Report for Nkom

Updating the mobile margin-squeeze tool

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Contents

1 Introduction

Analysys Mason has been commissioned to support Nkom on the adaptation and finalisation of the margin-squeeze tool that was previously developed in 2016, to ensure that it can continue to be used as a primary price-control tool for the regulation of wholesale mobile access prices. The previous version of the margin-squeeze tool previously developed is referred to as the "March 2020 model" in this document. A small number of refinements have been made to this version to develop an updated version of the margin-squeeze tool. This will be referred to as the "June 2022 model".

This document provides an overview of the June 2022 model. It outlines the general model structure and its underlying principles, as well as explaining how to adjust the various inputs and parameters of the margin-squeeze tool.

1.1 Background

With regard to the imposition of a 'regulatory package' on Telenor in the market for access and call origination on mobile networks (Market 15 (2004) of the EFTA[1] Surveillance Authority, or ESA), Nkom launched a public consultation in September 2015 and notified a final decision to ESA in 2016. The overarching objective of the margin-squeeze tool remains to ensure that Nkom has at its disposal:

- a fully functioning margin-squeeze test tool that it can use to approve Telenor's reference offers for mobile virtual network operators (MVNO)
- a gross-margin test for all retail products that it can use to verify that these retail products would cover their direct and variable costs if the network inputs were bought based on the reference offers of Telenor.

In 2019, Analysys Mason has redeveloped all aspects of the margin-squeeze tool, in order to simplify the calculation flow and the procedure for updating the margin-squeeze tool with new data.

Analysys Mason has then simplified the approach to calculating the retail cost component, although the parametrisation in the June 2022 model is informed by the same input data as in earlier versions of the model. This new approach is described in Annex A.

1.2 Key inputs

We have used a range of data sources to build and populate the June 2022 model. These include some Nkom market statistics and aggregated data provided by Telenor. The main inputs are updated after receiving responses to the data requests sent to Telenor twice a year. Please refer to Section 2.3 for a more extensive explanation of the inputs used in the June 2022 model.

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[1]   European Free Trade Association.

1.3 Formatting and naming conventions

Consistent cell formatting has been used throughout all worksheets of the June 2022 model. This is to increase the transparency of the margin-squeeze tool, as well as making it easier to understand and modify. A number of standardised cell formats are used to distinguish parameters, data, calculations and links. The most important conventions are shown below in Figure 1.1.

Figure 1.1: Formatting conventions used in the June 2022 model [Source: Analysys Mason, 2022]

Throughout this user guide we have used the following naming conventions:

- **Worksheets**: *'XXXXX'* (e.g. *'Revenue'*)
- **Worksheet sub-sections**: 'XXXXX' (e.g. 'Tariffs')
- **Sub-section categories**: <**XXXXX**> (e.g. <**International tariffs**>).

1.4 Structure of this document

The remainder of this user guide is structured as follows:

- Section 2 describes the general structure of the margin-squeeze tool and its underlying principles
- Section 3 explains the process for maintaining and updating the June 2022 model
- Annex A describes how the retail costs have been calculated in the June 2022 model.

2   General model description

This section describes the structure of the June 2022 model and its underlying principles:

- model structure and granularity of data (Section 2.1)
- control panel (Section 2.2)
- model inputs (Section 2.3)
- model calculations and outputs (Section 2.4).

2.1   Model structure

The June 2022 model generates results for a given period, specified by the user. Figure 2.1 shows the overall structure of the June 2022 model, including the flow of calculations and the links between the different worksheets.
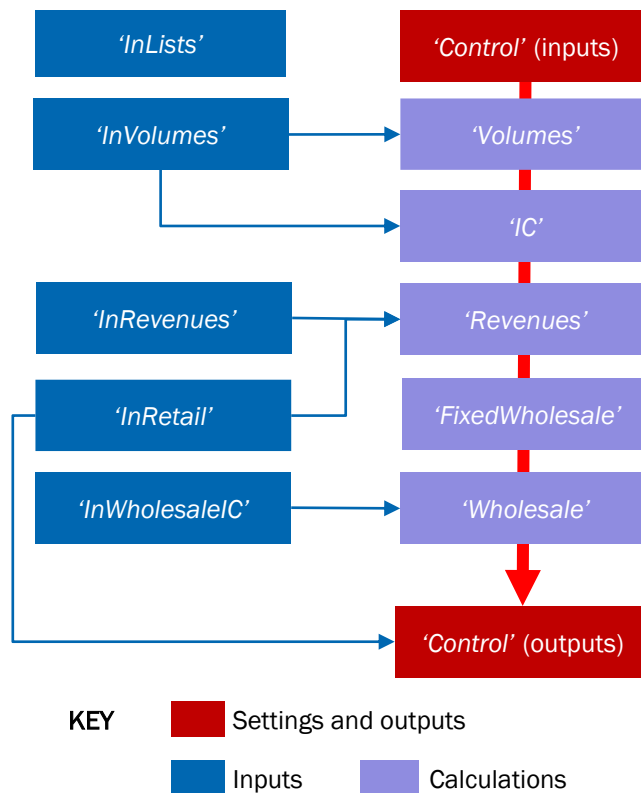

