this purpose, a questionnaire was circulated to NRAs of all BEREC members. A total of twenty-seven countries provided information: Austria, Belgium, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the UK.

The participating NRAs were asked to provide all of the parameters as well as the methods used to calculate the Weighted Average Cost of Capital (WACC). In addition, six qualitative questions serve to provide information on who the regulation is applied to, the length of the regulation period, for which time period the cost of capital parameters are specified, updated and applied to and if parameters are/may be adjusted outside of the specified time periods.

Table 1 Cost of Capital Parameters

2.1.1	Gearing ratio (in %)
2.1.2	Interest-bearing debt capital (in %)
2.1.2	Non-interest bearing debt capital (in %)
2.2.1	Tax rate on cost of equity (in %)
2.2.2	Tax rate on cost of debt (in %)
2.2.3	Average tax rate (in %)
2.3.1	Inflation rate (in %)
2.4.1	Nominal risk free rate (in %)
2.5.1	Market risk premium (in %)
2.5.3	Asset beta
2.5.3	Equity beta

2.5.4	Cost of equity post-tax (in %)
2.5.5	Cost of equity pre-tax (in %)
2.6.1	Risk premium (debt) (in %)
2.6.2	Cost of debt post-tax (in %)
2.6.3	Cost of debt pre-tax (in %)
2.7.1	Which cost of capital - 2.7.2 to 2.7.5 - do you apply to the regulated operator conceptually? (nominal pre-tax / nominal post-tax / real pre-tax / real post-tax)
2.7.2	Nominal pre-tax WACC (in %)
2.7.3	Real pre-tax WACC (in %)
2.7.4	Nominal post-tax WACC (in %)
2.7.5	Real post-tax WACC (in %)
2.8.1	Your WACC calculation refers to… (regulated operator / generic efficient operator / other [please comment])
2.8.2	In which year did you last specify the "cost of capital" parameters?
2.8.3	How often are "cost of capital" parameters updated?
2.8.4	Relevant period of this cost of capital
2.8.5	Do you adjust the tariff if the calculated cost of capital changes during the regulatory period? (No / Yes [please comment])
2.8.6	How long is the regulation period to which the cost of capital parameters applied?

Although information on all seven markets of the EC Recommendation was gathered, it was decided to concentrate the analysis on one fixed and one mobile network market, i.e. Market 4 and Market 7 because here the most complete and therefore conclusive information was provided[45].

More or less all NRAs use the CAPM (Capital Asset Pricing Model) to calculate the WACC (more precisely the cost of equity). The differences in the cost of capital applied by regulators in the pricing decisions reflect therefore the differences in the financial markets of the different countries as they show in the parameters.

[45] The data contained within this section have to be read and interpreted with caution: while utmost care was taken in the questionnaire design – providing technical explanations and definitions where necessary – some questions may have nevertheless been interpreted in different ways. Not all NRAs have provided information on all questions, limiting the representativeness of those questions that have been answered by only few respondents. It has to be taken into account that regulatory periods vary between different NRAs; therefore, parameters provided were estimated at different points in time. It also has to be kept in mind that all data collected for the survey has been provided as of the 1st January 2012. Therefore, data contained within the survey may no longer be accurate today or in line with current proceedings.

2 Method Used for Calculating the Cost of Capital

The cost of capital refers to the cost of a company's funds (both debt and equity). From an investor's point of view it is the return that they expect for providing capital to the company. In a regulated environment the regulator has to calculate the cost of capital (and thus the required interest on equity and debt) based on the company's regulated products and services.

There are two components to the calculation of the cost of capital:

- the ***cost of equity*** which is calculated with the help of the Capital Asset Pricing Model (CAPM) The CAPM is a model that describes the relationship between risk and expected return. The general idea behind CAPM is that investors need to be compensated in two ways: time value of money and risk. The time value of money is represented by the nominal risk-free rate and compensates the investors for placing money in any investment over a period of time. The other component represents risk and calculates the amount of compensation the investor needs for taking on additional risk. This is calculated by taking the beta as measure for systematic risk that compares the risk of the asset to the market risk. The market risk premium reflects the compensation that investors demand for choosing to invest into the (risky) market portfolio over a risk free investment. The formula for the CAPM is: $r = i + (r_M - i) \cdot \beta$

  where r is the required rate of return, i the risk free interest, r_M the market risk and β the measure of the risk of the asset/investment in comparison to the market risk.

- the ***cost of debt*** represents the interest rate paid by the company and can be modeled as the nominal risk free rate plus a risk component (risk premium), which itself incorporates a probable rate of default.

Broadly speaking, a company's assets are financed by either equity or debt. WACC is the average of the costs of these sources of financing, each of which is weighted by its respective use in the given situation. Once cost of debt and cost of equity have been determined, their blend, the weighted-average cost of capital (WACC), can be calculated:

$$WACC = \frac{\sum_{i=1}^{N} r_i \cdot MV_i}{\sum_{i=1}^{N} MV_i}$$

where N is the number of sources of capital (securities, types of liabilities); r_i is the required rate of return for security i; and MV_i is the market value of all outstanding securities i.

Thus the average cost of capital is computed as follows:

$$WACC = \frac{D}{D+E} K_d + \frac{E}{D+E} K_e$$

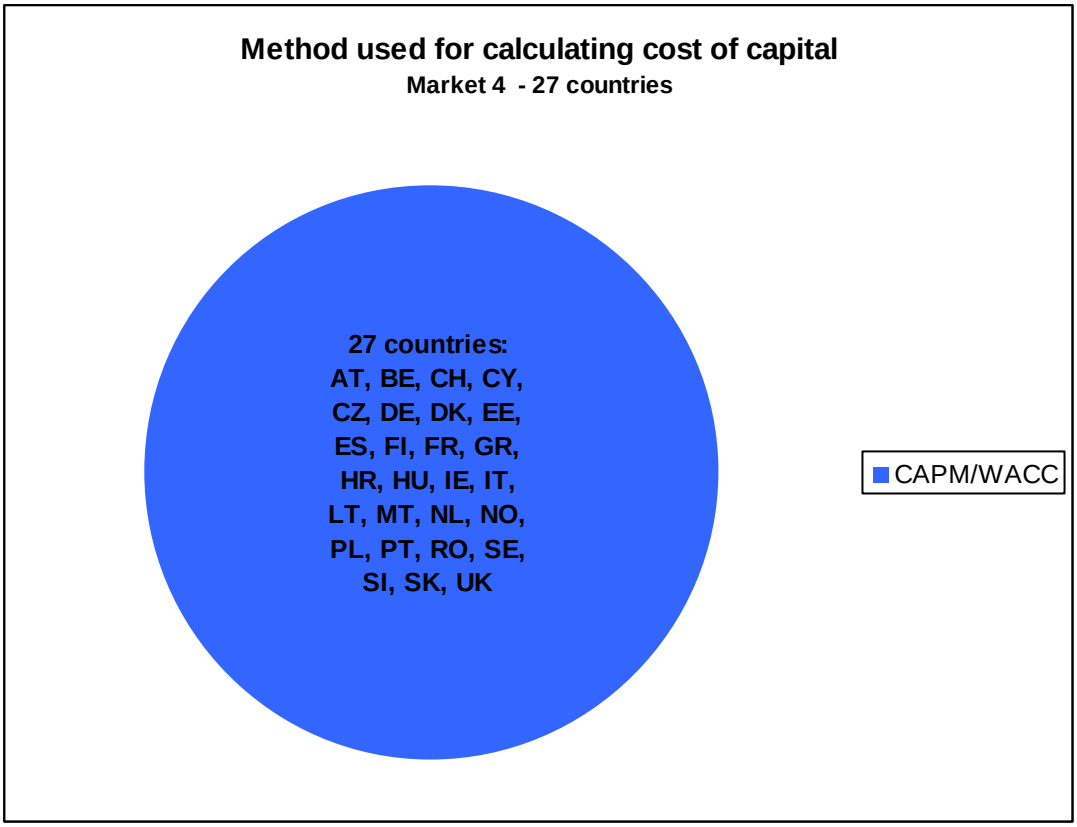
where D is the total debt, E is the total equity, Ke is the cost of equity, and Kd is the cost of debt.

Table 2 CAPM / WACC calculation

Calculation of the Weighed Average Cost of Capital	
Equity	
	Equity Beta / Asset Beta
x	Market-Risk Premium
=	Equity-Risk Premium
+	Nominal Risk Free Rate
=	Cost of Equity Pre-Tax
+	Tax Factor
=	Cost of Equity Post-Tax
x	Equity Ratio
=	Cost of Equity
Debt	
	Nominal Risk Free Rate
+	Risk Premium Debt
=	Cost of Debt Pre-Tax
x	Tax Factor
=	Cost of Debt Post-Tax
x	Debt Ratio
=	Cost of Debt
Total Capital	
Weighted Average Cost of Capital Pre-Tax / Post Tax	

Respondents were asked to convey the method (choices were: “CAPM/WACC”, “other, please comment”) they use to calculate the rate of return (i. e. the weighted average cost of capital) of the regulated operator. All twenty-seven countries have chosen the CAPM/WACC method to calculate the rate of return on regulated assets in Market 4.

Figure 1 Method Used for Calculating Cost of Capital (Market 4) – countries



2.1 Cost of Capital

In this section NRAs were asked to provide all relevant parameters used to calculate the cost of capital – cost of equity and cost of debt – which they are then required to apply to the calculation of tariffs for regulated products or services. The value of the parameter and the method used to calculate it were to be provided. Not all NRAs have provided details on their calculation methods; where it has been provided it will be shown in the text.

It can be assumed that NRAs are only able to provide those parameters that they actually use in their cost of equity and cost of debt calculations. Only those parameters where information has been obtained from a majority of respondents have been analysed below.

Some countries have calculated scenarios using a high and low value or a high, medium and low range (which therefore cannot be shown in the graphic depiction of a value range nor can they be included in a mean value or standard deviation calculation). Some scenarios are based on varying efficiencies.

2.1.1 Cost of Equity Parameters

NRAs were asked to provide all parameters that are required to calculate the cost of equity:

Table 3 Cost of Equity

	Equity
	Equity Beta / Asset Beta
x	Market-Risk Premium
=	Equity-Risk Premium
+	Nominal Risk Free Rate
=	Cost of Equity Pre-Tax
+	Tax Factor
=	Cost of Equity Post-Tax
x	Equity Ratio
=	Cost of Equity

2.1.1.1 Equity Beta

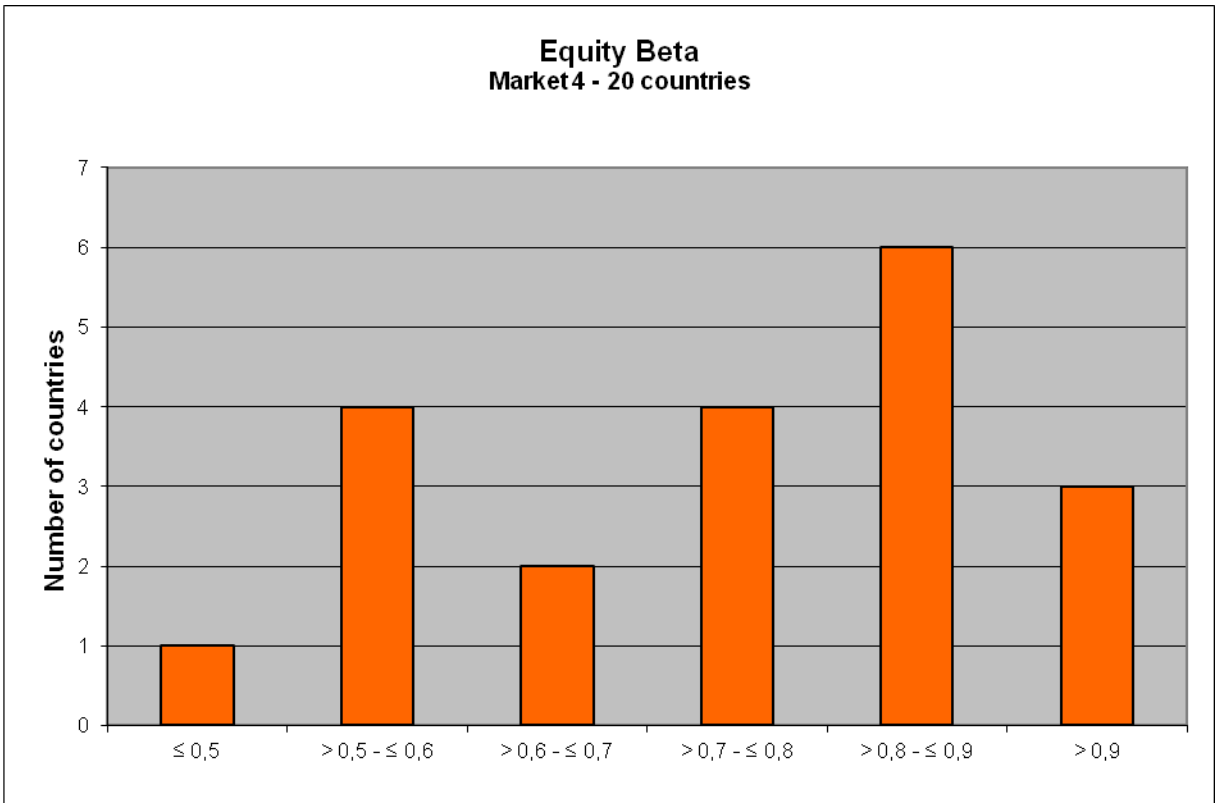
The equity beta is a measure of the sensitivity of a company's returns to market returns, i.e. taking into account the company's capital structure. It is usually estimated using a share index of relevant companies from the same/similar type of industry.

The estimated equity beta is shown in the following figure for twenty countries. One country only estimates asset betas, the estimations of three countries cannot be shown because they are based on scenario modelling and the values of three countries have not been provided. The values range from 0.45 to almost 1.4. Mid points and standard deviation have been calculated for this parameter as follows:

Table 4 Mid points and standard deviation – equity beta (Market 4)

Arithmetic mean	0.76
Median	0.75
Standard Deviation	0.21

Figure 2 Equity Beta (Market 4) – value range



2.1.1.2 Asset Beta

The asset beta is a measure of the sensitivity of a company's asset's returns to market returns. It is calculated from the equity beta which is adjusted leaving aside the company's capital structure; it is also called unlevered beta. Therefore, the asset beta is generally a lower value than the equity beta.

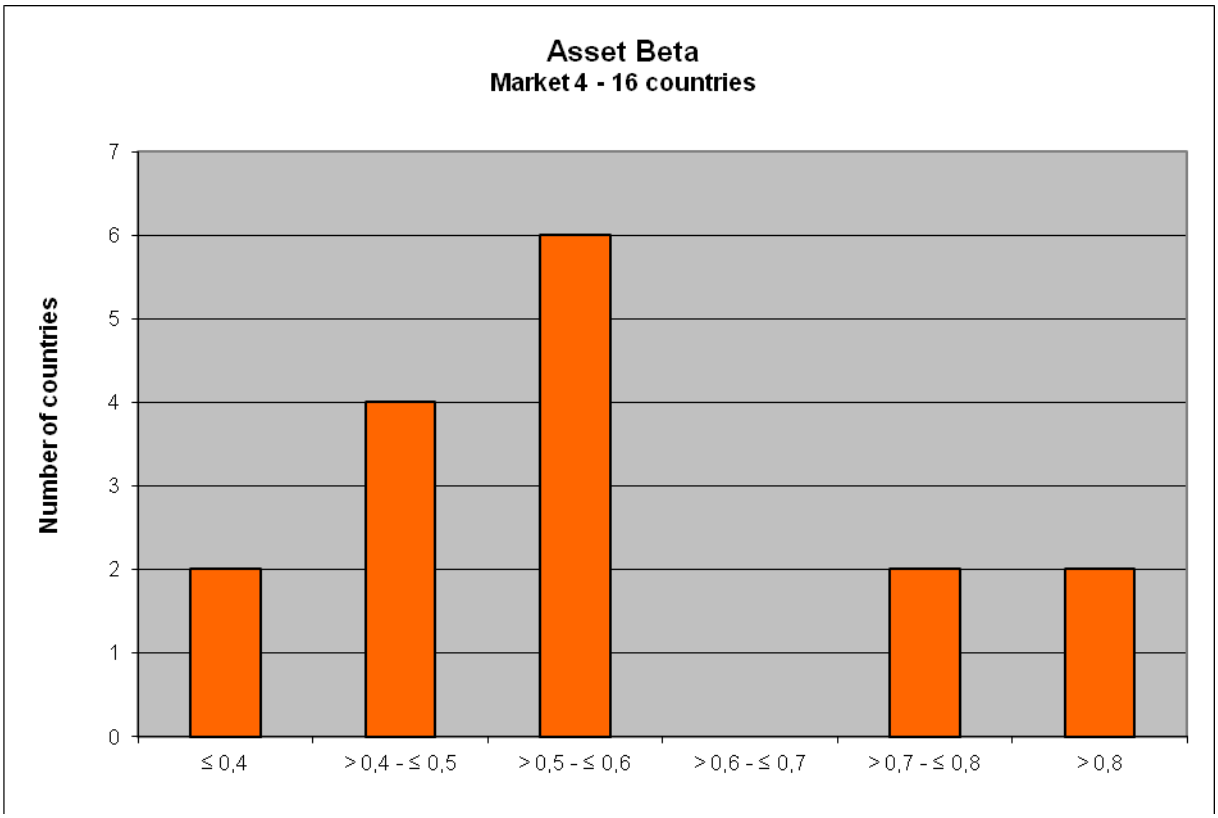
The estimation of asset beta is shown below for sixteen countries. Six countries only estimate equity beta, two countries use scenario modelling, therefore the values cannot be shown in a range and the value of three countries are missing.

The asset beta is in the range of around 0.5 to just over 1. Mid points and standard deviation have been calculated for this parameter as follows:

Table 5 Mid points and standard deviation - asset beta (Market 4)

Arithmetic mean	0.57
Median	0.52
Standard Deviation	0.15

Figure 3 Asset Beta (Market 4) – value range



2.1.1.3 Market Risk Premium

The market risk premium is the difference between the expected return on a market portfolio and the risk free rate. It is usually estimated using average (arithmetic or geometric means) historical returns on (long-term, i.e. 30 to 200 years) share or bond indices.

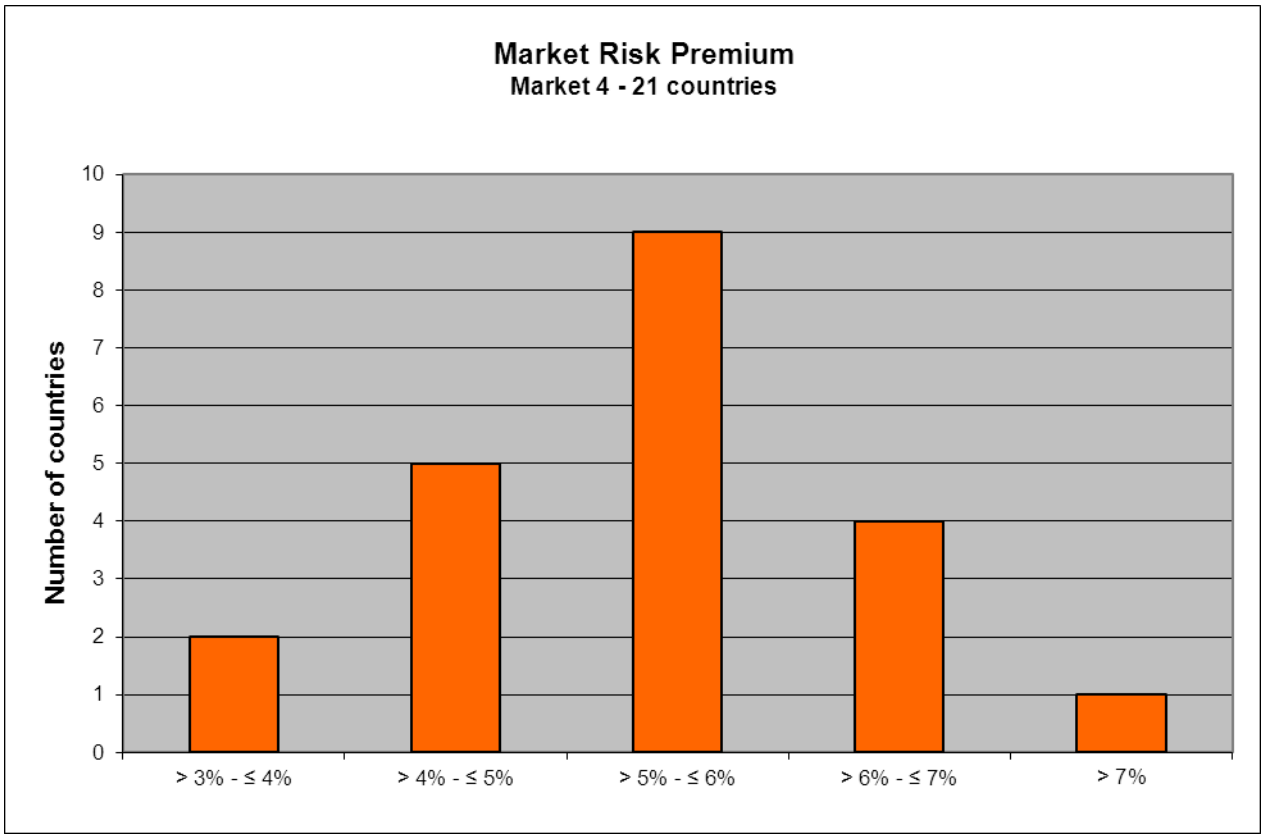
The estimated market risk premium is shown in the following figure for twenty-one countries. Three countries are not depicted because they use scenario modelling and the values of three countries have not been provided.

