

Report for Nkom

Model update methodology

27 June 2016

Ian Streule, Emil Arnell

Ref: 2000952-272a

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Analysys Mason Limited
St Giles Court
24 Castle Street
Cambridge CB3 0AJ
UK
Tel: +44 (0)1223 460600
cambridge@analysismason.com
www.analysismason.com
Registered in England No. 5177472

1 Introduction

Analysys Mason Limited (Analysys Mason) has been commissioned to support Nkom in the adaptation and finalisation of the margin-squeeze tool that was previously developed, to ensure that it can be used as a primary price-control tool for the setting of Market 15 wholesale prices.

This document provides an overview of the model developed for this purpose. It outlines the general structure of the model and its underlying principles, explains how to adjust the various inputs and parameters of the model, and summarises its results.

This manual is intended to be used as a reference document to allow Nkom to operate the model in future with minimal assistance from Analysys Mason.

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 Surveillance Authority (ESA)), Nkom launched a public consultation in September 2015 and plans to notify a draft final decision to ESA during 2016.

The overarching objective of the current draft model is to ensure that Nkom has at its disposal:

- a fully functioning margin-squeeze test tool that it can use to approve Telenor's MVNO reference offers and as a starting point for setting the national roaming price
- 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 networks inputs were bought based on the reference offers of Telenor.
- an operational tool that it can use to set geographically de-averaged pricing gradients for national roaming.

The model was developed in draft format and published as part of the national public consultation process. Some minor adjustments have been made to the model after the national public consultation process based on some inputs from the operators.¹

This document provides guidance on using the margin-squeeze model developed by Analysys Mason for Nkom.

Key inputs to the model

We have used a range of data sources to build and populate the margin-squeeze model. These include some Nkom market statistics and aggregated data provided by Telenor.

¹ A list of the changes made to the model following the public consultation is provided in Annex A.

The main inputs will be updated after receiving responses to the data requests sent to Telenor.

Please refer to Section 2.3 for a more extensive explanation of the inputs used in the model.

Formatting and naming conventions used in the model

Consistent cell formatting has been used throughout all sheets of the model. This is to increase the transparency of the model, as well as making it easier to understand and modify. A number of standardised cell formats are used to distinguish inputs, assumptions, calculations and links. The most important conventions are shown in the following figure.

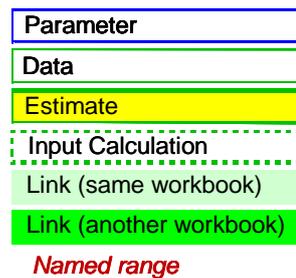


Figure 1: Formatting conventions used in the model [Source: Analysys Mason, 2016]

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

- **sheets:** 'XXXXX' (e.g. 'Revenues')
- **sheet sub-sections:** 'XXXXX' (e.g. 'Tariffs')
- **sub-sections categories:** <XXXXX> (e.g. <International Tariffs>)
- **segments:** XXXXX (e.g. Residential).

Structure of this document

The remainder of this user guide is structured as follows:

- Section 2 describes the general structure of the model and its underlying principles
- Section 3 explains the process for maintaining and updating the model
- The document also contains the an annex which lists the changes made to the model following the public consultation.

2 General description of the model

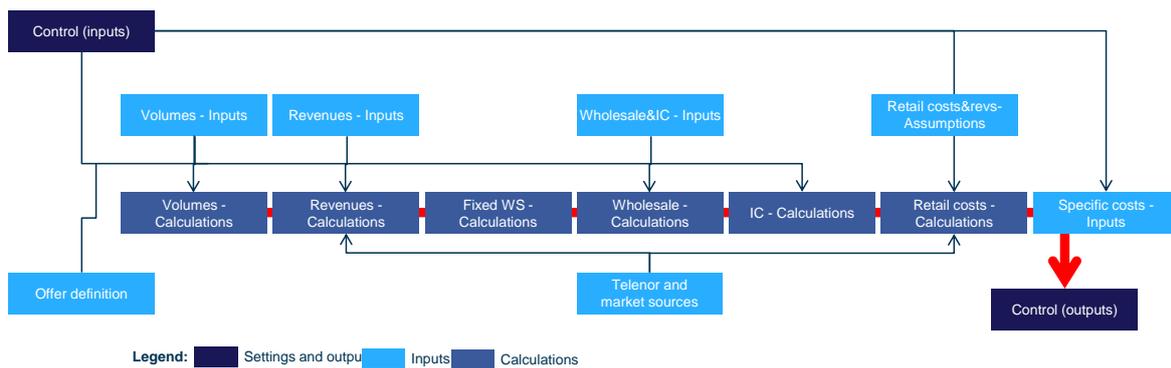
This section describes the structure of the model and its underlying principles:

- structure of the model and granularity of data (Section 2.1)
- control panel (Section 2.2)
- model inputs (Section 2.4)
- model sources (Section 2.4)
- model calculations and outputs (Section 2.5).

2.1 Structure of the model

The model generates results for a given period, specified by the user. Figure 2 shows the overall structure of the model, including the flow of calculations and the links between the different sheets within the model.

Figure 2: Overall structure of the margin-squeeze test tool [Source: Analysys Mason, 2016]



The table below provides a brief description of each sheet within the model.

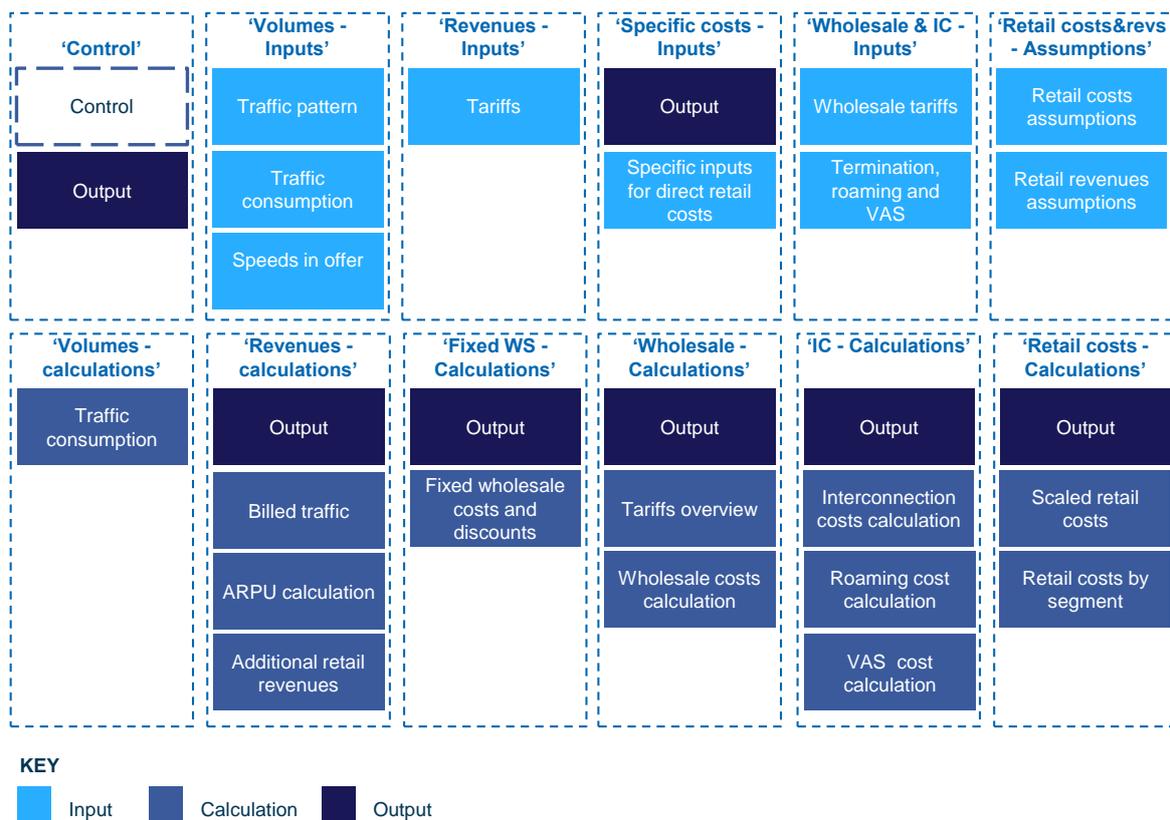
Figure 3: Overview of the sheets in the model [Source: Analysys Mason, 2016]