Figure 2.1: Overall structure of the margin-squeeze test tool [Source: Analysys Mason, 2022]

The table below provides a brief description of each worksheet within the June 2022 model.
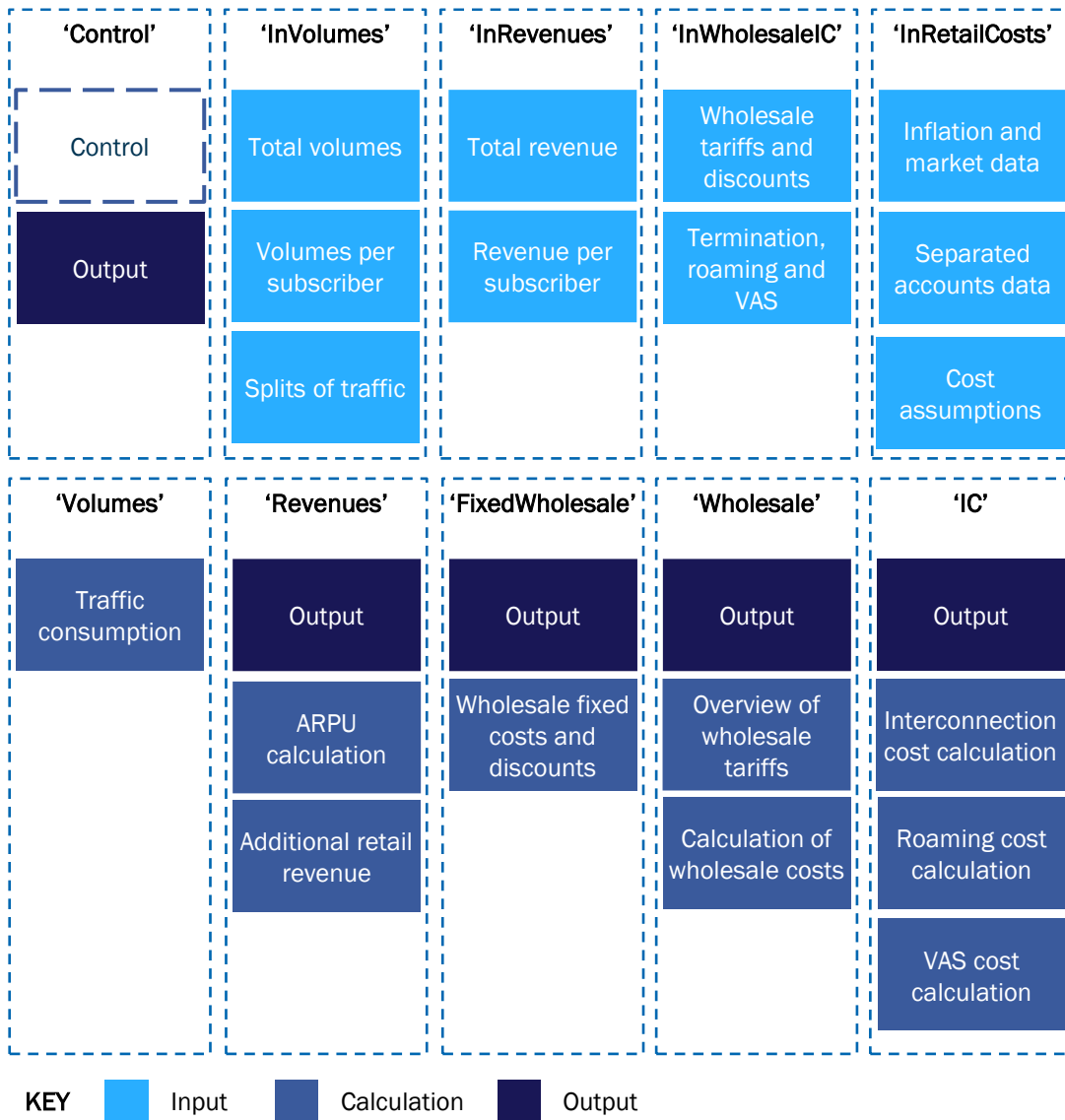
Figure 2.2: Overview of the worksheets in the June 2022 model [Source: Analysys Mason, 2022]