The values range from around 4 % to a maximum of around 15 %. Mid points and standard deviation have been calculated for this parameter as follows:

Table 6 Mid points and standard deviation – market risk premium (Market 4)

Arithmetic mean	5.56 %
Median	5.00 %
Standard Deviation	2.21 %

Figure 4 Market Risk Premium (Market 4) – value range



2.1.1.4 Nominal Risk Free Rate

The nominal risk free rate is the expected return of an asset, which bears in theory no risk at all, i.e. where the expected returns are certain. This parameter is used to estimate the cost of equity as well as the cost of debt. In a regulatory environment it is usually calculated using the average of a mid to long term time-line of interest for government bonds.

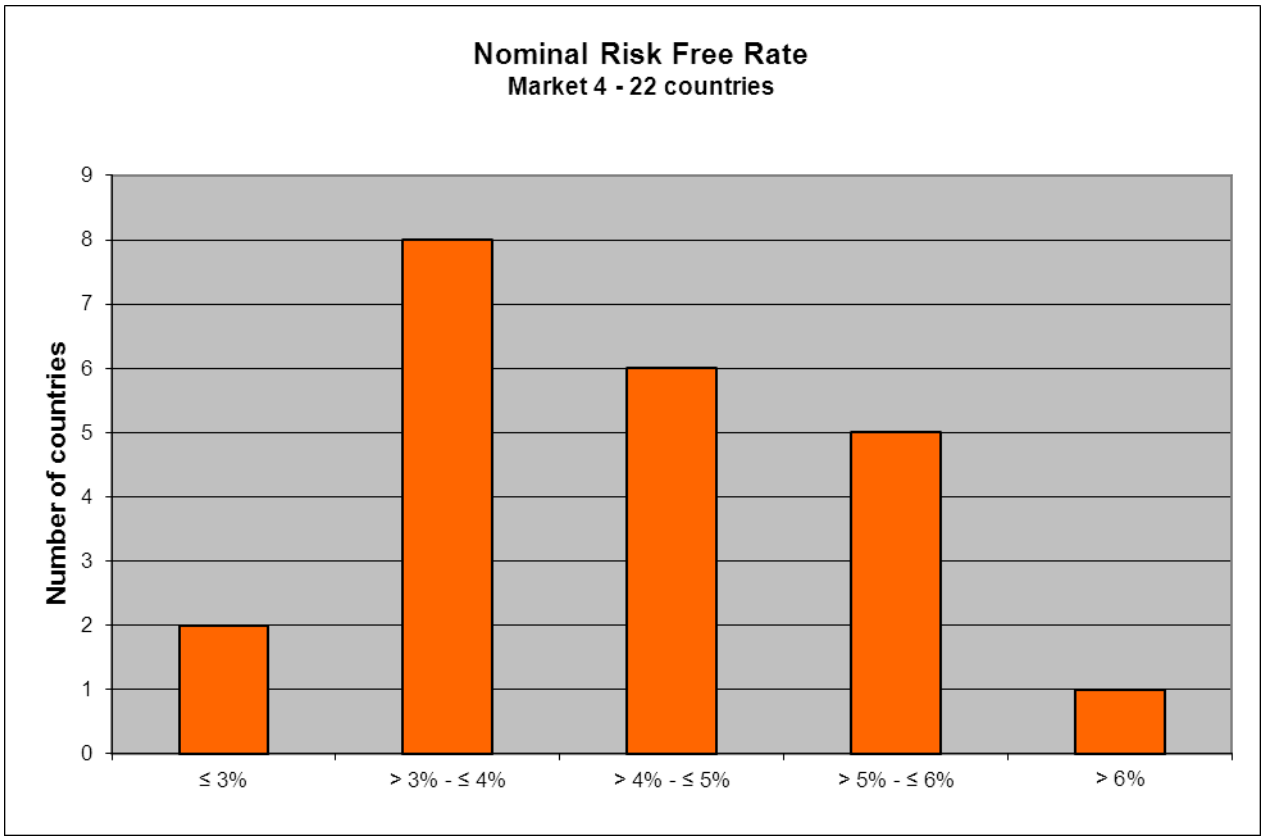
The nominal risk-free rate is shown below for twenty-two countries. The rates for two countries cannot be depicted because they use scenario modelling and the values of three countries are missing.

The values range from a low of under 2 % to a high of just over 7 %. Mid points and standard deviation have been calculated for this parameter as follows:

Table 7 Mid points and standard deviation – nominal risk free rate (Market 4)

Arithmetic mean	4.21 %
Median	4.04 %
Standard Deviation	1.02 %

Figure 5 Nominal Risk Free Rate (Market 4) – value range



2.1.2 Cost of Equity

2.1.2.1 Cost of Equity (Pre-Tax)

The cost of equity (pre-tax) is the before tax rate of return of a company that must be realised in order to satisfy investors. It is calculated from the post-tax cost of equity using a country specific tax factor.

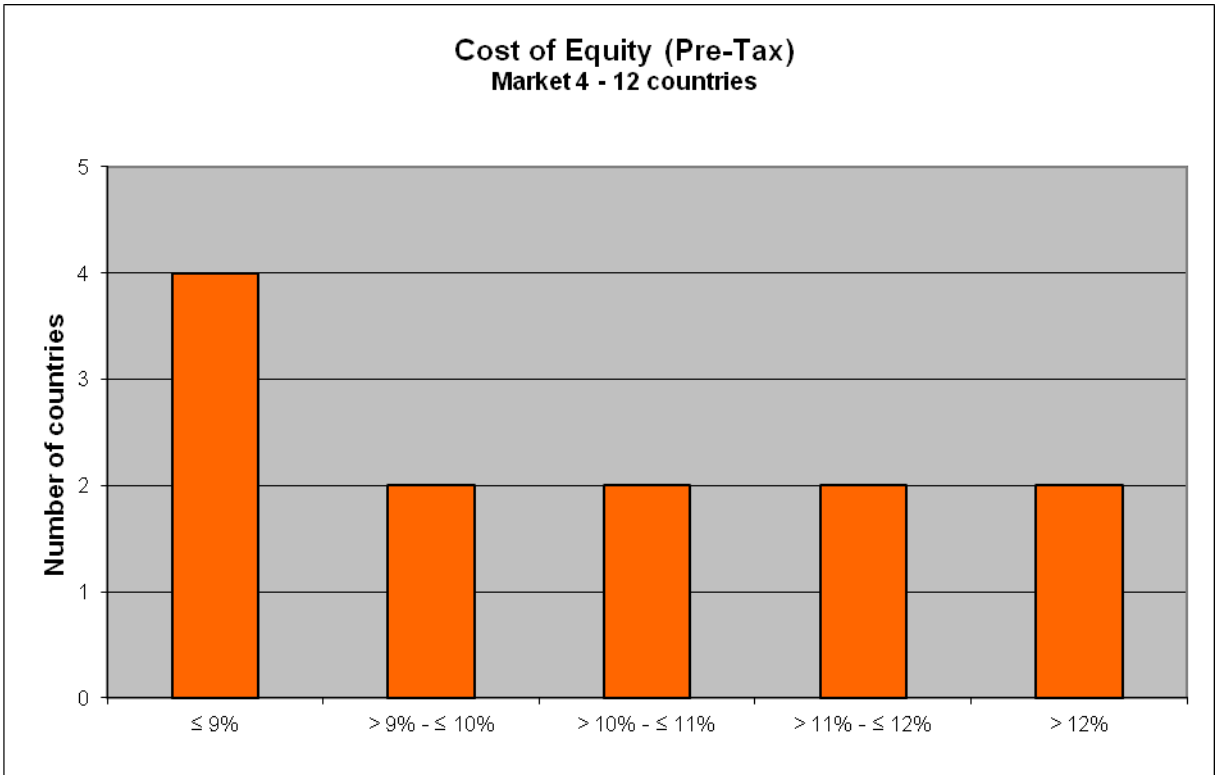
The calculated pre-tax cost of equity is shown below for twelve countries. Eight countries only estimate post-tax values. Three countries use scenario modelling, therefore their calculated values cannot be shown in a range. The values of four countries are missing.

The pre-tax cost of equity is within a range of between 5 % and 13 %. Mid points and standard deviation have been calculated as follows:

Table 8 Mid points and standard deviation – pre-tax cost of equity (Market 4)

Arithmetic mean	9.70 %
Median	9.77 %
Standard Deviation	2.04 %

Figure 6 Pre-Tax Cost of Equity (Market 4) – value range



2.1.2.2 Average Tax Rate

The average tax rate is used to determine post-tax values. NRAs were asked to specify the average tax rate in percent used in their calculation. None of the respondents gave further information on how the average tax rate was determined (i. e. at a specific point in time, as an average over a certain time frame etc.).

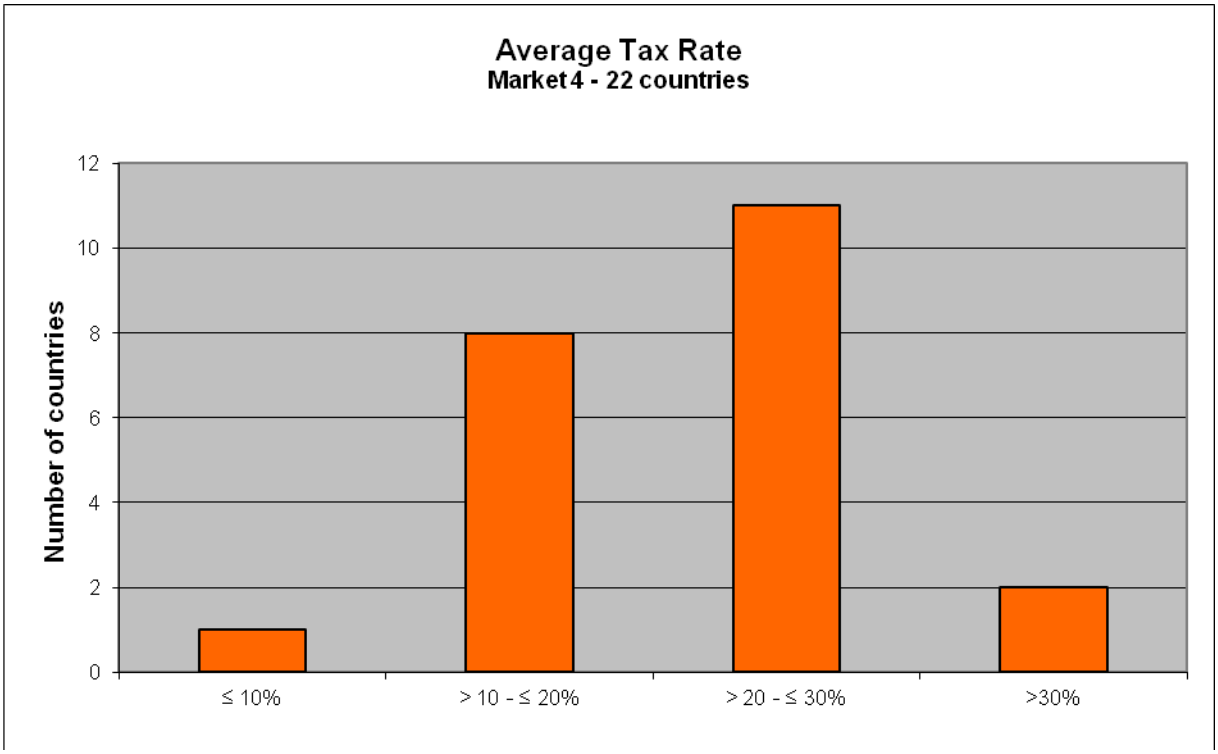
Twenty-two countries have provided this parameter. One country uses a benchmark WACC (EU average) and therefore does not calculate WACC parameters. Four countries have only provided a tax rate on cost of equity or cost of debt.

The lowest average tax rate is almost 10 % and the highest 36 %. Mid points and standard deviation have been calculated for this parameter as follows:

Table 9 Mid points and standard deviation – average tax rate (Market 4)

Arithmetic mean	23.19 %
Median	24.00 %
Standard Deviation	7.00 %

Figure 7 Average Tax Rate (Market 4) – value range



2.1.2.3 Cost of Equity (Post-Tax)

The post-tax cost of equity is the after tax rate of return of a company that must be realised in order to satisfy investors. It is usually calculated using the estimated beta multiplied with the estimated market risk premium (= the equity risk premium) and adding the risk free rate.
The post-tax cost of equity is shown for sixteen countries in the following figure. Four countries only estimate pre-tax values. The values of three countries that use scenario modelling are excluded. The value of four countries is missing.
The values of the fifteen countries lie within a range of around 5 % to more than 14 %. Mid points and standard deviation have been calculated as follows:

Table 10 Mid points and standard deviation – post-tax cost of equity (Market 4)

Arithmetic mean	9.05 %
Median	8.00 %
Standard Deviation	2.49 %

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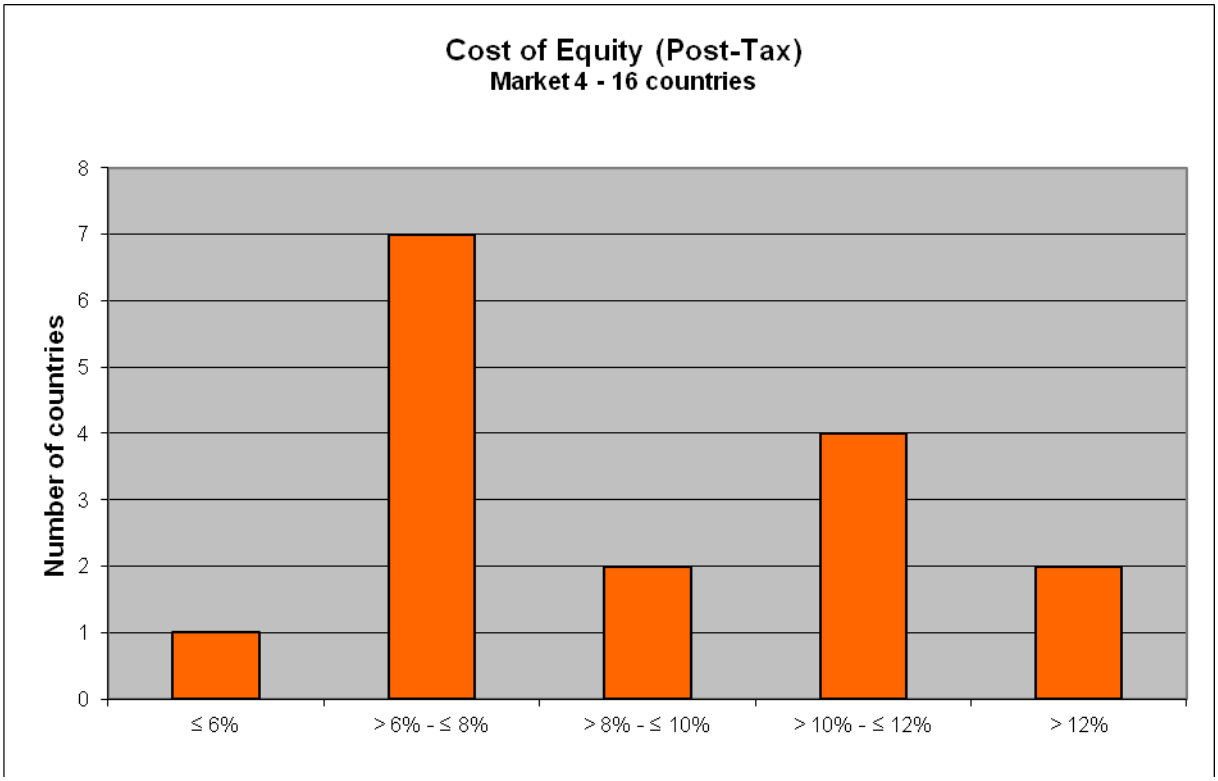
Figure 8 Post-Tax Cost of Equity (Market 4) – value range



2.1.3 Cost of Debt Parameters

NRA's were asked to provide all parameters that are required to calculate the cost of equity:

Table 11 Cost of Debt

	Debt
	Nominal Risk Free Rate
+	Risk Premium Debt
=	Cost of Debt Pre-Tax
x	Tax Factor
=	Cost of Debt Post-Tax
x	Debt Ratio
=	Cost of Debt

2.1.3.1 Nominal Risk Free Rate

The nominal risk free rate is the expected return of an asset, which bears in theory no risk at all, i.e. where the expected returns are certain. This parameter is used to estimate the cost of equity as well as the cost of debt. In a regulatory environment it is usually calculated using the average of a mid to long term time-line of interest for government bonds.

For results see point 2.1.1.4.

2.1.3.2 Risk Premium Debt

The risk premium debt is the return in excess of the risk-free rate of return that an investor expects to yield for a risky debt. It is usually estimated based on an average of the risk premium for long-term (i. e. 5 to 20 years) bills or bonds (usually of companies operating within the same industry).

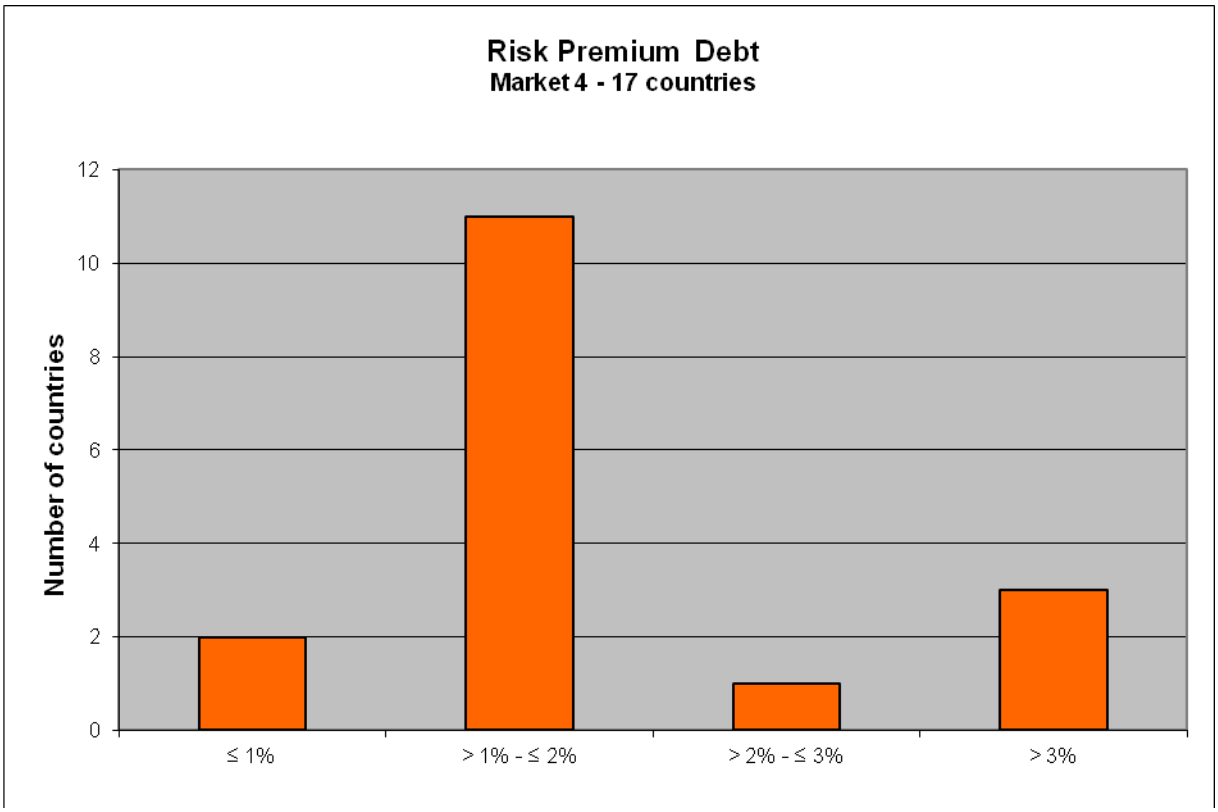
Seventeen countries' risk premium debt is depicted below. The values of three countries are not shown here because they use scenario modelling and the values of seven countries are unknown.