Worksheet	Description
'C'	Lists the worksheets constituting the margin-squeeze tool
'V'	Specifies the version history of the margin-squeeze tool
'S'	Provides a guide to the styles used in the margin-squeeze tool
'L'	Specifies the lists used in the margin-squeeze tool
'Control'	Contains the key settings and main hypothesis, and provides outputs of the margin-squeeze test tool
'InLists'	Contains key lists and definitions, including the listed wholesale offers and their assumed data speed options
'InVolumes'	Includes input data regarding traffic volumes and package offers This worksheet serves as input for the following worksheets: 'Volumes', 'Revenues', 'Wholesale' and 'IC'
'InRevenues'	Presents the tariff data inputs, including the monthly fees for the offers, the tariffs for out-of-the-bundle-traffic for voice, SMS and data, and the tariffs for value-added services (VAS), international traffic and international roaming This worksheet serves as input for 'Revenues'
'InWholesaleIC'	Presents the data from the wholesale reference offer and other interconnect costs This worksheet serves as input for 'FixedWholesale', 'Wholesale' and 'IC'
'InRetailCosts'	Presents assumptions (fixed versus variable costs by segment) on retail costs and revenue. Also contains relevant data on the Norwegian mobile market, inflation and cost/revenue information from Telenor's separated accounts
'Volumes'	Calculates values regarding traffic consumption and destination
'Revenues'	Calculates the average revenue per user (ARPU) of the retail offers and of termination
'FixedWholesale'	Calculates fixed wholesale charges (that are not driven by subscribers or traffic) and wholesale volume discounts
'Wholesale'	Main parameters of the wholesale offer and wholesale cost calculation
'IC'	Calculates the interconnection costs for voice, SMS, roaming and VAS

Each of the main worksheets within the June 2022 model is in turn divided into several sub-sections, as shown in Figure 2.3 below.

Figure 2.3: Sub-sections into which each worksheet is divided [Source: Analysys Mason, 2022]

'Control'	'InVolumes'	'InRevenues'	'InWholesaleIC'	'InRetailCosts'
Control	Total volumes	Total revenue	Wholesale tariffs and discounts	Inflation and market data
Output	Volumes per subscriber	Revenue per subscriber	Termination, roaming and VAS	Separated accounts data
	Splits of traffic			Cost assumptions

'Volumes'	'Revenues'	'FixedWholesale'	'Wholesale'	'IC'
Traffic consumption	Output	Output	Output	Output
	ARPU calculation	Wholesale fixed costs and discounts	Overview of wholesale tariffs	Interconnection cost calculation
	Additional retail revenue		Calculation of wholesale costs	Roaming cost calculation
				VAS cost calculation

KEY ▮ Input ▮ Calculation ▮ Output

Granularity of data

The input data of the June 2022 model is presented at offer level for each segment.

Calculations for each specific category (i.e. revenue, wholesale costs, retail costs and interconnection costs) are performed within each worksheet where we present results for each of up to four segments[2] and for each offer within that segment.

The final output of the June 2022 model is presented in the *'Control'* worksheet where all calculations are aggregated.

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2   Currently only two segments are active. These represent residential and business products respectively.

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2.2 *'Control'* worksheet

2.2.1 Control parameters

The user can select the settings of the June 2022 model and define the case that will be tested.

This includes a choice of the assumed data speed options for the modelled retail products (from the options of 15Mbit/s, 150Mbit/s and unlimited). The model is capable of testing four different sets of choices (all 15Mbit/s, all 150Mbit/s, all unlimited and another choice).