The value range spans a low of 0.13 % and a high of 11.7 %, while most countries have a value of between 1 and 2 %. Mid points and standard deviation have been calculated for this parameter as follows:

Table 12 Mid points and standard deviation – risk premium debt (Market 4)

Arithmetic mean	2.25 %
Median	1.60 %
Standard Deviation	2.66 %

Figure 9 Risk Premium Debt (Market 4) – value range



2.1.4 Cost of Debt

2.1.4.1 Cost of Debt (Pre-Tax)

The pre-tax cost of debt is the return before tax in excess of the risk-free rate of return that an investor expects to yield for a risky debt. It is calculated from the pre-tax cost of debt using a country specific tax factor.

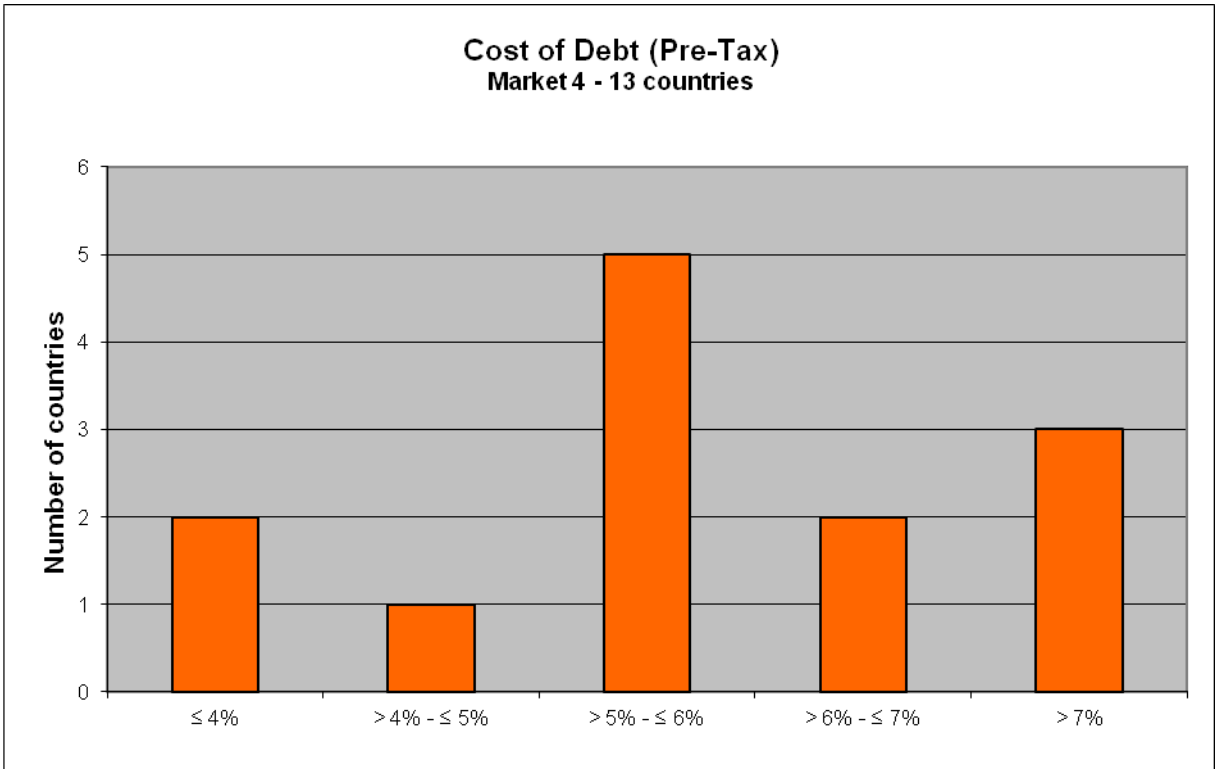
Thirteen countries' pre-tax cost of debt values are shown below. Seven countries only calculate post-tax values, two countries use scenario modelling, therefore their value cannot be shown and the values of five countries are not included.

The value range lies between a low of 3 % and a high of 9 %. Mid points and standard deviation have been calculated as follows:

Table 13 Mid points and standard deviation – pre-tax cost of debt (Market 4)

Arithmetic mean	5.84 %
Median	5.70 %
Standard Deviation	1.73 %

Figure 10 Pre-Tax Cost of Debt (Market 4) – value range



2.1.4.2 Average Tax Rate

The average tax rate is used to determine post-tax values. NRAs were asked to specify the average tax rate in percent used in their calculation. None of the respondents gave further information on how the average tax rate was determined (i. e. at a specific point in time, as an average over a certain time frame etc.).

For results see point 2.1.2.2.

2.1.4.3 Cost of Debt (Post-Tax)

The post-tax cost of debt is the after tax return in excess of the risk-free rate of return that an investor expects to yield for a risky debt. It is calculated using the nominal risk free rate and adding the estimated risk premium debt.

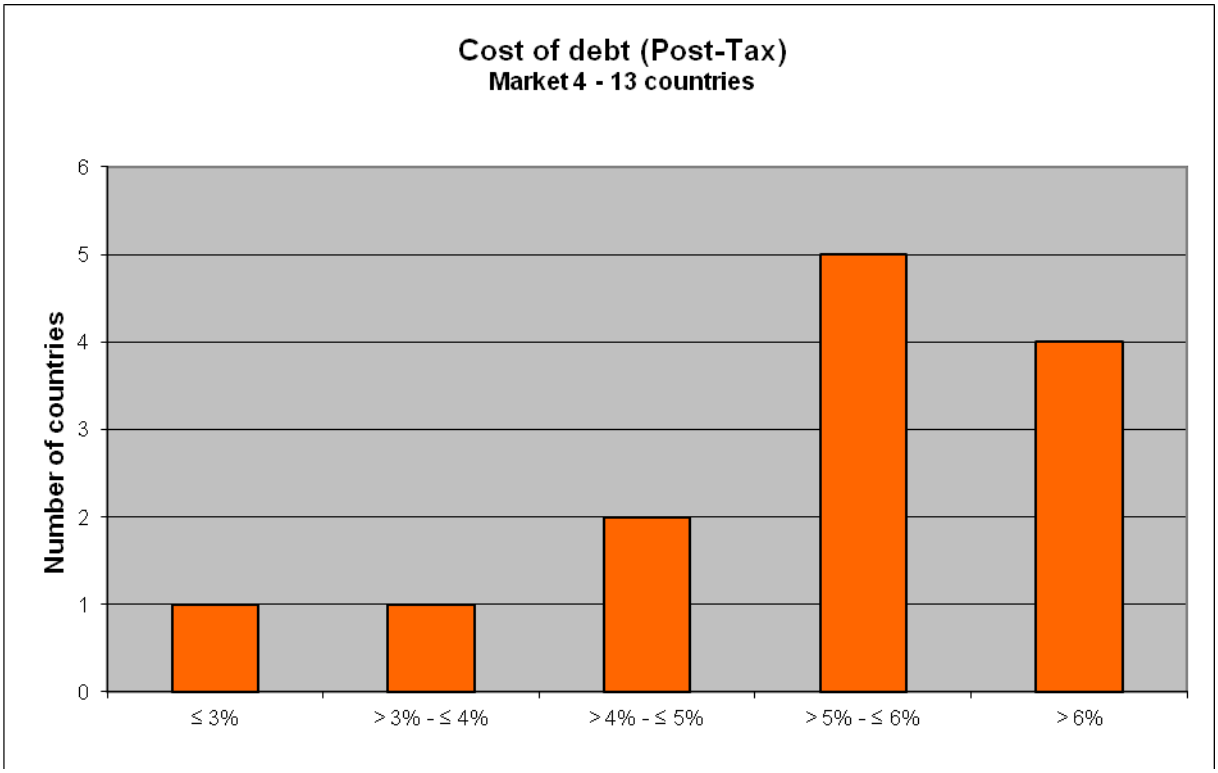
The values of thirteen countries are shown for the post-tax cost of debt. Five countries use scenario modelling, therefore their value cannot be displayed. Four countries only calculate pre-tax values and the values of five countries have not been provided.

The value range lies between a low of 2.4 % and a high of almost 7 %. Mid points and standard deviation have been calculated as follows:

Table 14 Mid points and standard deviation – post-tax cost of debt (Market 4)

Arithmetic mean	5.30 %
Median	5.39 %
Standard Deviation	1.27 %

Figure 11 Post-Tax Cost of Debt (Market 4) - value range



2.1.5 Inflation Rate

The inflation rate is used by some countries to determine real values, as opposed to nominal values. These are adjusted with a given inflation rate for the regulation period. NRAs were asked to specify the inflation rate in percent they use in their calculations. None of the respondents provided further information on how this average inflation rate was determined (i. e. at a specific point in time, as an average over a certain time frame etc.)

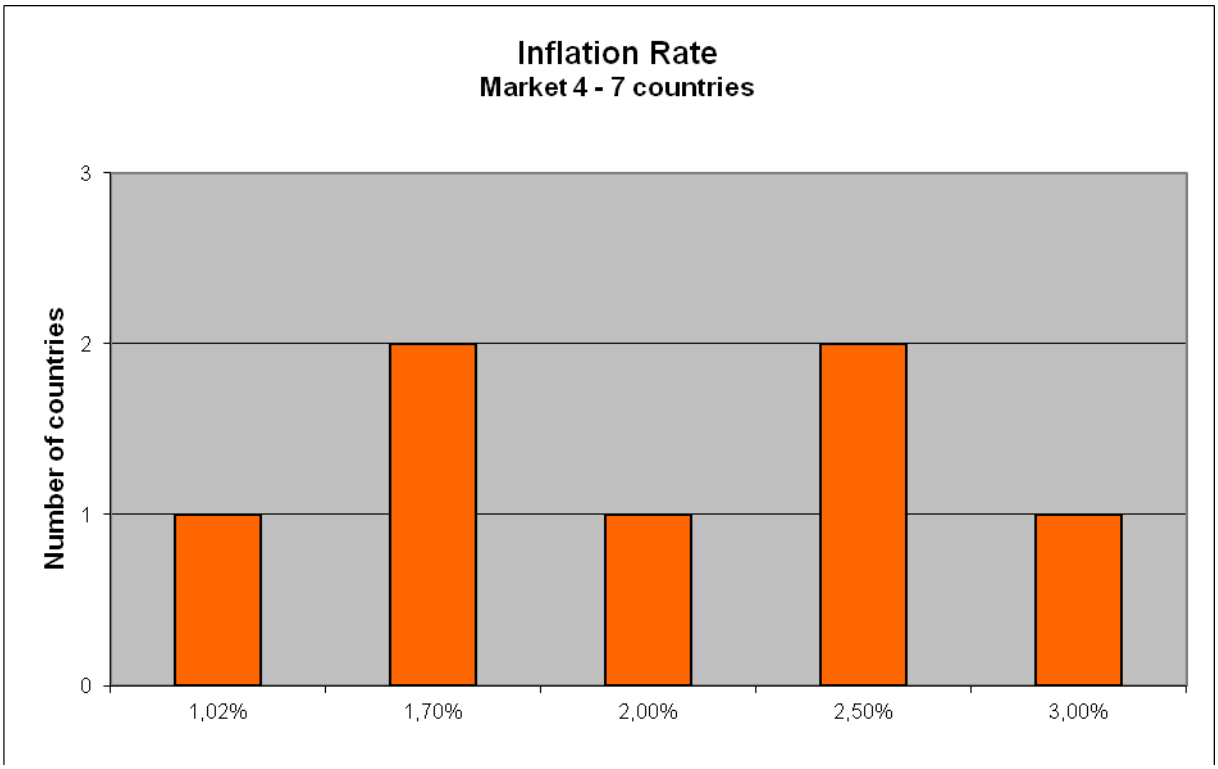
Seven countries have provided their inflation rate, however, as can be seen in point 2.1.6 below, only two countries apply a real pre-tax WACC.

The inflation rate is very country specific (i. e. determined from a country-specific basket of goods) and varies from a minimum of around 1.02 % to 3 %. Mid points and standard deviation have been calculated for this parameter as follows:

Table 15 Mid points and standard deviation – inflation rate (Market 4)

Arithmetic mean	2.06 %
Median	2.00 %
Standard Deviation	0.66 %

Figure 12 Inflation Rate (Market 4) – value range

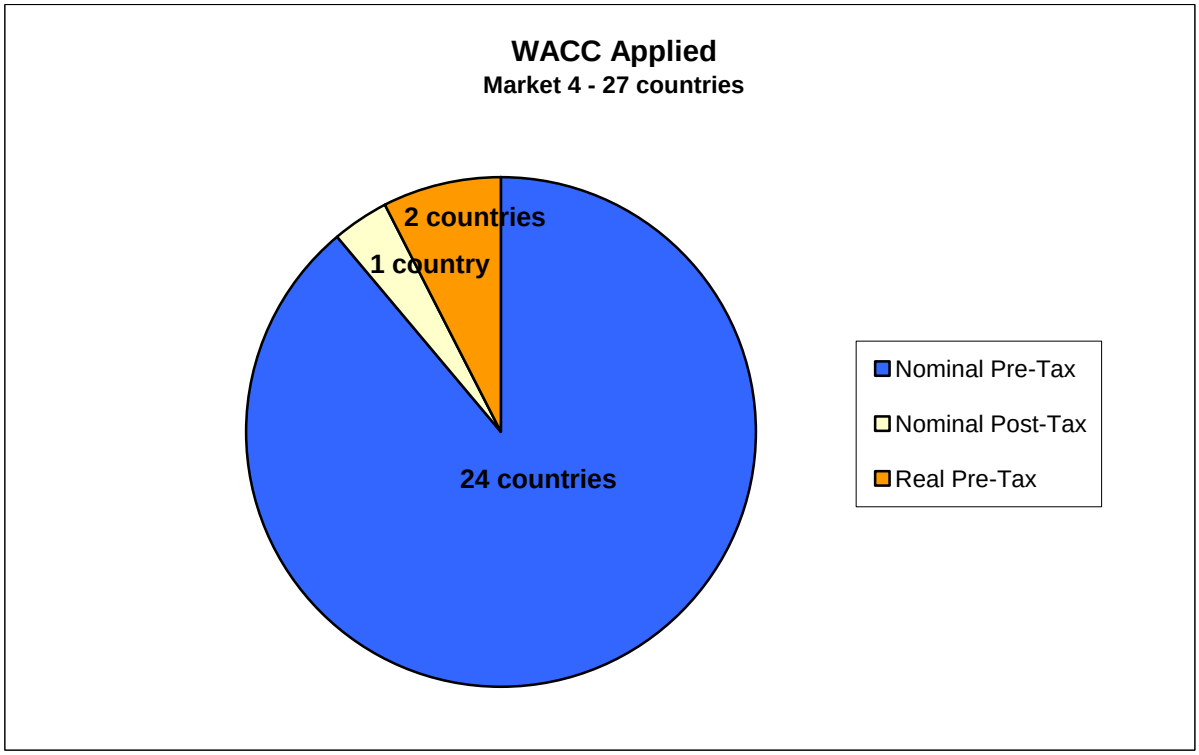


2.1.6 WACC Applied

Respondents were asked what type of WACC they apply in their calculations (choices were “nominal pre-tax”, “nominal post-tax”, “real pre-tax”, “real post-tax”). All but two respondents specified that they apply a nominal pre-tax WACC, i. e. they do not make adjustments for inflation: the WACC value is specified in point 2.1.7.

Two countries apply a real pre-tax WACC, i. e. they make adjustments for inflation to the WACC applied; the WACC value is specified in point 2.1.8. One country applies a nominal post-tax.

Figure 13 WACC Applied (Market 4) – number of countries



2.1.7 WACC Value (Nominal Pre-Tax)

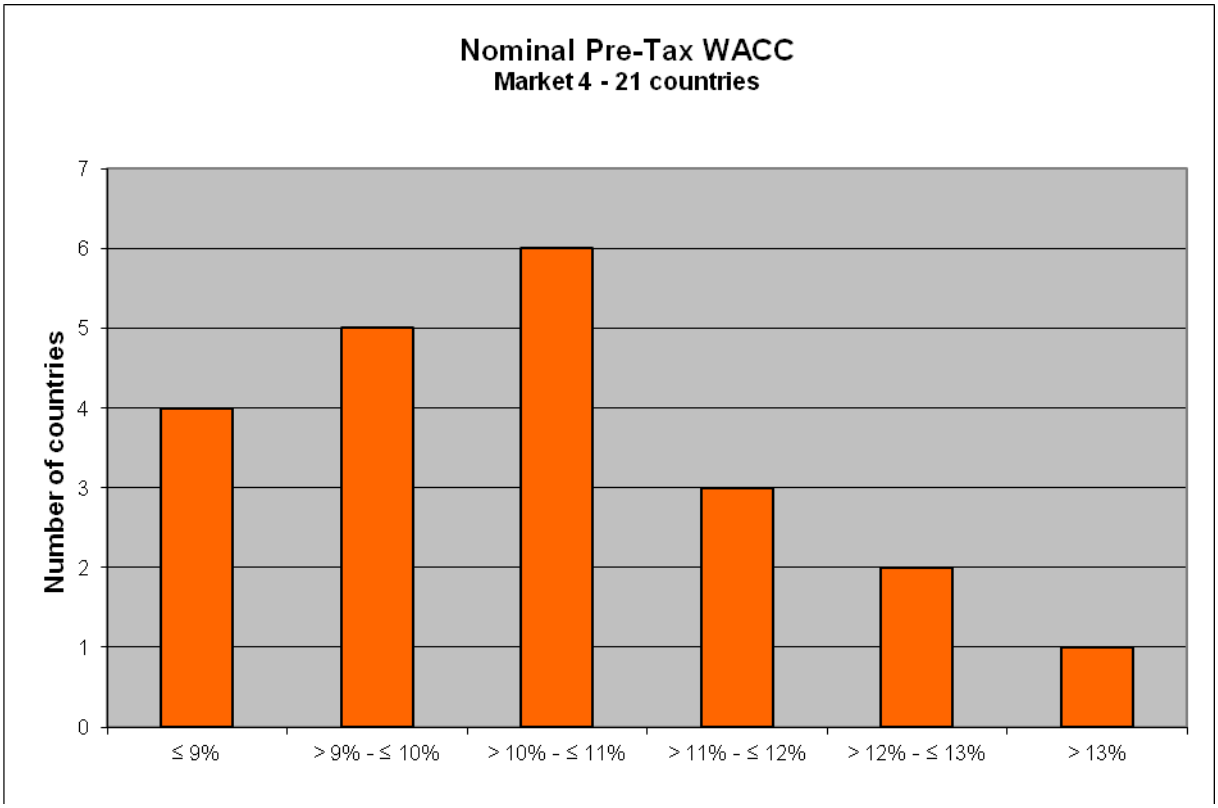
Of the twenty-four countries applying a nominal pre-tax WACC the values of twenty are shown in comparison. Two countries use scenario modelling, thus their values cannot be shown in a range and two countries' values have not been reported.