2.2.2 Outputs

The June 2022 model presents the results at total, segment level and at offer level, for each set of product data speed options:

- At the all-segment level, the mix of segments is calculated, and the results weighted together

- At the segment level, the margin is calculated taking into consideration ARPU, handset revenue (including other revenue) as well as wholesale, interconnection and retail costs

- At the offer level, the gross margin is calculated taking into consideration ARPU and wholesale and interconnection costs. Retail costs and handset revenue (including other revenue) are excluded as they are calculated at the segment level only.

The average wholesale cost per data megabyte has also been linked through to the *'Control'* worksheet at both the all-segment level and segment level. These values are calculated at the top of the *'Wholesale'* worksheet.

2.3 Model inputs

The June 2022 model uses several input parameters (which are shown in light blue in Figure 2.3 above), which will be sourced from Telenor and Nkom.

The input data presented herein has been asked for in a separate data request sent to Telenor.

The main inputs and their location within the June 2022 model are described below.

2.3.1 *'InVolumes'* worksheet

The volume inputs are provided for each retail offer and split by the different segments.

<Total volumes>	This category includes the main traffic inputs, including national traffic inputs (for voice, SMS and data), international traffic (voice and SMS), VAS (voice and SMS) and roaming traffic (voice, SMS and data). It also contains the off-net incoming traffic for voice and SMS.

\<Volumes per subscriber\>	As above, but specifies volumes on a per-subscriber basis.
\<Domestic voice\> Location: 'Split of traffic'	Contains the split of voice traffic according to destination (on-net, off-net fixed and off-net mobile).
\<Data traffic tiers\> Location: 'Split of traffic'	Contains the split of data traffic by wholesale data tier.

2.3.2 *'InRevenues'* worksheet

The revenue inputs are provided for each retail offer and for the different segments.

\<Total revenue\>	This category specifies the total revenue by product and by segment, including:
	
	 • recurring revenues and other fees, which include
	   – monthly fees for the call plan
	   – discounts and credit notes, including invoice reductions that are related to voluntary lock-in in return for a reduction in the invoice
	   – connection, dunning and invoicing fees
	   – monthly fees for add-on services
	 • lock-in fees, which include pay-back of handset subsidies (in addition to one-off fees paid at the time of the acquisition)
	 • breach of lock-in contract fees, which are one-off fees paid to exit a contract lock-in
	 • revenue for national traffic (voice, SMS and data)
	 • revenue for international traffic (voice and SMS)
	 • revenue for VAS (voice and SMS)
	 • revenue for roaming traffic (voice, SMS and data)
	 • revenue for incoming traffic (voice and SMS).

\<Revenue per subscriber\>	As above, but expressed on a per-subscriber basis.

2.3.3 *'InWholesaleIC'* worksheet

The wholesale and IC inputs are provided for each wholesale offer (as they do not vary between different retail users).

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<Wholesale offers> Location: 'Wholesale tariffs'	This category includes the wholesale costs for the access fee and for the origination and termination tariffs for voice, SMS and data.
<Wholesale discounts> Location: 'Wholesale tariffs'	This category includes the discounts based on total monthly turnover.
<Termination rates> Location: 'Termination, roaming and VAS'	This category allows the input of current termination rates. The inputs can be differentiated based on the wholesale offer.
<Roaming> Location: 'Termination, roaming and VAS'	This category allows the input of current average roaming rates. The inputs can be differentiated based on the wholesale offer.
<VAS> Location: 'Termination, roaming and VAS'	This category allows the input of current average VAS unit costs. The inputs can be differentiated based on the wholesale offer.

2.3.4 *'InRetailCosts'* **worksheet**

<Inflation data>	Inflation for Norway, as taken from Statistisk Sentralbyrå (SSB).[3]
<Market data>	This section collates relevant data from Nkom's subscriber statistics, regarding the total mobile market and Telenor's subscriber base.
<Separated accounts data>	This section contains retail revenue data from Telenor's separated accounts, covering "mobile handset" revenue and "other" revenue. The equivalent external cost categories are also presented. An assumed split of these costs and revenues by segment is also included, based on data provided by Telenor, for use on the *'Revenues'* worksheet.
<Cost assumptions>	A new simpler approach has been adopted for the calculation of retail costs in the June 2022 model. A unit cost and year-on-year cost trend has been estimated for each of the following: • fixed cost for the residential segment

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[3]   https://www.ssb.no/priser-og-prisindekser/statistikker/kpi/maaned

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- fixed cost for the business segment
- variable cost per subscriber for the residential segment
- variable cost per subscriber for the business segment.

The unit cost values have been derived for the year 2015 from the inputs in earlier versions of the model (from April 2019). The cost trends have been calculated by analysing the retail cost data from several years of Telenor's separated accounts. This is described in Annex A.

The assumption in the June 2022 model is that the cost trend applied to the unit cost values going forward will either be:

- zero (in nominal terms)
- inflation according to SSB, or
- according to the estimated cost trends.

2.4 Model calculations and outputs

The June 2022 model has five main worksheets for the margin-squeeze tool calculations:

- traffic ('*Volumes*')
- ARPU ('*Revenues*')
- costs ('*FixedWholesale*', '*Wholesale*' and '*IC*').

These worksheets are sourced from the '*Control*' worksheet and the input worksheets, and do not need to be changed when updating the June 2022 model.

Within each worksheet, an output per segment and per offer is calculated. These values will feed the final results of the June 2022 model, shown in the '*Control*' worksheet and described in Section 2.2.2.

3 Using the margin-squeeze tool

3.1 Operating the margin-squeeze tool

The main setting for the margin-squeeze test tool can be found in the *Control* worksheet. In this worksheet, the user can select the wholesale offer used as input (i.e. the offer to be tested). This worksheet also summarises several cross-checks. If all the cross-checks are zero, then the aspect being checked is working correctly.

3.2 Updating the margin-squeeze tool

The June 2022 model is an active calculation that is updated every six months. As such, certain inputs need to be regularly updated. We explain below how to update these inputs.

Model inputs and sources

Most of the inputs in the June 2022 model have been asked for in the data request sent to Telenor and they have been explained in Section 2.3.

Some of the key inputs (such as retail prices and wholesale costs) should be updated based on data provided by Telenor and be applied at the time of the update. Nkom should replace the data that populates the margin-squeeze tool with the new updated data. If the updated data is placed in other locations/worksheets, the margin-squeeze tool will not recognise this new data without adjusting the formulas and calculations.

Analysys Mason has created an Excel workbook to send to Telenor in which to provide data. This workbook contains a series of cross-checks on the data submitted, including consistency of product and quantity labels in the datasets provided. When all the checks on the *'FrontPage'* worksheet of the Excel workbook are zero, the dataset provided should be robust.

When updating the margin-squeeze tool with the new data, the final versions of the Telenor submission should be linked to the margin-squeeze tool workbooks. All workbooks should be in the same directory. The external workbook links for each file can be updated using File → Edit Links to Files.

Other inputs should be updated on an annual basis. Nkom can choose not to update them if it considers that the changes in the most recent years will have been minimal. Additionally, some inputs that are updated less frequently (such as termination rates) should be updated when new values become available.

Retail offers, segment lists and wholesale offers

In the *'InLists'* worksheet, lists will need to be updated with the names of the retail offers being tested, as well as the segments and wholesale offers (with their respective efficient market shares). The offer-by-offer weights must also be calculated by Nkom and linked into this worksheet. The latest wholesale offers to be tested will need to be added to the list on the *'InLists'* worksheet. The corresponding wholesale cost entries must also be populated on the *'InWholesaleIC'* worksheet. The effective date of the margin-squeeze test must also be entered for use in the retail cost calculation. The effective date will normally be the end of the tested period.

A cross-check has been included that compares prices in the current (i.e. latest to be tested) MVNO/SP agreements. There is also a two-line table where the names of the latest agreements should be entered on the *'InLists'* worksheet. The resulting cross-check is shown on the '*Control*' worksheet. If there are instances where the prices in the MVNO agreement are higher than those in the SP agreement, then these are highlighted in light blue on the *'InWholesaleIC'* worksheet and these prices can be reviewed.

Frequency of updates

The following table provides an overall indication of the frequency with which updates to the margin-squeeze tool are to be applied for different items.