The estimation of the WACC value varies between just over 5 % and a high of almost 14 %. Mid points and standard deviation have been calculated as follows:

Table 16 Mid points and standard deviation – nominal pre-tax WACC (Market 4)

Arithmetic mean	10.10 %
Median	10.20 %
Standard Deviation	1.97 %

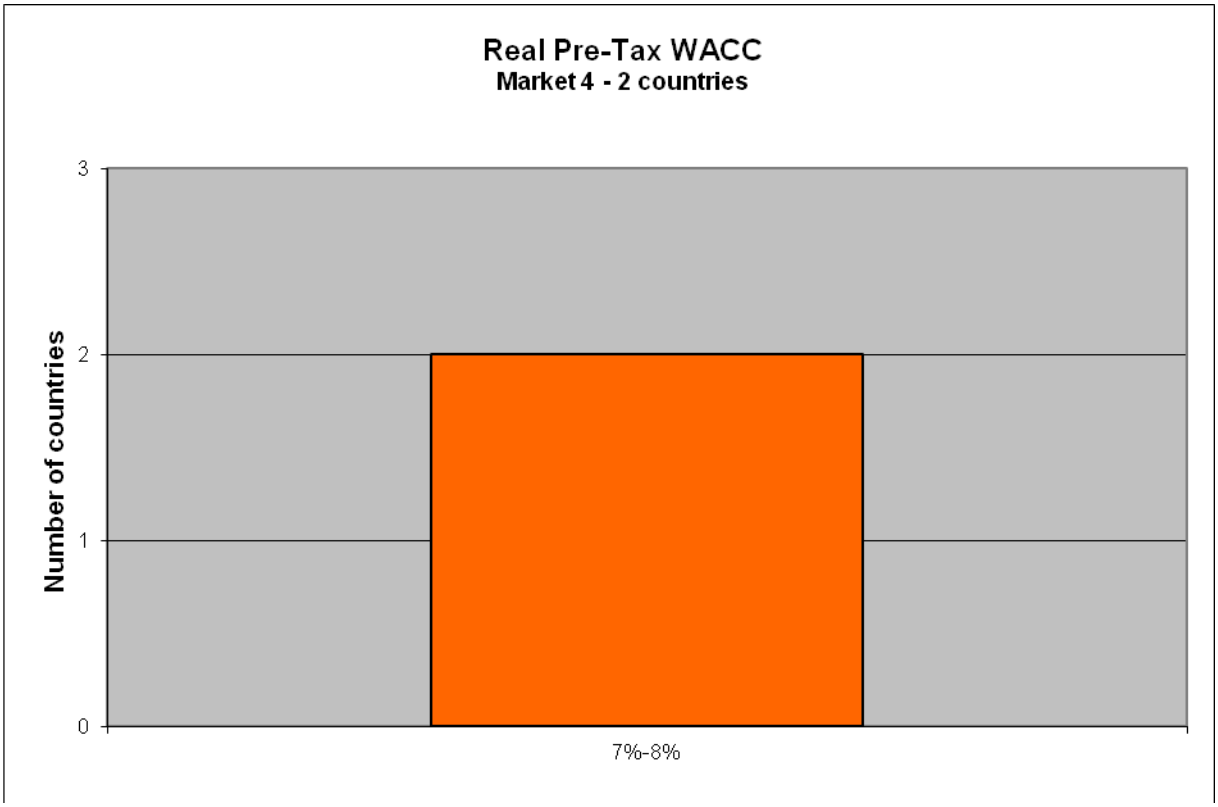
Figure 14 Nominal Pre-Tax WACC (Market 4) – value range



2.1.8 WACC Value (Real Pre-Tax)

The estimation of the WACC value of the two countries that apply a real pre-tax WACC is between 7 % and 8 %.

Figure 15 Real Pre-Tax WACC (Market 4) – value range



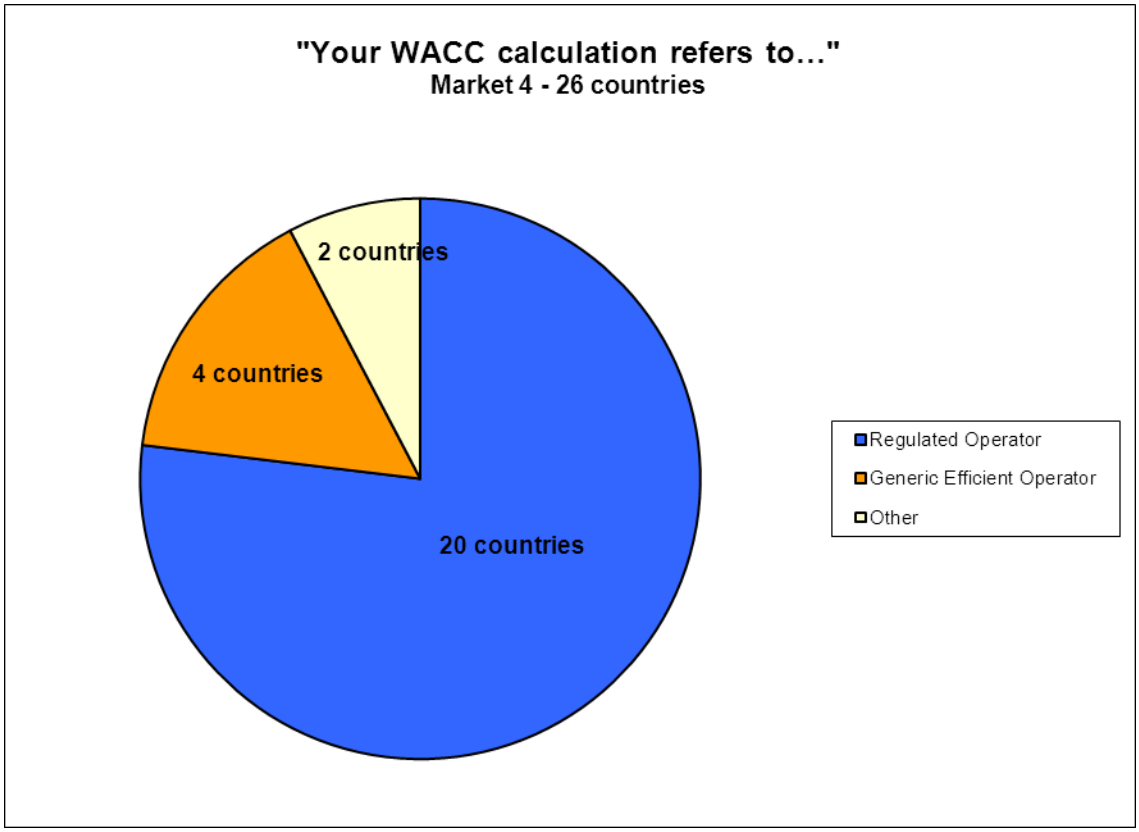
2.1.9 Qualitative Questions

Six qualitative questions were posed to the NRAs in order to ascertain how the regulation is applied: is it applied to the regulated operator, a generic efficient operator or other, the length of the regulation period, for which time period the cost of capital parameters are specified, updated and applied to and if the parameters are/may be adjusted outside of the specified time period.

2.1.9.1 WACC Applied to Operator

NRAs were asked to specify, if their "***WACC calculation refers to the "regulated operator", a "generic efficient operator" or "other"***. All but one country responded.
A majority of twenty countries apply the WACC to the regulated operator. Four countries apply the WACC to a generic efficient operator. The two "other" answers were not further specified.

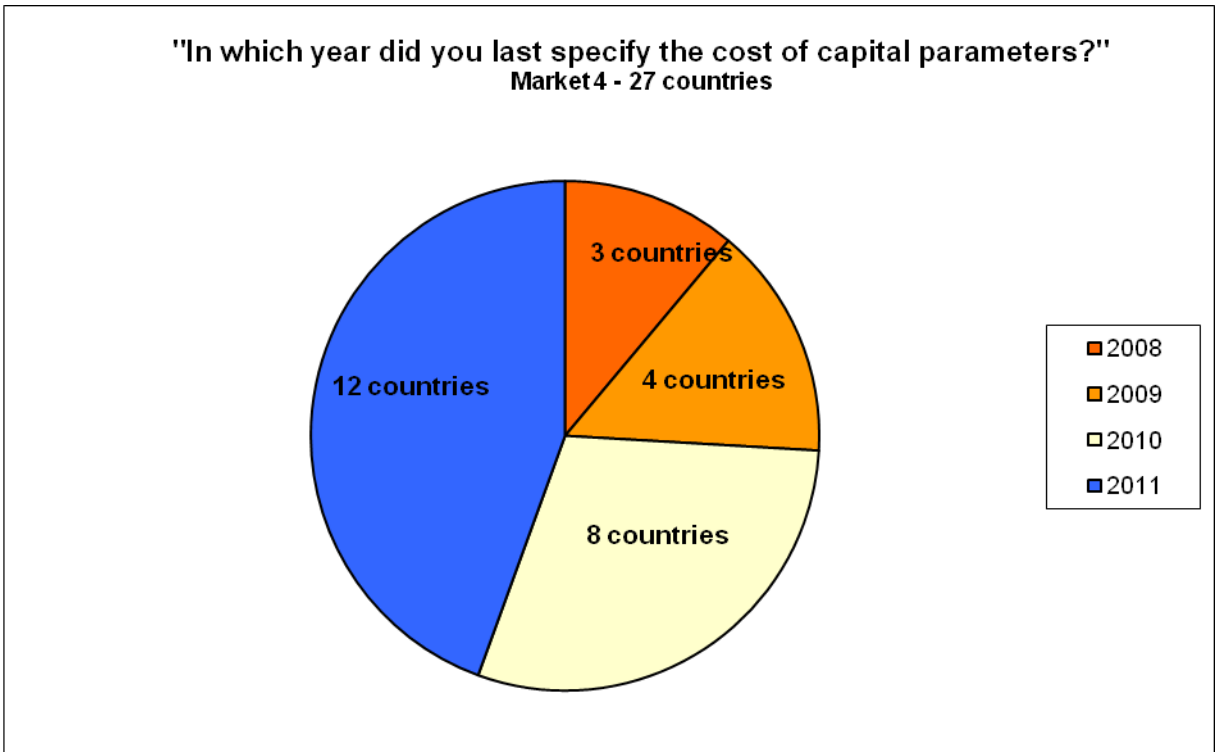
Figure 16 WACC Applied to Operator (Market 4) – number of countries



2.1.9.2 Specification of Cost of Capital Parameters

The following chart shows how NRAs answered the question ***"in which year did you last specify the cost of capital parameters?"*** All twenty-seven countries responded to this question. Most countries specified the parameters most recently in 2010 or 2011 (twenty countries), the remaining seven countries specified the parameters prior to that time period (2008 or 2009).

Figure 17 Specification of Cost of Capital Parameters (Market 4) – number of countries

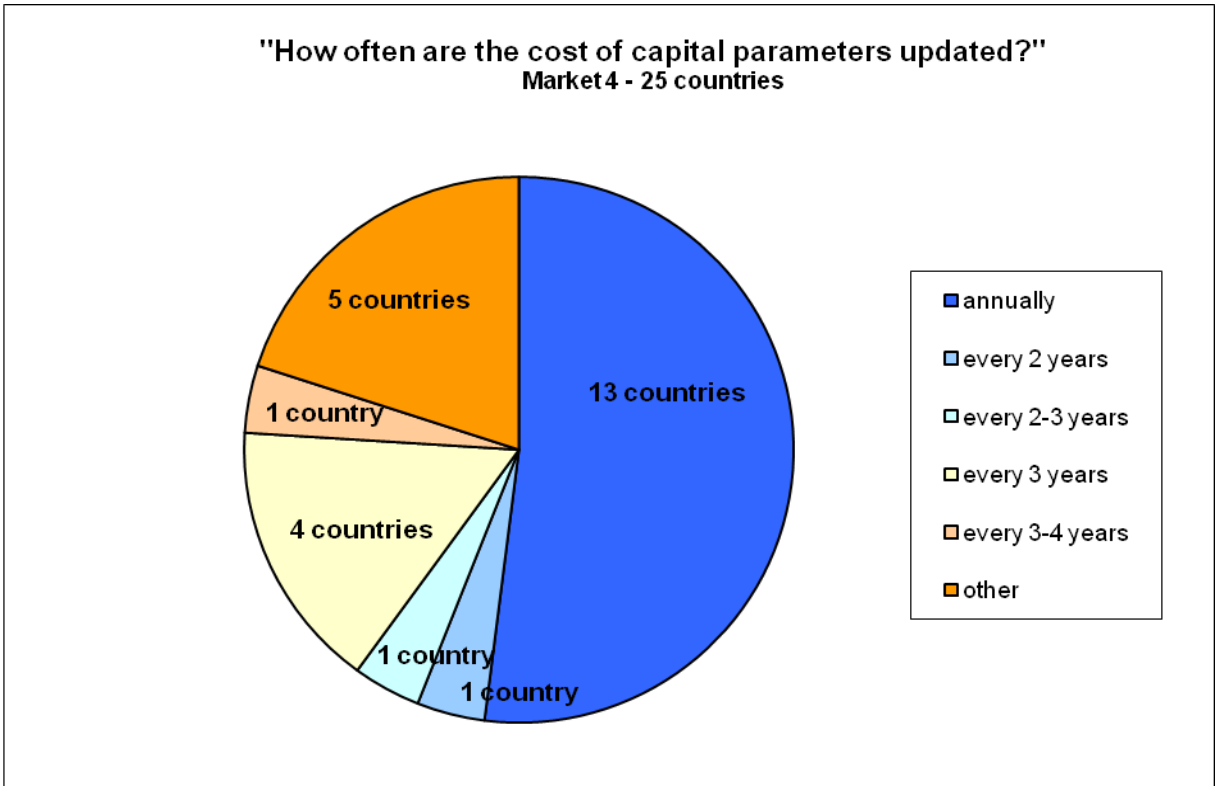


2.1.9.3 Update Frequency for Cost of Capital Parameters

Twenty-five respondents answered the question ***"how often are cost of capital parameters updated?"*** Three countries did not provide information to this question.

A majority of thirteen countries update their cost of capital parameters annually. Of these countries, one country only updates the risk-free rate annually. The five countries who replied with "other" specified that they update "when they develop a new model", "as required" or "not specified".

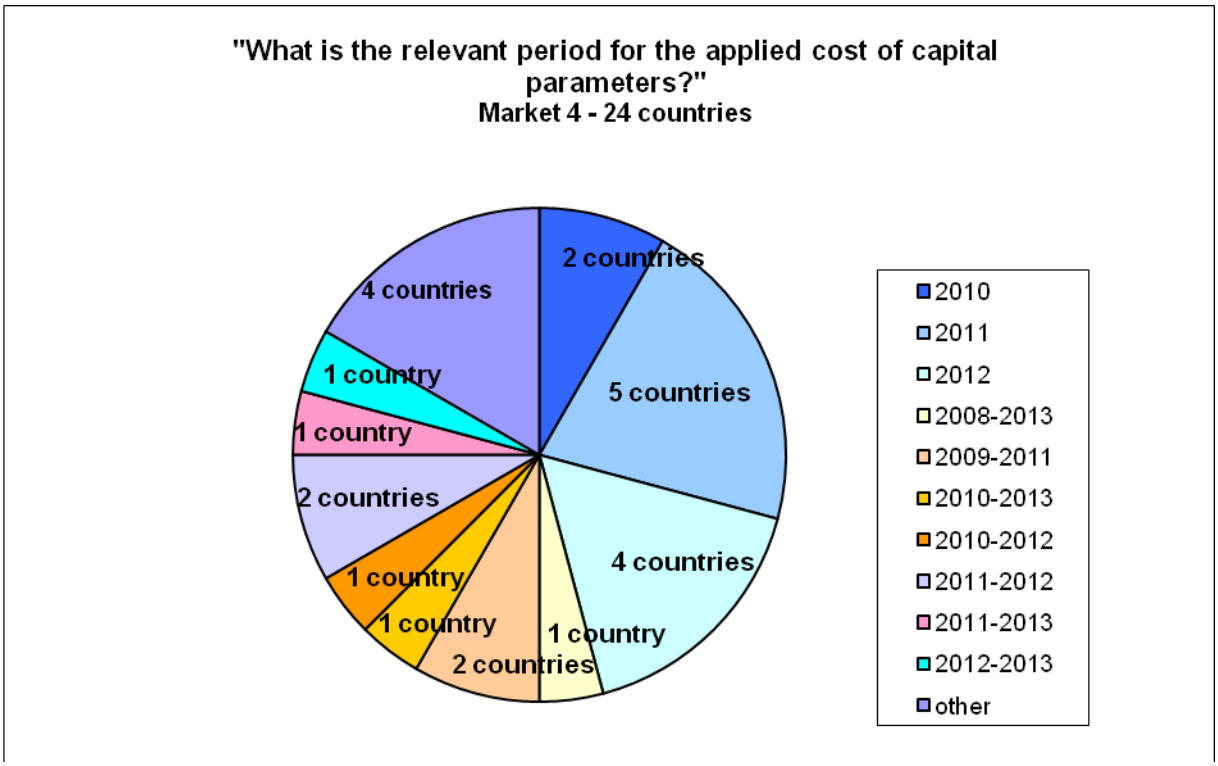
Figure 18 Update Frequency for Cost of Capital Parameters (Market 4) – number of countries



2.1.9.4 Relevant Period for Applied Cost of Capital Parameters

The question ***"what is the relevant period for the applied cost of capital parameters?"*** was answered differently within most of the twenty-four countries (missing are responses from three countries). Included are years or time periods dating from 2008 until 2013.

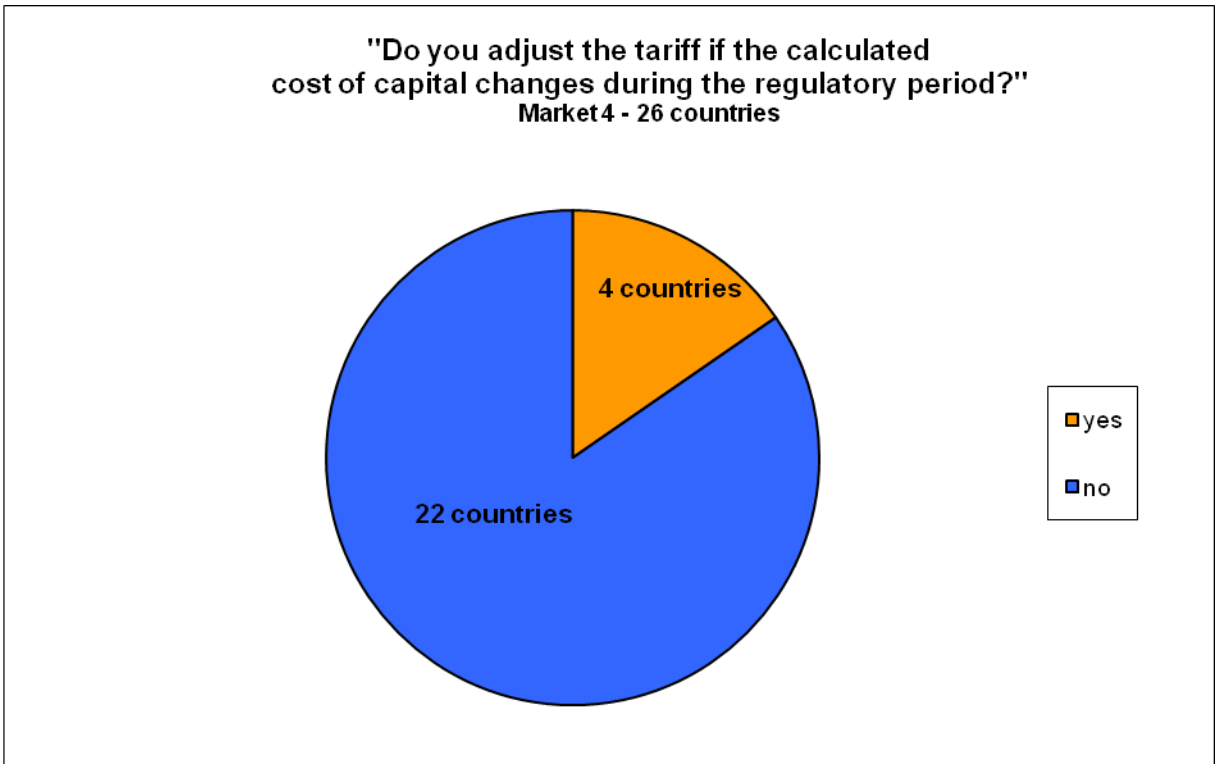
Figure 19 Relevant Period for Applied Cost of Capital Parameters (Market 4) – countries



2.1.9.5 Adjustment of Tariffs

Respondents were required to specify the following: ***"do you adjust the tariff if the calculated cost of capital changes during the regulatory period?"*** Of the twenty-six countries (one country has not replied) that have replied to this question a majority of twenty-two do not immediately adjust the regulated tariff if the calculated cost of capital changes during the regulatory period. The remaining four countries adjust their tariffs; one of them on an ad-hoc basis.

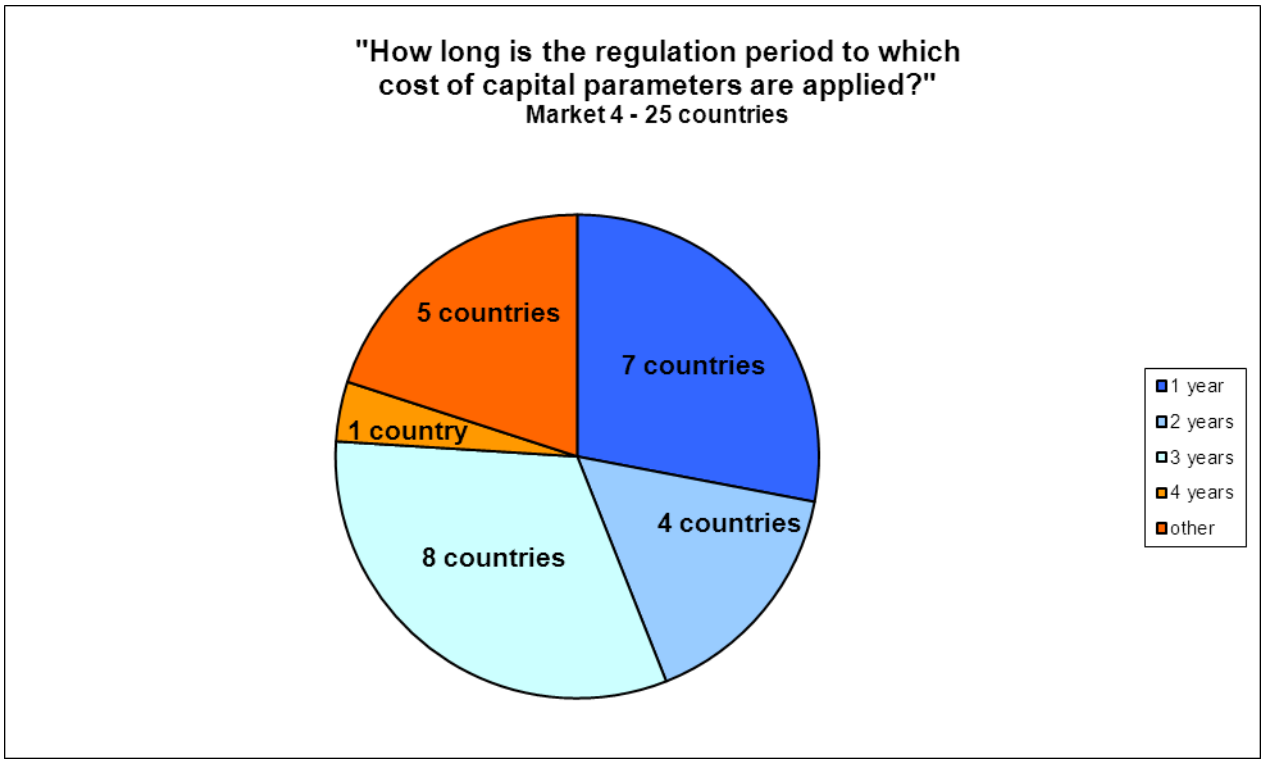
Figure 20 Adjustment of Tariffs (Market 4) – number of countries



2.1.9.6 Length of the Regulation Period

Concerning the question ***"how long is the regulation period to which the cost of capital parameters are applied?"*** there was a reply from twenty-five countries (two countries have not replied). Nineteen countries' regulation periods run from one to three years. One country's regulation period spans four years and five countries apply their cost of capital parameters to different regulation periods, i. e. "until further notice" or "until new decision".

Figure 21 Length of the Regulation Period (Market 4) – number of countries



3 Survey results Market 7

3.1 Cost of Capital

In this section NRAs were asked to provide all relevant parameters used to calculate the cost of capital – which they then apply to calculate tariffs for regulated products or services. The value of the parameter and the method used to calculate it were to be provided. Not all NRAs have provided details on the calculation methods; where it has been provided it will be shown in the text.

It can be assumed that NRAs are only able to provide those parameters that they actually use in their CAPM. Only those parameters where information has been obtained from a majority of respondents have been analysed below.

Four countries use benchmarking as a means to determine wholesale prices in this market. One of these countries nevertheless uses CAPM/WACC calculation in the compilation of regulatory accounts. Therefore only three countries – since they do not calculate WACC – have been excluded from the results in this section.

Some countries have calculated scenarios using a high and low value or a high, medium and low range (which therefore cannot be shown in the graphic depiction of a value range). Some scenarios are based on varying efficiencies. Some parameter estimations are different depending upon gearing (i. e. equity beta, risk premium cost of equity and debt).

3.1.1 Cost of Equity Parameters

NRA's were asked to provide all parameters that are required to calculate the cost of equity:

Table 17 Cost of Equity

	Equity
	Equity Beta / Asset Beta
x	Market-Risk Premium
=	Equity-Risk Premium
+	Nominal Risk Free Rate
=	Cost of Equity Pre-Tax
+	Tax Factor
=	Cost of Equity Post-Tax
x	Equity Ratio
=	Cost of Equity

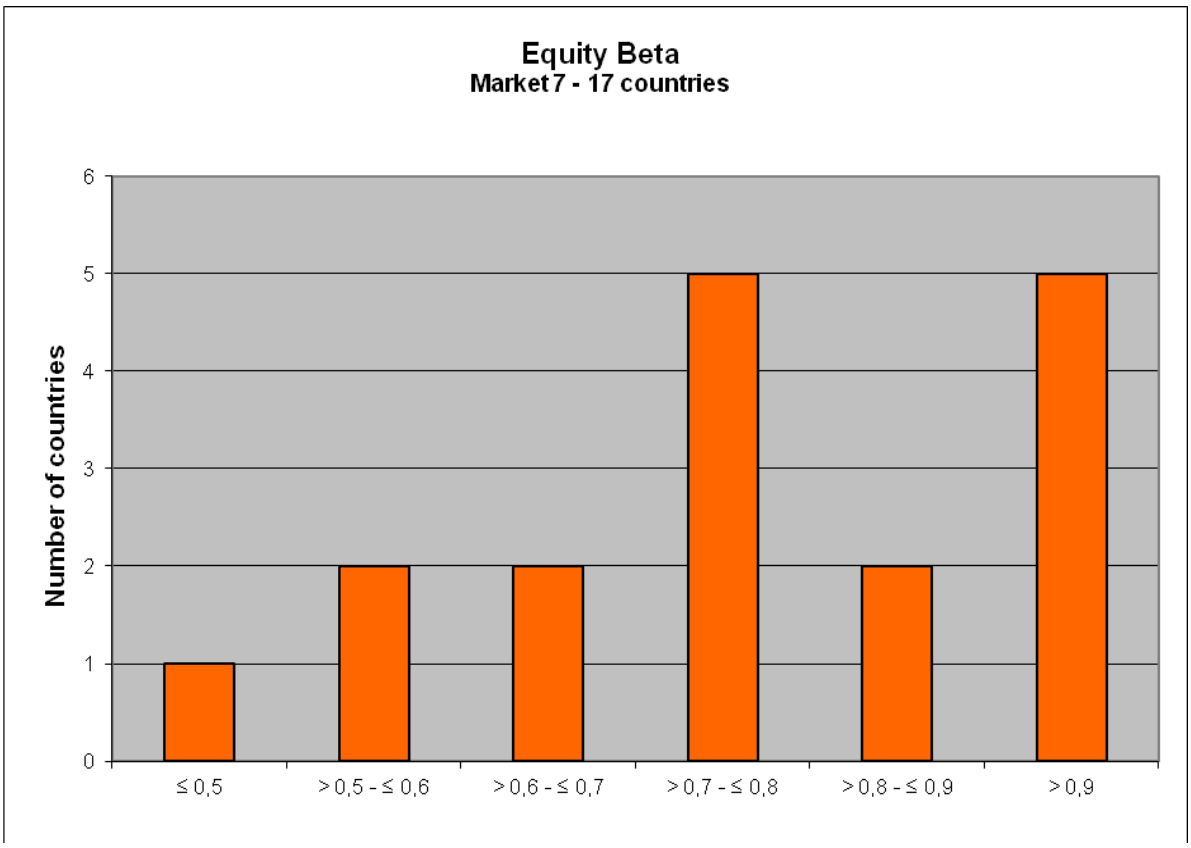
3.1.1.1 Equity Beta

The equity beta is a measure of the sensitivity of a company's returns to market returns, i.e. taking into account the company's capital structure; it is also called levered beta. It is usually estimated using a share index of relevant companies from the same/similar type of industry. The estimated equity beta is shown in the following figure for seventeen countries. Two countries only estimate asset betas, one country calculates WACC as an average of national mobile operators and the estimations of four countries cannot be shown because they are based on scenario modelling. Three countries apply benchmarking.
The values range from a low of 0.45 to a high of 1.4. Mid points and standard deviation have been calculated for this parameter as follows:

Table 18 Mid points and standard deviation – equity beta (Market 7)

Arithmetic mean	0.82
Median	0.76
Standard Deviation	0.25

Figure 22 Equity Beta (Market 7) – value range



3.1.1.2 Asset Beta

The asset beta is a measure of the sensitivity of a company's asset's returns to market returns. It is calculated from the equity beta which is adjusted leaving aside the company's capital structure; it is also called unlevered beta. Therefore, the asset beta is generally a lower value than the equity beta.

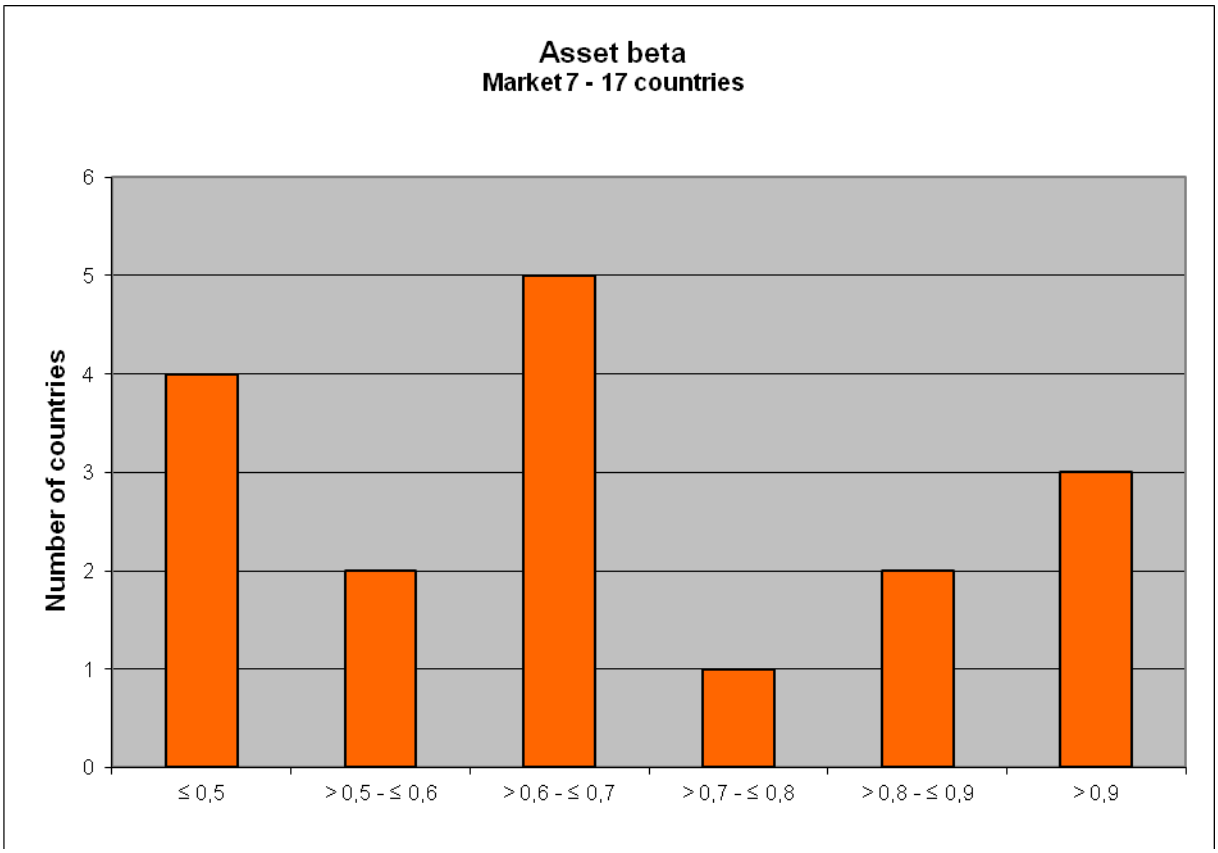
The estimation of asset beta is shown for seventeen countries. Four countries only estimate equity beta and two countries use scenario modelling, therefore their value cannot be shown in a range and one country calculates WACC as an average of national mobile operators. Three countries apply benchmarking.

The asset beta is in the range of 0.4 to over 1.3. Mid points and standard deviation have been calculated for this parameter as follows:

Table 19 Mid points and standard deviation - asset beta (Market 7)

Arithmetic mean	0.70
Median	0.64
Standard Deviation	0.26

Figure 23 Asset Beta (Market 7) – value range



3.1.1.3 Market Risk Premium

The market risk premium is the difference between the expected return on a market portfolio and the risk free rate. It is usually estimated using average (arithmetic or geometric means) historic returns on (long-term, i. e. 30 to 200 years) share or bond indices.

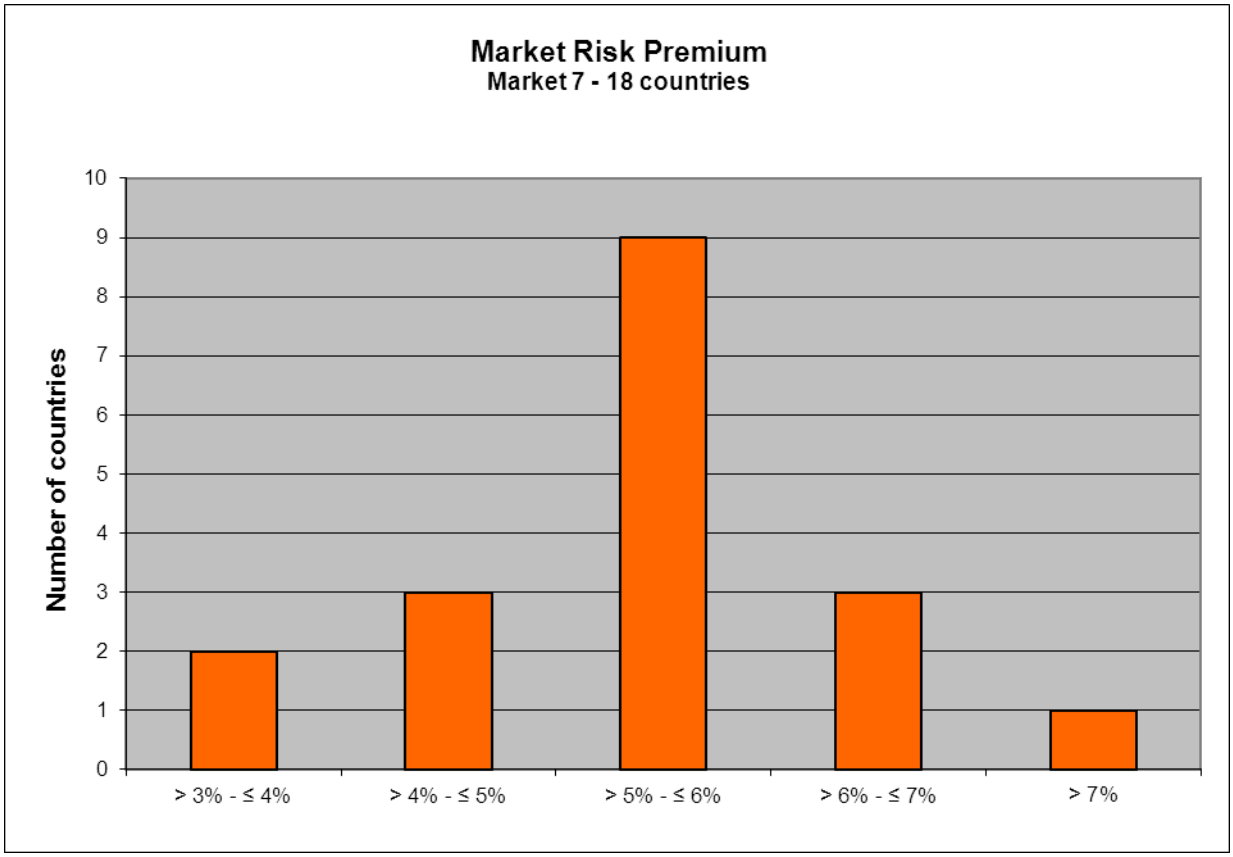
The estimated market risk premium is shown in the following figure for eighteen countries. Three countries use scenario modelling, therefore their value cannot be shown in a range and the value of two countries is missing and one country calculates WACC as an average of national mobile operators. Three countries apply benchmarking.

The values range from a low of just under 4 % to a high of more than 7 %. Mid points and standard deviation have been calculated for this parameter as follows:

Table 20 Mid points and standard deviation – market risk premium (Market 7)

Arithmetic mean	5.27 %
Median	5.21 %
Standard Deviation	0.94 %

Figure 24 Market Risk Premium (Market 7) – value range



3.1.1.4 Nominal Risk Free Rate

The nominal risk free rate is the expected return of an asset, which bears in theory no risk at all, i.e. where the expected returns are certain. This parameter is used to estimate the cost of equity as well as the cost of debt. In a regulatory environment it is usually calculated using the average of a mid to long term time-line of interest for government bonds.

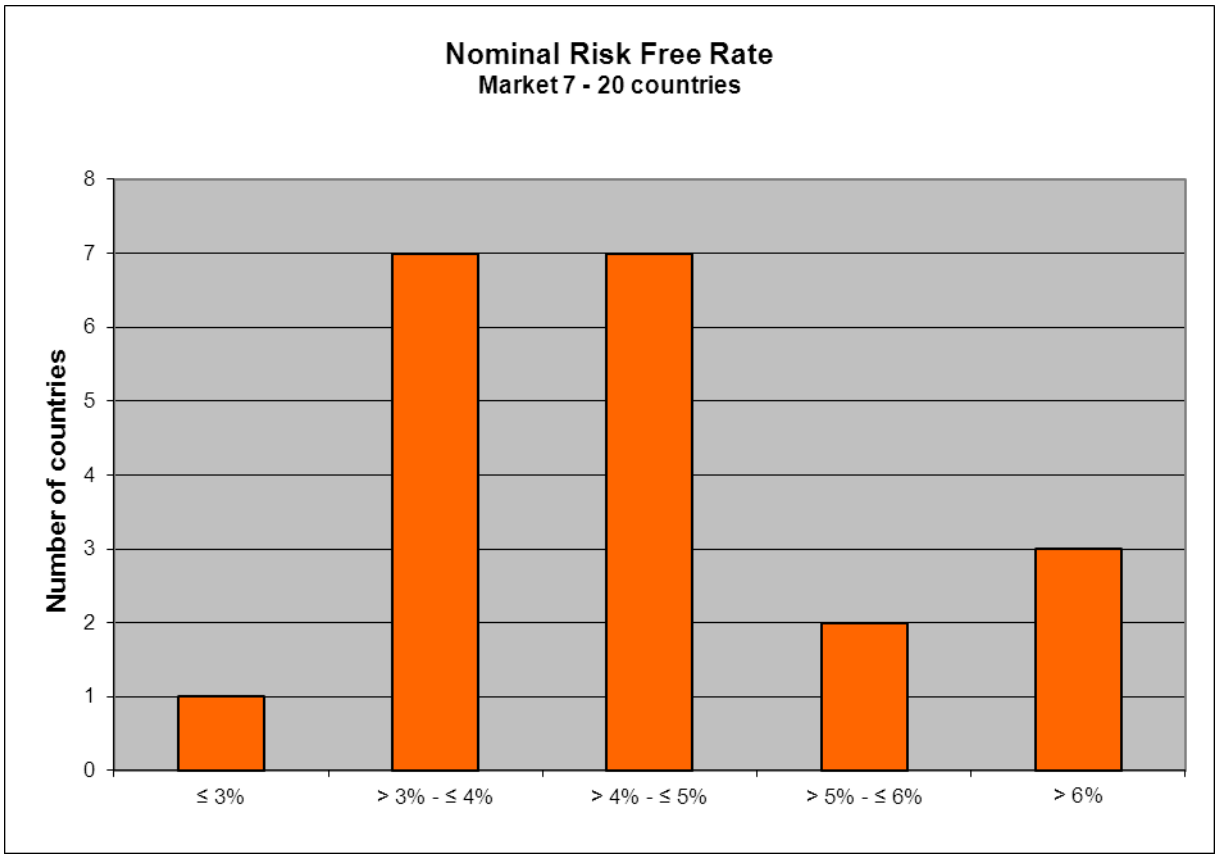
The nominal risk-free rate is shown below for twenty countries. The values of one country cannot be depicted because they use scenario modelling and the values of two countries have not been provided. One country calculates WACC as an average of national mobile operators and three countries apply benchmarking.

The values range from a low of 2.53 % to a high of 7.3 %. Mid points and standard deviation have been calculated for this parameter as follows:

Table 21 Mid points and standard deviation – nominal risk free rate (Market 7)

Arithmetic mean	4.41 %
Median	4.14 %
Standard Deviation	1.22tw %

Figure 25 Nominal Risk Free Rate (Market 7) – value range



3.1.2 Cost of Equity

3.1.2.1 Cost of Equity (Pre-Tax)

The pre-tax cost of equity is the before tax rate of return of a company that must be realised in order to satisfy investors. It is calculated from the post-tax cost of equity using a country specific tax factor.