Figure 3.1: Indication of how frequently updates should be applied [Source: Analysys Mason, 2022]

Worksheet	Item	Frequency of update
'InLists'	Retail offers to be tested and their weights	Updated each time the margin-squeeze tool is run
'InLists'	Wholesale offers	Added each time the margin-squeeze tool is run
'InVolumes'	Traffic patterns and consumption	Relinked to new data each time the margin-squeeze tool is run
'InRevenues'	Revenue	Relinked to new data each time the margin-squeeze tool is run
'InWholesaleIC'	Wholesale tariffs in Telenor's reference offers in the market for mobile access and origination	Updated for the current wholesale offers each time the margin-squeeze tool is run
'InWholesaleIC'	Termination, roaming and VAS costs	Relinked each time the margin-squeeze tool is run
'InRetailCosts'	Monthly inflation data	Updated each time the margin-squeeze tool is run from SSB[4]
'InRetailCosts'	Market data for Norway	Updated annually
'InRetailCosts'	Separated accounts data for retail revenue and external retail costs, including a split of these categories between segments	Updated annually

3.3   Calculations and outputs

When input data is updated, there is no need to change calculations as they will be treating the updated data automatically. Therefore, results/outputs will be presented in the same location and will use the same methodology, regardless of the input data.

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[4]   https://www.ssb.no/priser-og-prisindekser/statistikker/kpi/maaned

Annex A Calculation of retail costs

The key cost assumptions required for any given version of the margin-squeeze tool are a retail cost per subscriber for each of the two modelled segments (residential and business), separated into a fixed cost part and a variable cost part. This leads to the requirement of four retail cost assumptions:

- fixed retail costs for the residential segment
- variable retail costs for the residential segment
- fixed retail costs for the business segment
- variable retail costs for the business segment.

In this annex, we first provide a summary of the approach in the April 2019 model and then describe the approach in the current model.

A.1 Previous approach

The previous calculation of retail costs in the April 2019 model used data derived from operator data submitted in 2015. The key inputs were:

- Telenor's retail cost categories from its separated accounts
- for each category, an assumed proportion of the cost that is fixed
- for each category, an assumed split between the residential and business segments
- Telenor's subscribers in each segment as of the end of June 2015.

Telenor's retail costs and subscriber data for the year 2017 (the latest full year of data available as of 1 April 2019) were also included in the April 2019 model. The split between residential and business segments was rescaled, first using Telenor's mix of subscribers by segment in 2017 and then again using the split of residential and business subscribers at the market level in 2017.

These values were then used to calculate the fixed costs by segment and the variable costs by segment in 2017 for a reference operator. The outputs of the calculation were a final total retail cost per subscriber by segment which fed into the margin-squeeze tool.

This calculation of retail costs has been updated once a year using the latest set of market data statistics and the latest set of data from Telenor's separated accounts.

A.2 New approach

A new simpler calculation of the inputs for the retail cost assumptions in the margin-squeeze tool has been developed. The inputs underlying the new calculation are the same as those from the April 2019 model and are therefore consistent with the previous approach, with the exception of

proportion of fixed costs for depreciation and cost of capital.[56] The cost inputs in the new approach are set out in Figure A.1 (but are redacted in the published version of this report).

Figure A.1: List of cost categories [Source: Previous modelling[7], 2022]

Category	Proportion of cost that is fixed ✂	Proportion of cost related to residential ✂
Sales – commissions		
Sales– other		
Marketing		
Customer service		
Management & Administration – IS		
Management & Administration – Other		
Invoicing		
Postage costs		
Project Management		
Service platforms		
Depreciation		
Cost of capital		

The cost and revenue categories in the separated accounts related to number portability have been zero for some time and have been removed from the margin squeeze tool. The two remaining "external" cost categories (mobile handsets and other) are treated separately in this new approach.

These external costs and the corresponding revenues are now split between segments and then converted to per-subscriber costs. The splits of these costs/revenues between segments are derived using information from Telenor's separated accounts. These costs and revenues are provided by Telenor in the data request and will be updated annually.

The new approach considers the remaining retail cost categories in a standalone, one-off calculation of suitable inputs reflecting these retail costs. In future iterations of the margin-squeeze tool, this calculation need not be updated: instead, a set of assumed cost trends will be used to update the retail cost assumptions. These could be the cost trends calculated as part of this new approach, or an alternative.

The new calculation is set out in Figure A.2. In particular, it removes the transformations using market-level statistics.

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[5] We have identified a small number of historic market statistics requiring correction based on the most recent data from the Ekomstatistikken (https://ekomstatistikken.nkom.no).

[6] The new calculation also uses year-average subscribers rather than year-end subscribers. This only has a small impact on the resulting unit cost and cost trends derived.

[7] See http://www.eftasurv.int/da/DocumentDirectAction/outputDocument?docId=2085, Figure 2.