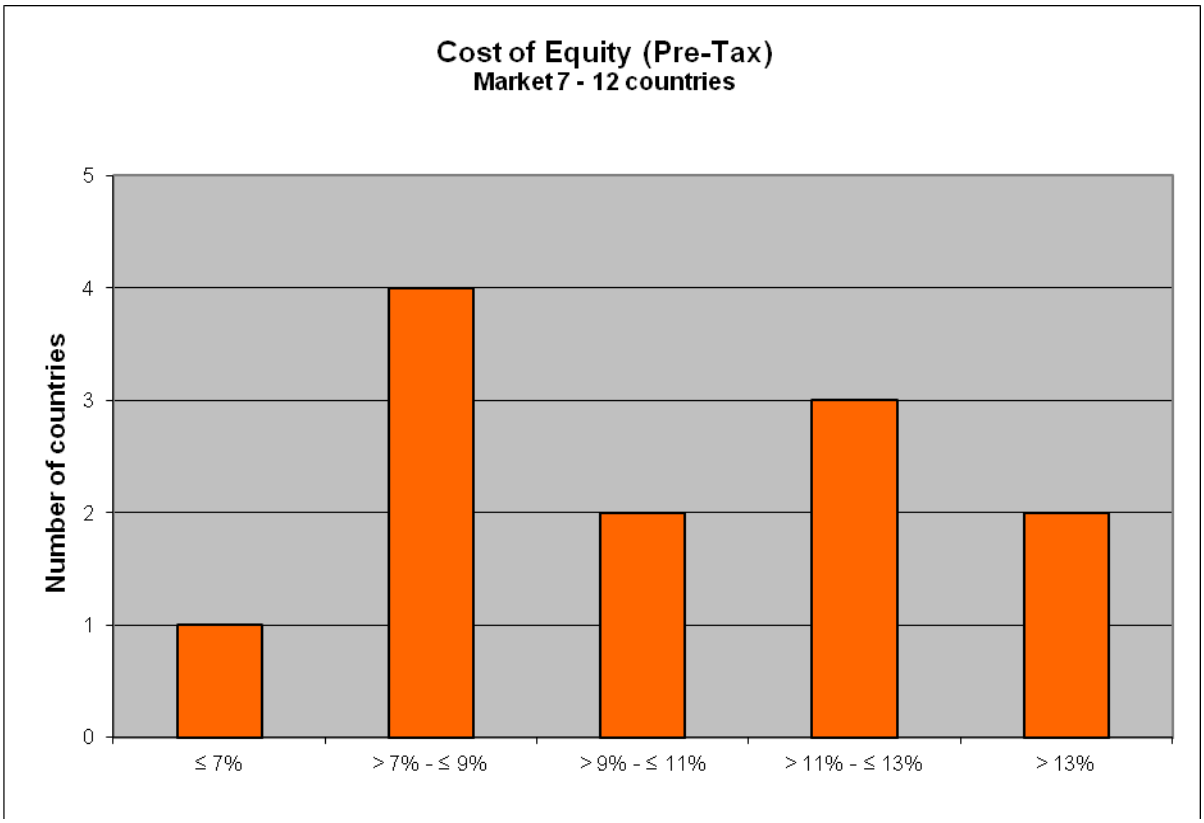
The calculated pre-tax cost of equity is shown below for twelve countries. Eight countries only estimate post-tax values. The values of two countries have not been provided. One country uses scenarios and one country calculates WACC as an average of national mobile operators. Three countries apply benchmarking.

The value range of the pre-tax cost of equity is between a low of about 5 % and a high of almost 19 %. Mid points and standard deviation have been calculated as follows:

Table 22 Mid points and standard deviation – pre-tax cost of equity (Market 7)

Arithmetic mean	10.26 %
Median	9.25 %
Standard Deviation	3.58 %

Figure 26 Pre-Tax Cost of Equity (Market 7) – value range



3.1.2.2 Average Tax Rate

The average tax rate is used to determine post-tax values. NRAs were asked to specify the average tax rate in percent used in their calculation. None of the respondents gave further information on how the average tax rate was determined (i. e. at a specific point in time, as an average over a certain time frame etc.).

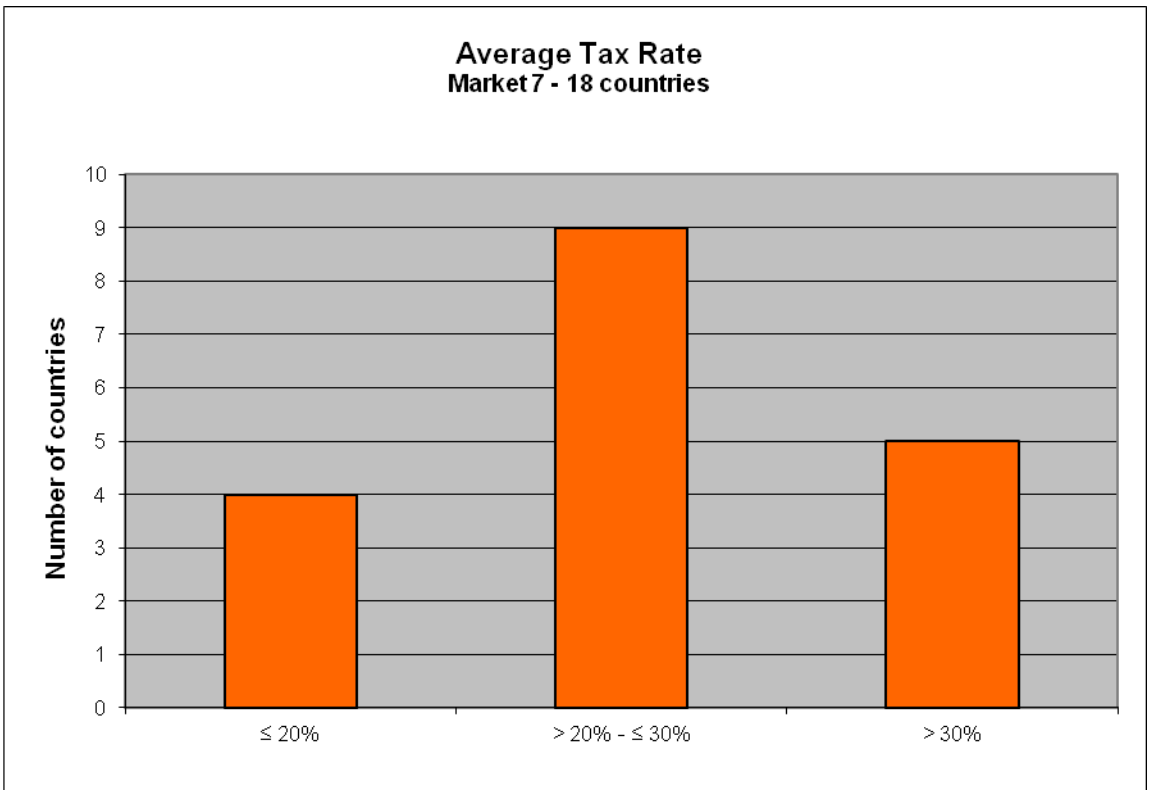
Eighteen countries have supplied their average tax rate. Four countries do not calculate an average tax rate and the values of two countries have not been reported. Three countries apply benchmarking.

The lowest average tax rate is around 12 % and the highest 36 % Mid points and standard deviation have been calculated for this parameter as follows:

Table 23 Mid points and standard deviation – average tax rate (Market 7)

Arithmetic mean	24.73 %
Median	25.00 %
Standard Deviation	6.40 %

Figure 27 Average Tax Rate (Market 7) – value range



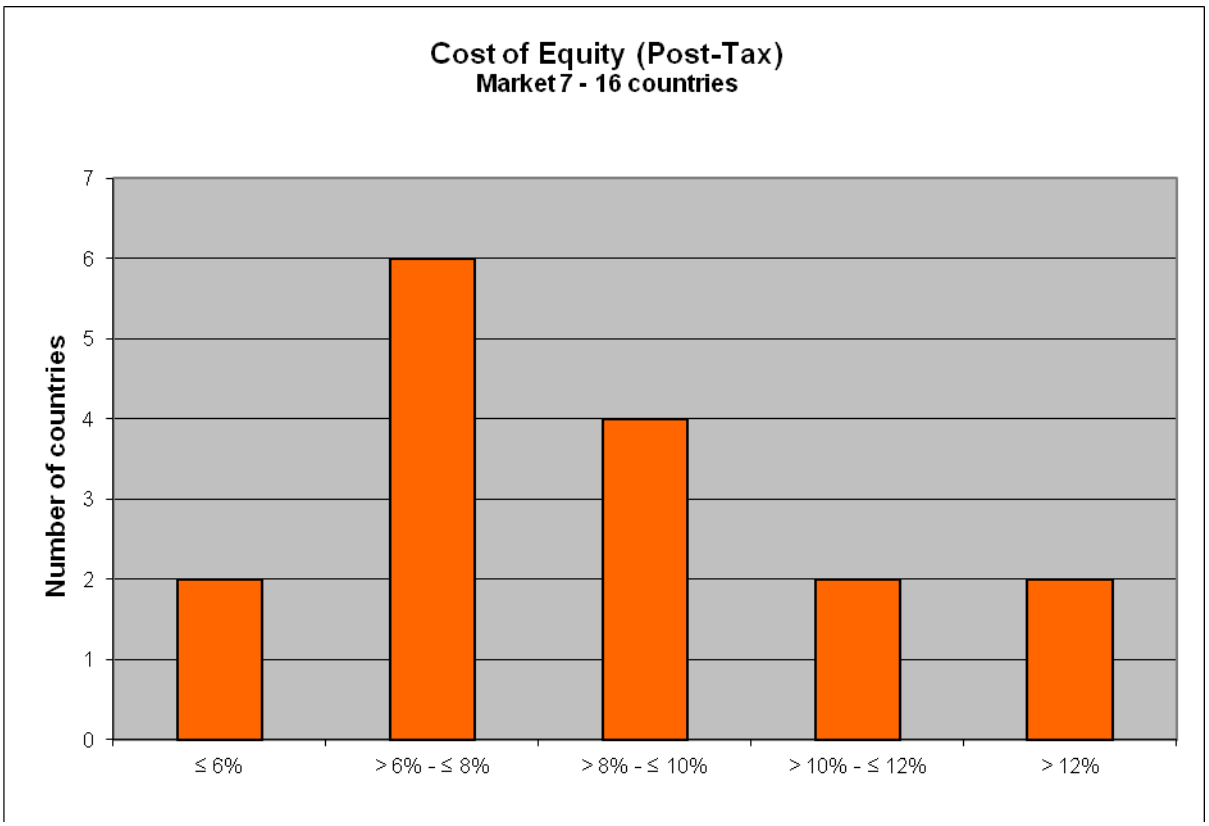
3.1.2.3 Cost of Equity (Post-Tax)

The post-tax cost of equity is the after tax rate of return of a company that must be realised in order to satisfy investors. It is usually calculated using the estimated beta multiplied with the estimated market risk premium (= the equity risk premium) and adding the risk free rate.
The post-tax cost of equity is shown for sixteen countries in the following figure. Two countries only estimate pre-tax values. The value of two countries is missing and one country calculates WACC as an average of national mobile operators. Three countries use scenario modelling, therefore their values cannot be shown in a range. Three countries apply benchmarking.
The lowest value is 5.2 %, the highest just over 15 %. Mid points and standard deviation have been calculated as follows:

Table 24 Mid points and standard deviation – post-tax cost of equity (Market 7)

Arithmetic mean	8.95 %
Median	8.11 %
Standard Deviation	0.02 %

Figure 28 Post-Tax Cost of Equity (Market 7) – value range



3.1.3 Cost of Debt Parameters

3.1.3.1 Nominal Risk Free Rate

The nominal risk free rate is the expected return of an asset, which bears in theory no risk at all, i.e. where the expected returns are certain. This parameter is used to estimate the cost of equity as well as the cost of debt. In a regulatory environment it is usually calculated using the average of a mid to long term time-line of interest for government bonds.
Results are shown in point 3.1.1.4.

3.1.3.2 Risk Premium Debt

The risk premium debt is the return in excess of the risk-free rate of return that an investor expects to yield for a risky debt. It is usually estimated based on an average of the risk premium for long-term (i. e. 5-20 years) bills or bonds (usually of companies operating within the same industry).

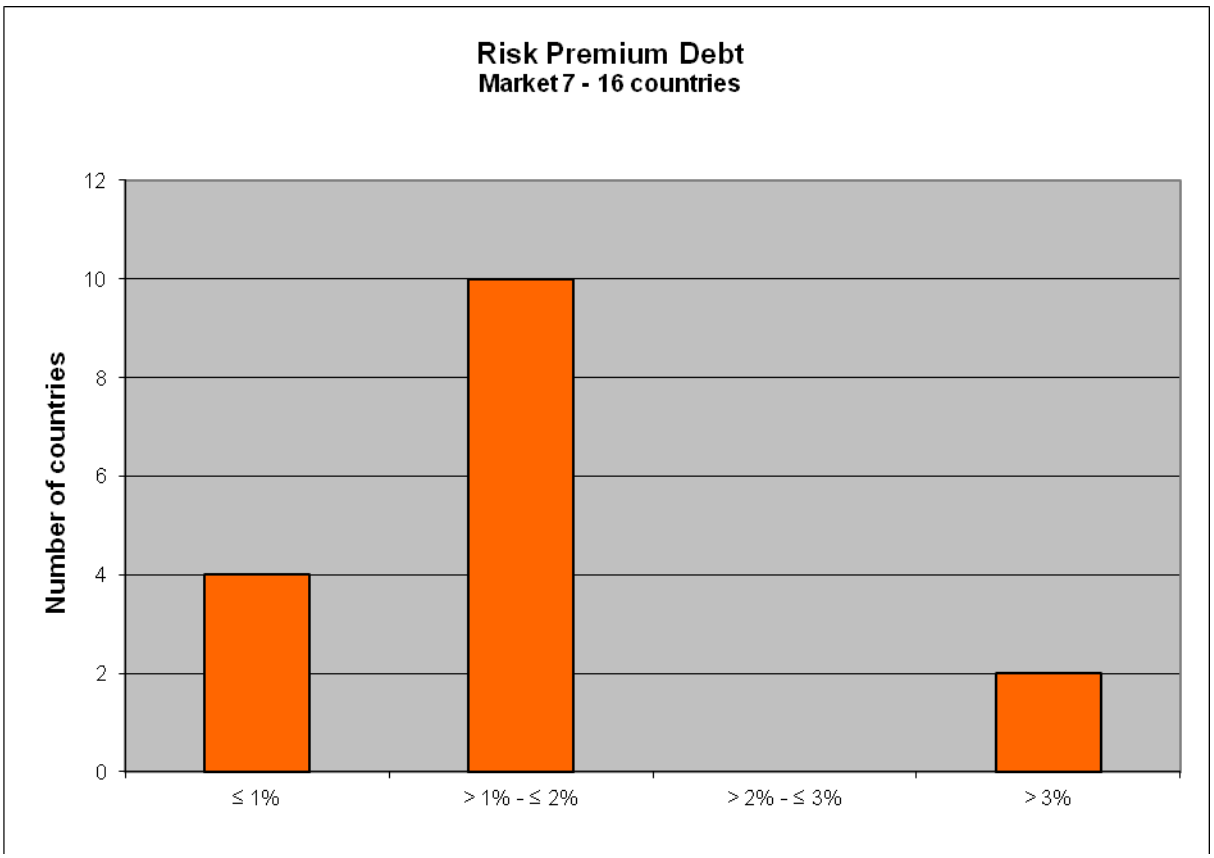
Sixteen countries have provided information on the risk premium debt. The values of three countries are not shown here because they use scenario modelling and the values of five countries are unknown or are not calculated. Three countries apply benchmarking.

The value range spans a low of 0.13 % and a high of 4.64 %. Mid points and standard deviation have been calculated for this parameter as follows:

Table 25 Mid points and standard deviation – risk premium debt (Market 7)

Arithmetic mean	1.60 %
Median	1.50 %
Standard Deviation	1.14 %

Figure 29 Risk Premium Debt (Market 7) – value range



3.1.4 Cost of Debt

3.1.4.1 Cost of Debt (Pre-Tax)

The pre-tax cost of debt is the before tax return in excess of the risk-free rate of return that an investor expects to yield for a risky debt. It is calculated from the pre-tax cost of debt using a country specific tax factor.

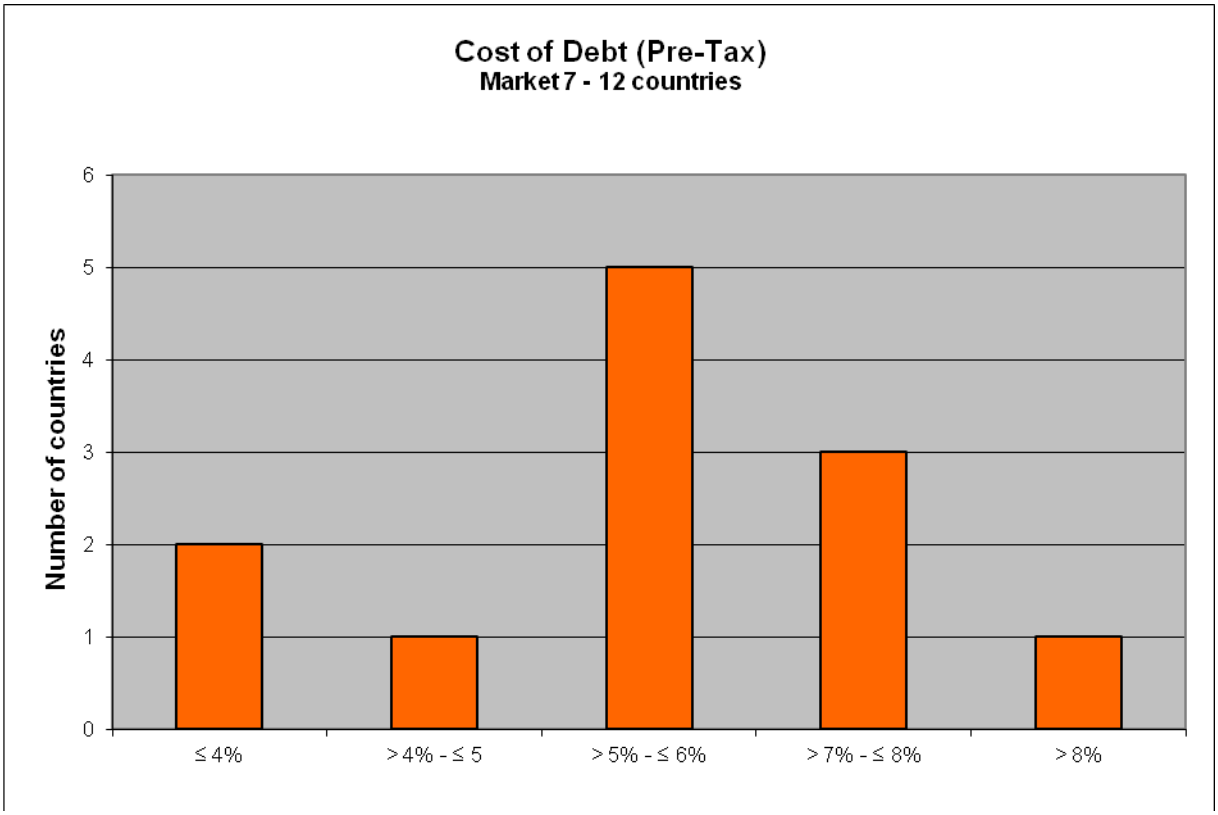
Twelve countries have provided information on their pre-tax cost of debt. Six countries only calculate post-tax values, two countries uses scenario modelling, therefore their value cannot be shown here and the values of four countries are not included. Three countries apply benchmarking.

The value range lies between a low of 3 % and a high of almost 10 %. Mid points and standard deviation have been calculated as follows:

Table 26 Mid points and standard deviation – pre-tax cost of debt (Market 7)

Arithmetic mean	5.71 %
Median	5.50 %
Standard Deviation	1.88 %

Figure 30 Pre-Tax Cost of Debt (Market 7) – value range



3.1.4.2 Average Tax Rate

The average tax rate is used to determine post-tax values. NRAs were asked to specify the average tax rate in percent used in their calculation. However none of the respondents gave further information on how the average tax rate was determined (i. e. at a specific point in time, as an average over a certain time frame etc.).
Results are shown in point 3.1.2.2.

3.1.4.3 Cost of Debt (Post-Tax)

The post-tax cost of debt is the after tax return in excess of the risk-free rate of return that an investor expects to yield for a risky debt. It is calculated using the nominal risk free rate and adding the estimated risk premium debt.

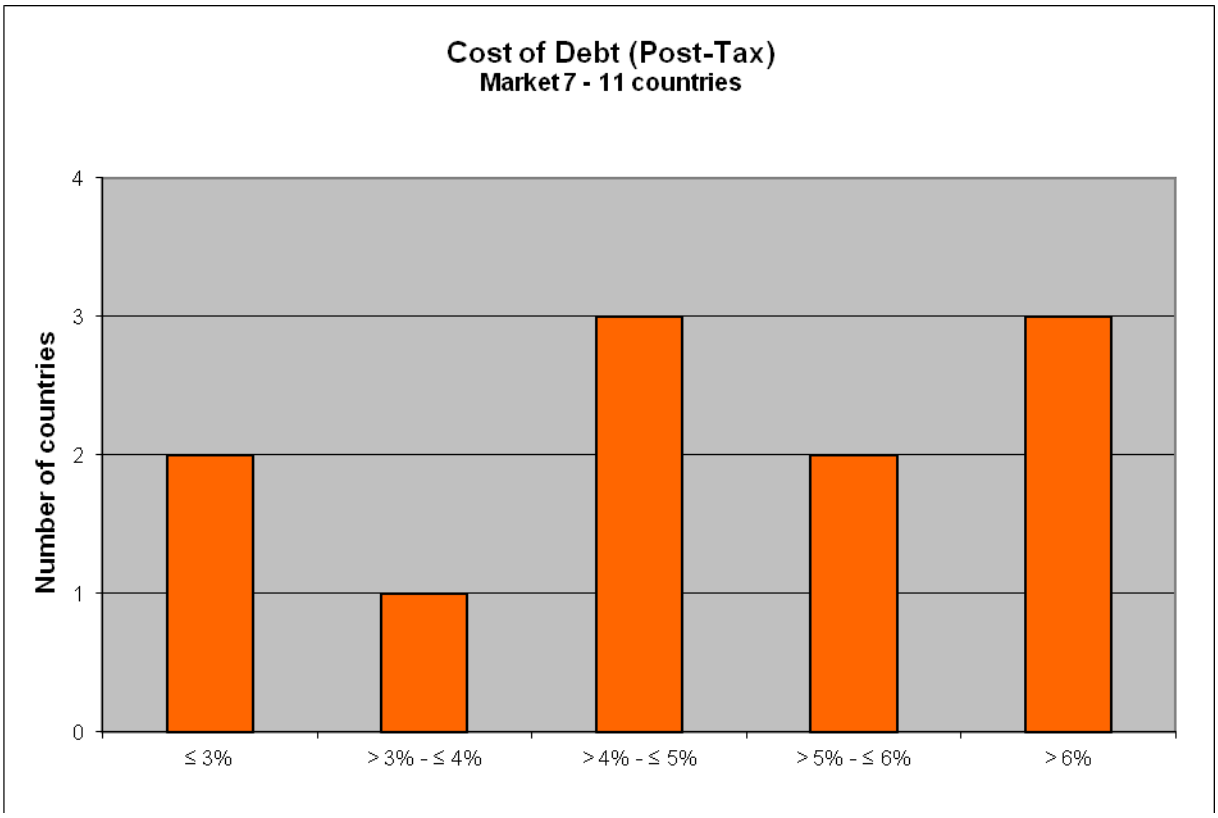
The value of the post-tax cost of debt is shown below for eleven countries. Three countries use scenario modelling, therefore their value cannot be shown. Six countries only calculate pre-tax values and the values of three countries have not been provided. One country calculates WACC as an average of national mobile operators and three countries apply benchmarking.

The value range lies between a low of 1.71 % and a high of 7.72 %. Mid points and standard deviation have been calculated as follows:

Table 27 Mid points and standard deviation – post-tax cost of debt (Market 7)

Arithmetic mean	4.85 %
Median	4.50 %
Standard Deviation	1.85 %

Figure 31 Post-Tax Cost of Debt (Market 7) – value range



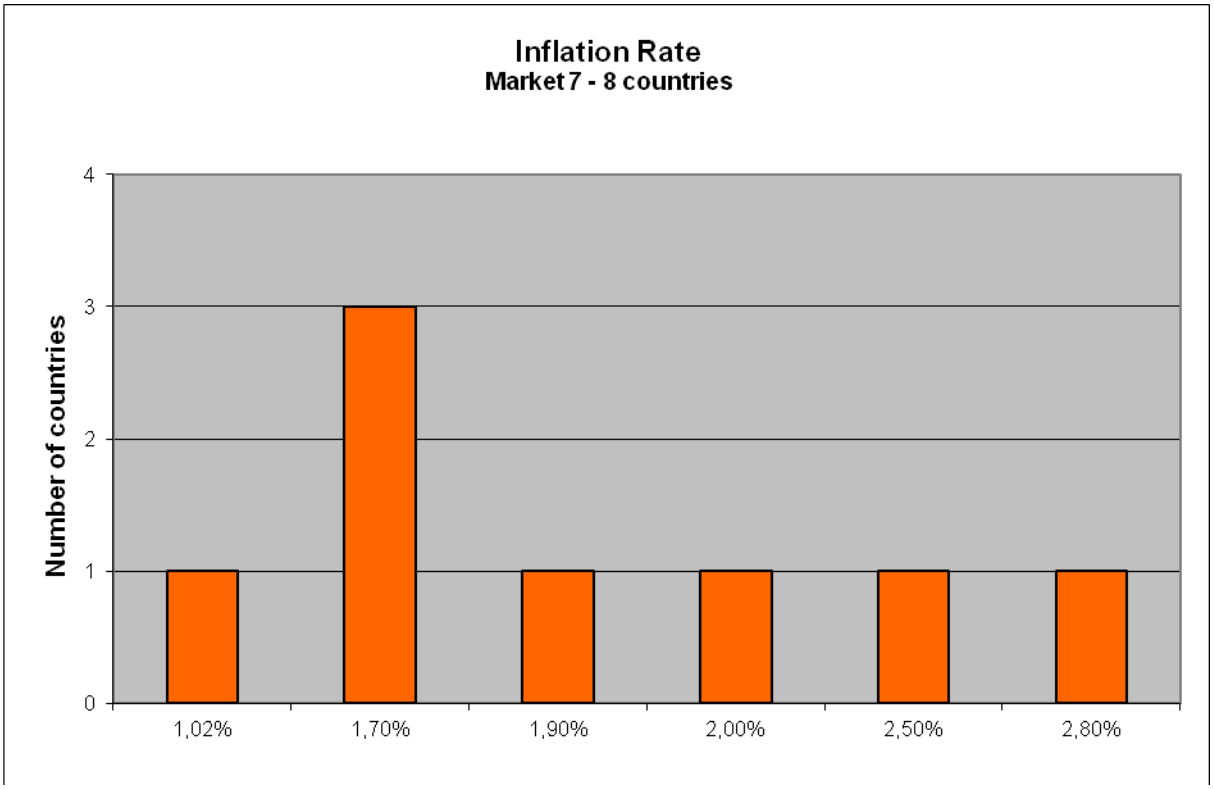
3.1.5 Inflation Rate

The inflation rate is used by some countries to determine real values, as opposed to nominal values. These are adjusted with a given inflation rate for the regulation period. NRAs were asked to specify the inflation rate in percent they use in their calculations. None of the respondents provided further information on how this average inflation rate was determined (i. e. at a specific point in time, as an average over a certain time frame etc.)
Eight countries have provided their inflation rate, however, as can be seen in point 3.1.6 only five countries apply a real pre-tax WACC. Three countries apply benchmarking.
The inflation rate is very country specific (i. e. determined from a country-specific basket of goods) and varies from a minimum of around 1.02 % to a maximum of 2.8 %. Mid points and standard deviation have been calculated for this parameter as follows:

Table 28 Mid points and standard deviation – inflation rate (Market 7)

Arithmetic mean	1.92 %
Median	1.80 %
Standard Deviation	0.54 %

Figure 32 Inflation Rate (Market 7) – value range



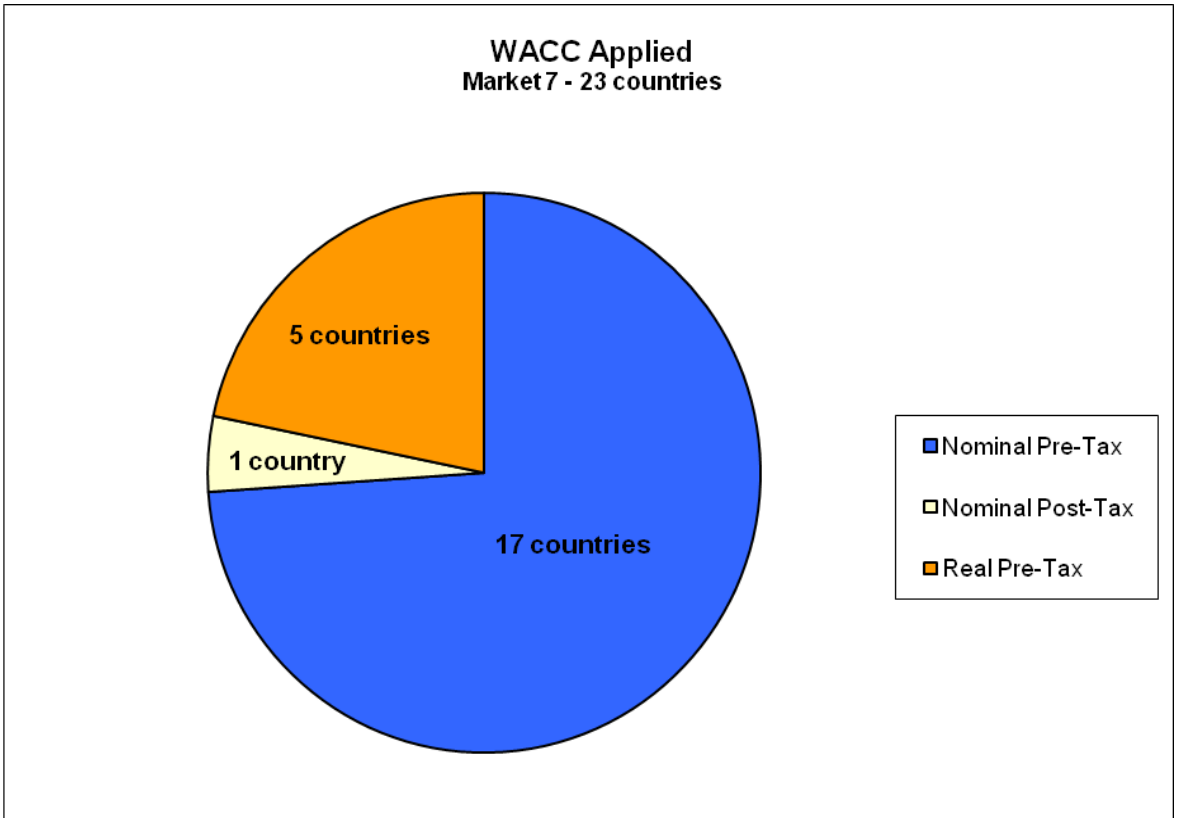
3.1.6 WACC Applied

Respondents were asked what type of WACC they apply in their calculations. All countries replied except for the three countries that apply benchmarking and the country that calculates WACC as an average of national operators.

A majority of seventeen respondents specified that they apply a nominal pre-tax WACC, i. e. they do not make adjustments for inflation; the value is specified in point 3.1.7.

Five countries apply a real pre-tax WACC, i. e. they make adjustments for inflation to the WACC applied; the value is specified in point 3.1.8. One country applies a nominal post-tax WACC.

Figure 33 WACC Applied (Market 7) – number of countries



3.1.7 WACC Value (Nominal Pre-Tax)

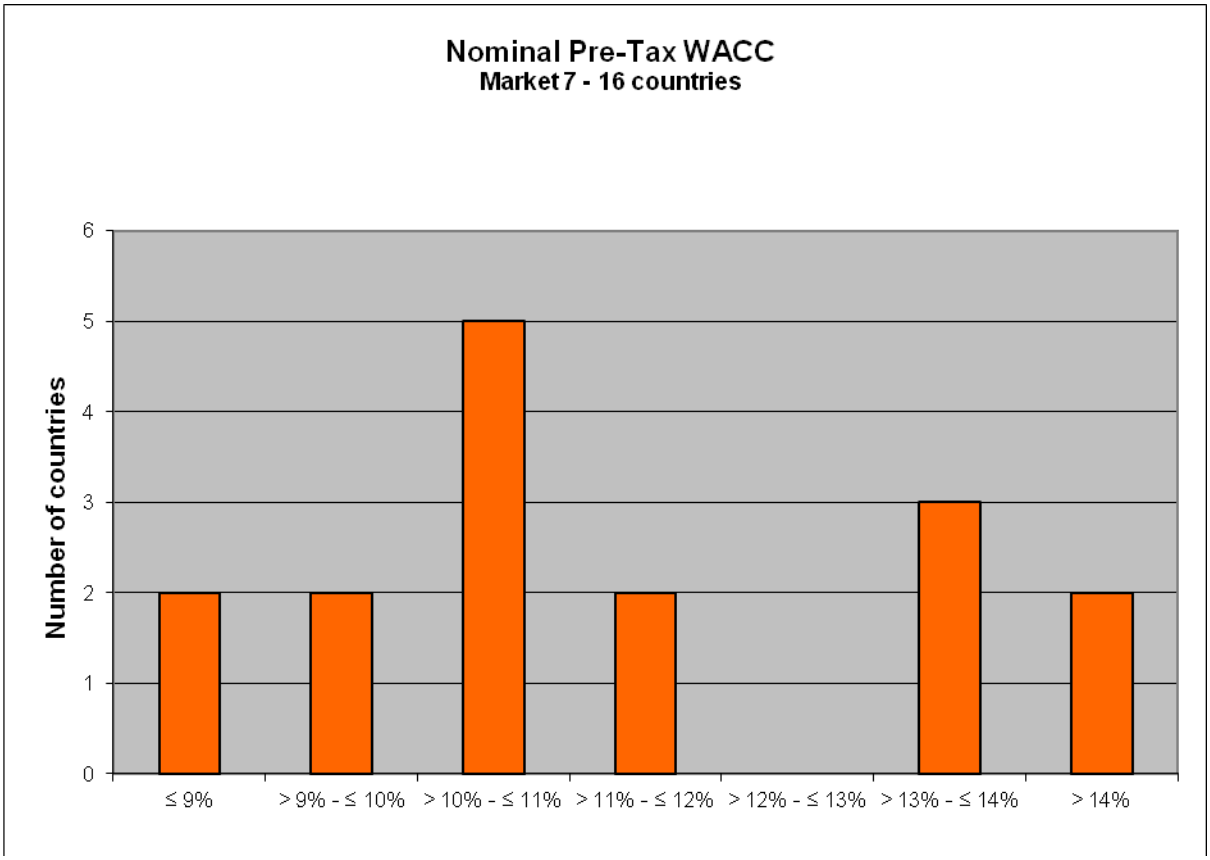
Seventeen countries apply a nominal pre-tax WACC. The values of the sixteen countries are shown in comparison because one country uses scenario modelling and thus their value cannot be shown in a range.

The estimation of the WACC value varies between a low of just over 5 % and a high of almost 16 %. Mid points and standard deviation have been calculated as follows:

Table 29 Mid points and standard deviation – nominal pre-tax WACC (Market 7)

Arithmetic mean	11.19 %
Median	10.69 %
Standard Deviation	2.60 %

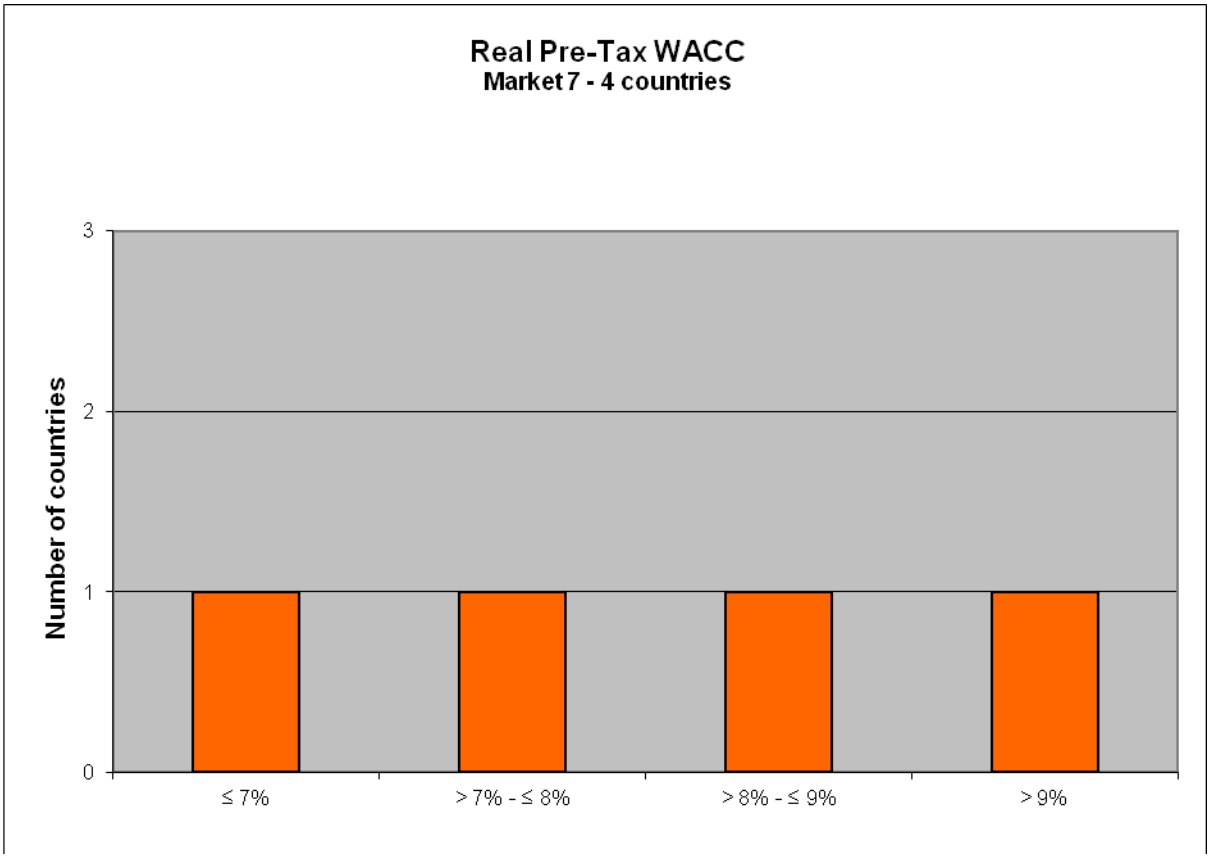
Figure 34 Nominal Pre-Tax WACC (Market 7) – value range



3.1.8 WACC Value (Real Pre-Tax)

The WACC value of four countries (one country that also applies a real pre-tax WACC has not provided a value) that apply a real pre-tax WACC is between 6 % and 10 %.

Figure 35 Real Pre-Tax WACC (Market 7) – value range



3.1.9 Qualitative Questions

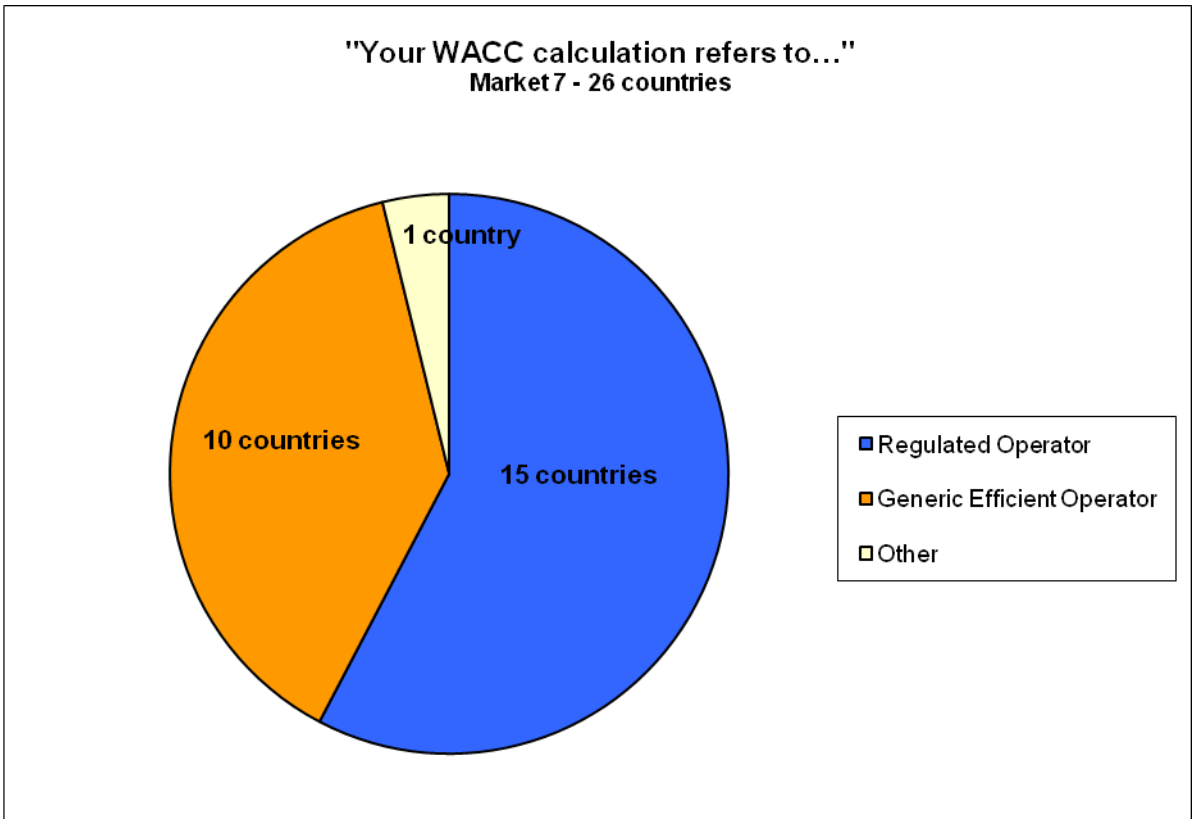
Six qualitative questions were posed to the NRAs in order to ascertain who the regulation is applied to (i.e. the regulated operator / the generic efficient operator), the length of the regulation period, for which time period the cost of capital parameters are specified, updated and applied to and if the parameters are/may be adjusted outside of the specified time period.