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Figure A.2: New calculation approach for retail costs excluding external cost categories in the June 2022 model [Source: Analysys Mason, 2022]
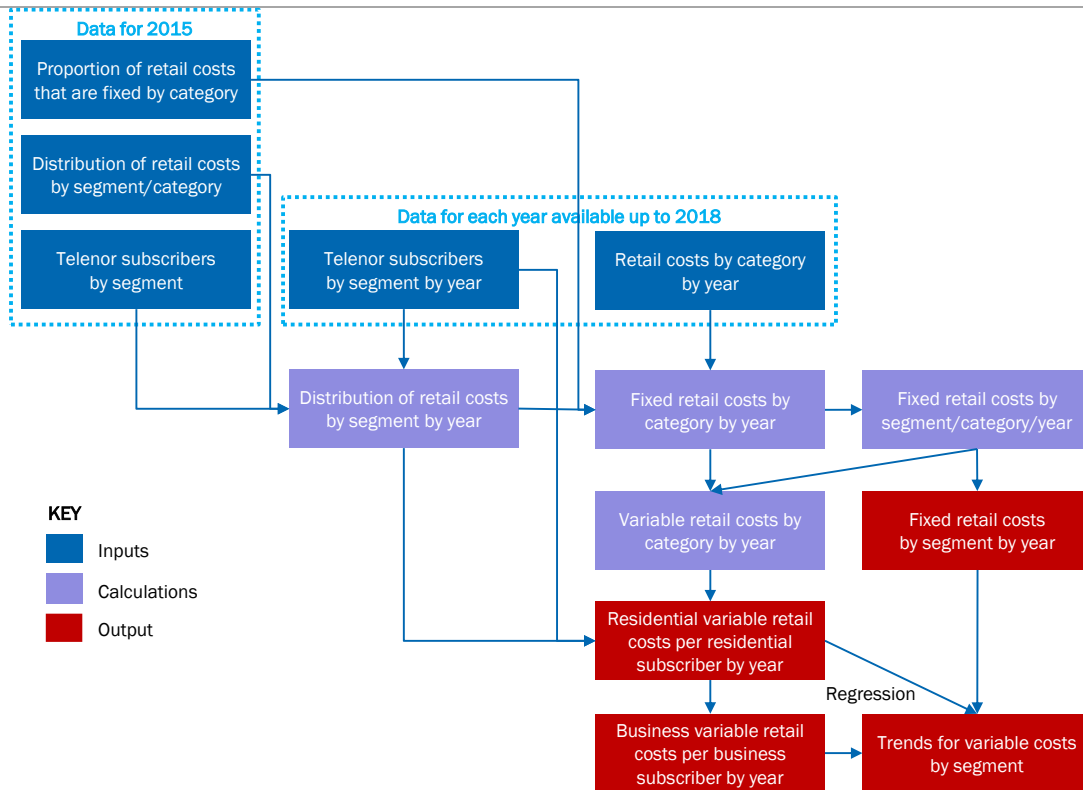
The new calculation is now undertaken for each year of retail cost data available from Telenor's separated accounts rather than just for the most recent year for which data is available. This has allowed cost trends to be estimated over the period 2014–18 for each retail cost assumption required for the March 2020 model (and subsequent versions), using a regression analysis over this period. These historic cost trends could be used to estimate the future evolution in retail costs.

The absolute unit cost values by segment are taken from the year 2015 (when the distribution inputs were provided) for use in the June 2022 model.[8] These 2015 unit cost and cost trend values are then entered as inputs into the June 2022 model on the *'InRetailCosts'* worksheet. Going forward, the cost trends will be applied as required at each update. If the current six-monthly update schedule is used, then half a year of cost trend will be applied with each update.

The unit cost values do not necessarily need to be revisited (unless Nkom believes a material change in the cost base has occurred), since the cost trend should be capturing future evolution in these costs. The June 2022 model itself allows the user to choose alternative cost trends for the unit cost values. The two other alternatives are to assume zero trends (i.e. flat in nominal terms) or to increase with inflation (i.e. flat in real terms). This option can be chosen on the *'Control'* worksheet.

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8   This leads to different assumed retail costs per subscriber in the June 2022 model compared to the
     April 2019 model. This is due to (i) the June 2022 model not including the transformations using the market-
     level statistics; (ii) the retail cost assumptions in the June 2022 model being based on retail cost data for
     2015 with a choice of cost trend applied, compared to the April 2019 model that uses retail cost data for
     2017 and (iii) the new approach to treating mobile handset costs and external costs.