3.1.9.1 WACC Applied to Operator

NRAs were to specify, if their ***"WACC calculation refers to the "regulated operator", a "generic efficient operator" or "other"***. Twenty-six countries responded to this question; one country did not provide information.

Fifteen countries apply the WACC to the regulated operator, whereas ten countries apply the WACC to a generic efficient operator. The "other" answer was not further specified.

Figure 36 WACC Applied to Operator (Market 7) – number of countries

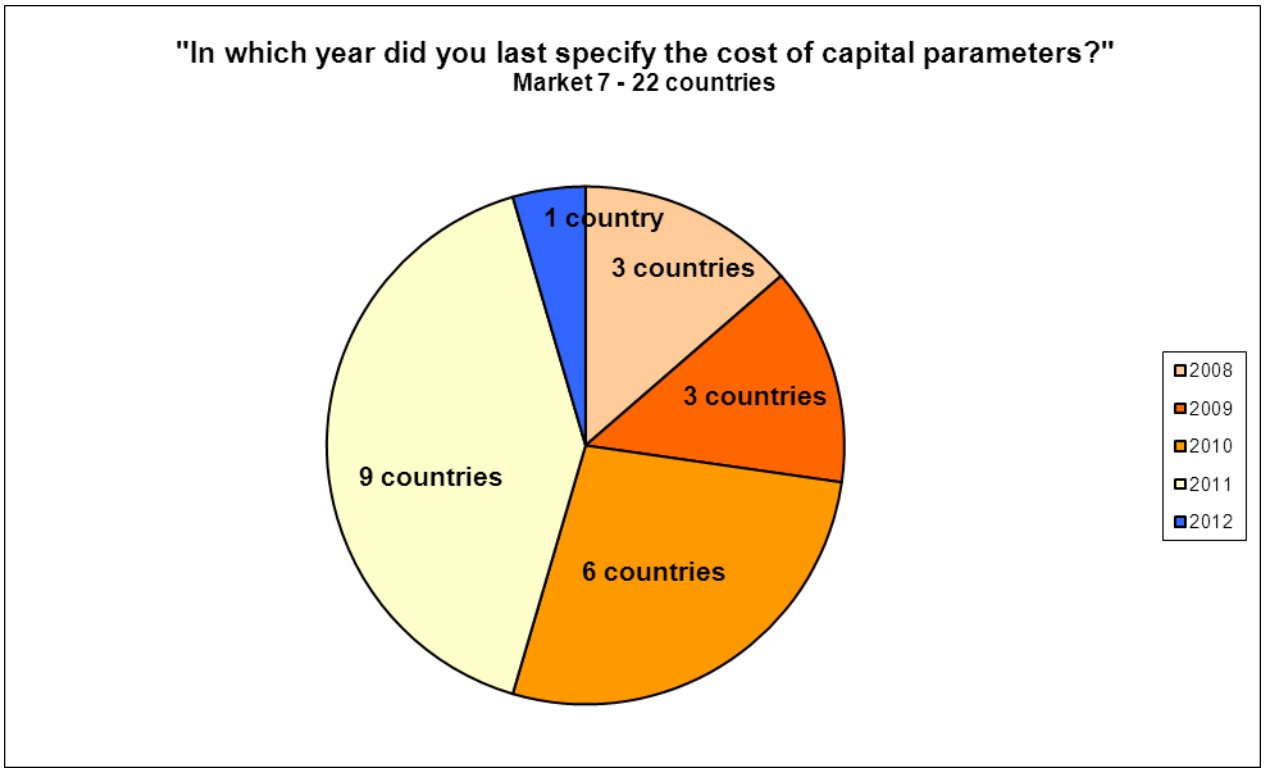


3.1.9.2 Specification of Cost of Capital Parameters

The following chart shows how NRAs answered the question ***"in which year did you last specify the cost of capital parameters?"*** Twenty-two countries have responded to this question, five countries have not provided information.

Most countries have specified the parameters most recently in 2010, 2011 or 2012 (sixteen countries), the remaining six countries have specified the parameters prior to that time period (2008, 2009).

Figure 37 Specification of Cost of Capital Parameters (Market 7) – number of countries

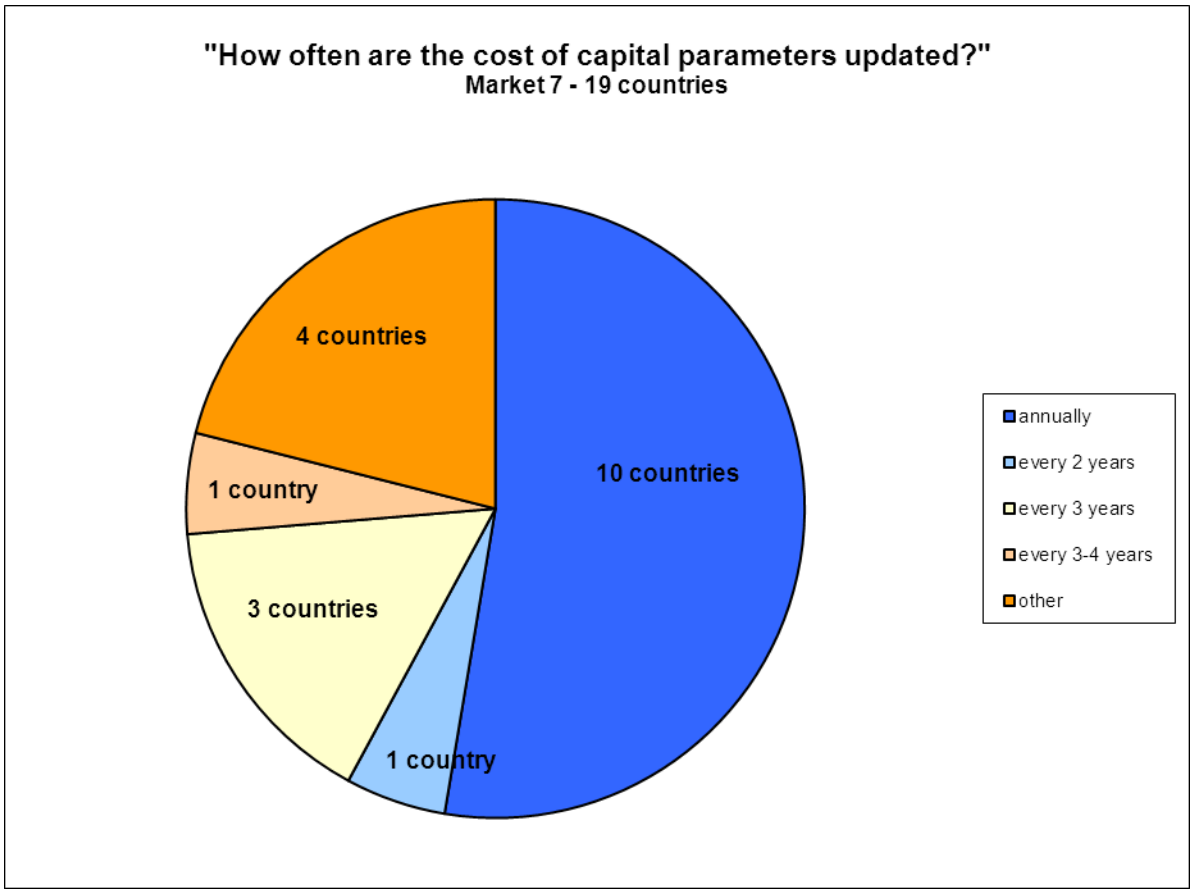


3.1.9.3 Update Frequency for Cost of Capital Parameters

Nineteen respondents answered the question ***"how often are cost of capital parameters updated?"*** Eight countries did not provide information.

A majority of ten countries update their cost of capital parameters annually.

Figure 38 Update Frequency for Cost of Capital Parameters (Market 7) – number of countries

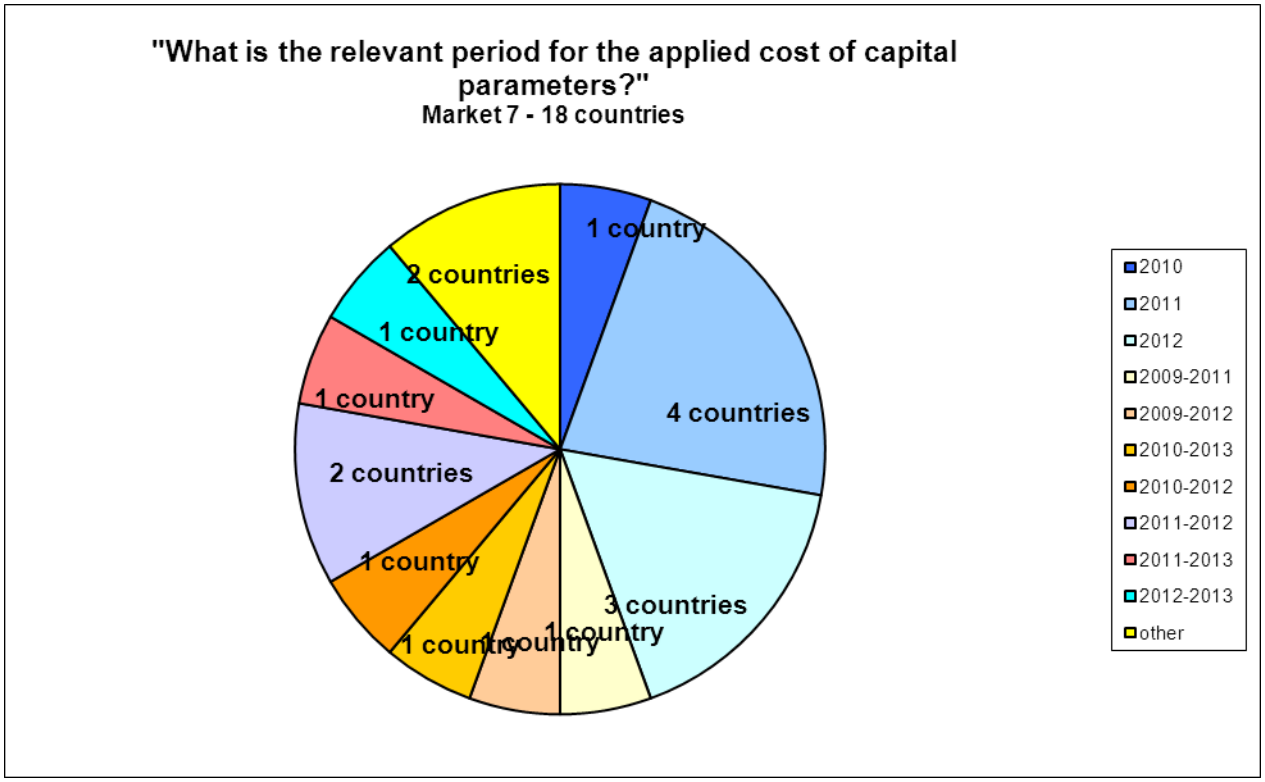


3.1.9.4 Relevant Period for Applied Cost of Capital Parameters

The question ***"what is the relevant period for the applied cost of capital parameters?"*** was answered differently within most of the eighteen countries that have responded to this question. Nine countries did not provide information to this question.

The regulatory period includes years or time periods dating from 2009 until 2013.

Figure 39 Relevant Period for Applied Cost of Capital Parameters (Market 7 – number of countries)

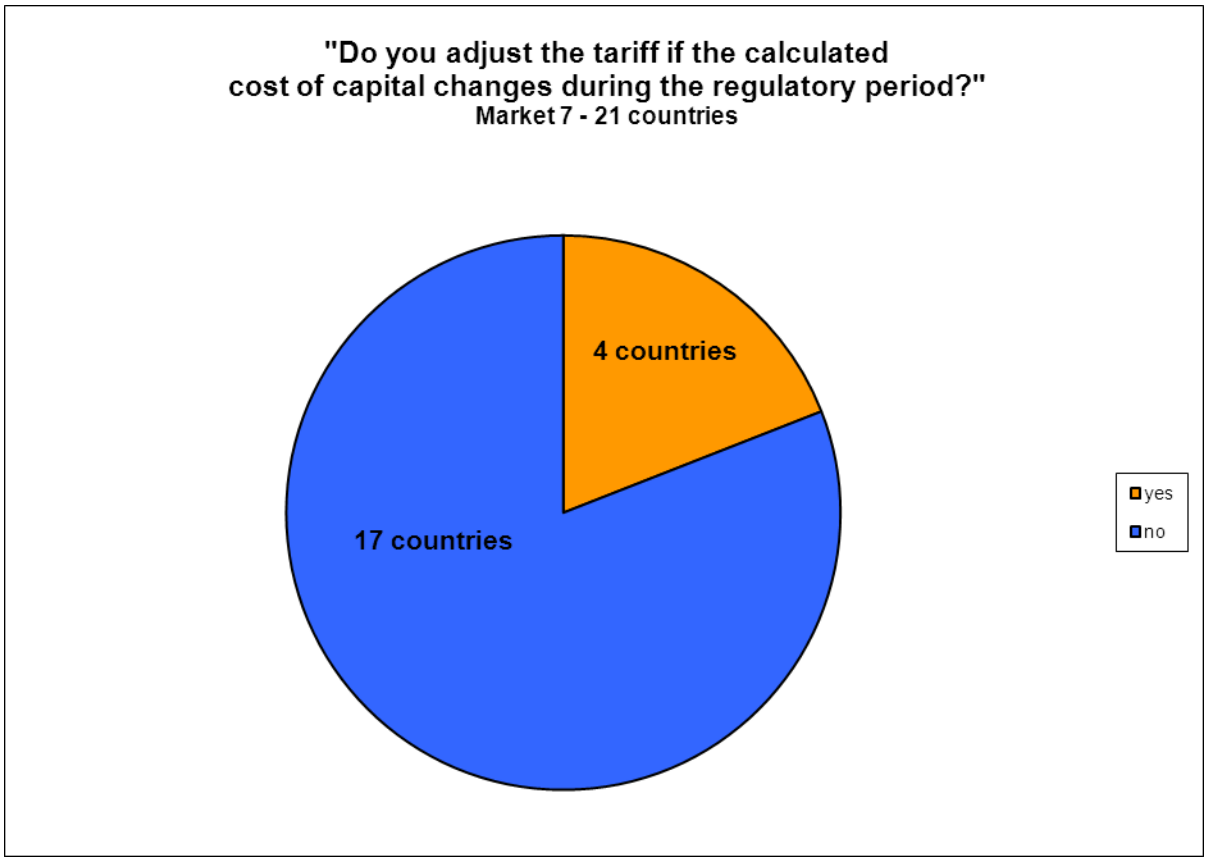


3.1.9.5 Adjustment of Tariffs

Respondents were required to specify the following: ***"do you adjust the tariff if the calculated cost of capital changes during the regulatory period?"*** Five countries have not provided information to this question.

Of the twenty-one countries that have replied to this question a majority of seventeen do not immediately adjust the regulated tariff if the calculated cost of capital changes during the regulatory period. The remaining four countries adjust their tariffs.

Figure 40 Adjustment of Tariffs (Market 7) – number of countries

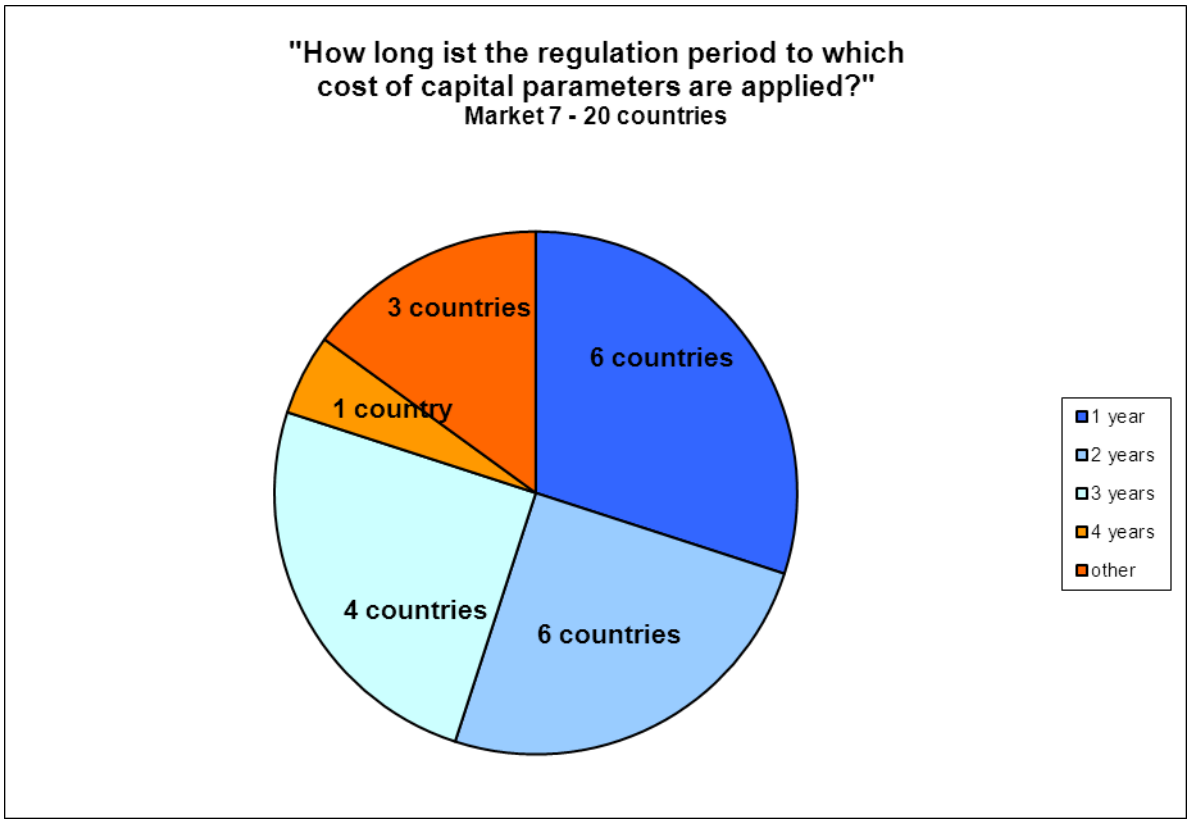


3.1.9.6 Length of the Regulation Period

Concerning the question ***"how long is the regulation period to which the cost of capital parameters are applied?"*** there was a reply from twenty countries – seven countries have not provided information.

The regulation period of sixteen countries runs from one to three years. One countries' regulation period spans four years and three countries apply their cost of capital parameters to an altogether different regulation period (i. e. "not defined" or "until new decision").

Figure 41 Length of Regulation Period (Market 7) – number of countries



4 Glossary

Arithmetic mean	The central value of a data set, i. e. the sum of the values divided by the number of values.
CAPM	Capital Asset Pricing Model. The CAPM is a model that describes the relationship between risk and expected return used to calculate the return on equity.
Median	A numerical value separating the higher half of the data sample from the lower half. The value can be used to reduce the predominance of outliers (in arithmetic mean values).
Standard deviation	A measure of the variation from the mean value. A low standard deviation indicates that the data points tend to be very close to the mean; a high standard deviation indicates that the data points are spread out over a large range of values. It is the square root of the data set's variance. Unlike variance, the standard deviation is expressed in the same units as the data. For measurements with percentage as the units, the standard deviation will have percentage points as the units.
WACC	Weighted Average Cost of Capital. The rate that an operator is expecting to pay on average to all its security holders (equity and debt) to finance its assets.