Sheet	Description
Guide	
'C'	Lists the sheets constituting the model inputs and specifies the version history of the model
'S'	Provides a guide to the styles used in model
'L'	Specifies the lists used in the model
Control	
'Control'	Contains the model settings and main hypothesis and provides outputs of the margin-squeeze test tool
Model inputs	
'Offer definition'	Specifies the offers and segments lists
'Volumes – Inputs'	Includes input data with regard to traffic volumes and package offers

Sheet	Description
	This sheet serves as input for the following sheets: <i>'Volumes - Calculations'</i> , <i>'Revenues - Calculations'</i> , <i>'Wholesale - Calculations'</i> and <i>'IC - Calculations'</i>
<i>'Revenues – Inputs'</i>	Presents the tariff data inputs, including the offers monthly fees, the tariffs of out of the bundle traffic for voice, SMS, data, and the tariffs for VAS, international traffic, international roaming, and video minutes This sheet serves as input for <i>'Revenues - Calculations'</i>
<i>'Specific costs – Inputs'</i>	Allows the input of offer-specific additional costs (e.g. Spotify, cloud storage) on a per-user basis The costs flow directly to the Output on the 'Control' sheet
<i>'Wholesale & IC – Inputs'</i>	Presents the data from the wholesale reference offer and other interconnect costs This sheet serves as input for <i>'Fixed WS – Calculations'</i> , <i>'Wholesale - Calculations'</i> and <i>'IC – Calculation'</i>
<i>'Retail costs&revs – Assumptions'</i>	Presents assumptions (fixed vs. variable costs assignment and segment cost assignment) with regard to retail costs and some specific retail revenues This sheet serves as input for <i>'Retail Cost - Calculations'</i> and <i>'Revenues - Calculations'</i>
Model calculations	
<i>'Volumes - Calculations'</i>	Calculates data with regard to traffic consumption and destination
<i>'Revenues - Calculations'</i>	Calculates the ARPU of the retail offers and of termination
<i>'Fixed WS – Calculations'</i>	Calculates fixed wholesale charges (that are not driven by subscribers or traffic) and wholesale volume discounts
<i>'Wholesale – Calculations'</i>	Main parameters of the wholesale offers and wholesale costs calculation
<i>'IC – Calculations'</i>	Calculates the interconnection costs for voice, SMS, roaming and VAS
<i>'Retail costs – Calculations'</i>	Main parameters on the retail costs and calculation of retail cost per subscription
Sources	
<i>'Telenor's volumes stats'</i>	Will include data of Telenor's retail offers
<i>'Market stats'</i>	Includes relevant data on the Norwegian mobile market
<i>'Telenor's retail stats'</i>	Includes Telenor's data inputs, including revenues and costs

Each of the main sheets within the model is in turn divided into several sub-sections, as shown below:

Figure 4: Sub-sections into which each sheet is divided [Source: Analysys Mason, 2016]



Granularity of data

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

Calculations for each specific category (i.e. Revenues, Wholesale costs, Retail costs and Interconnection costs) are performed within each sheet where we present results for each segment and for each offer.

The output of the whole model is presented in 'Control' where all calculations are aggregated.

2.2 Control panel

2.2.1 Control parameters

Under the Control section, the user is able to select the settings of the model and define the case that will be tested. A more detailed description of this section is provided in Section 3.1.

2.2.2 Outputs

The model presents the results at total, segment level and at offer level:

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

- at the segment level, margin is calculated taking into consideration ARPU, handset revenues as well as wholesale, interconnection and retail costs
- at the offer level, gross margin is calculated taking into consideration ARPU and wholesale and interconnection costs. Retail costs and handset revenues are excluded as they are calculated at segment level only.

2.3 Model inputs

The model uses a number of input parameters (which are shown in light blue in Figure 4 above), which will be sourced from Telenor, other Norwegian operators and Nkom.

The input data presented herein has been asked for in a separate data request sent to Telenor and to other Norwegian operators and stakeholders.

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

2.3.1 Sheet 'Volumes - Inputs'

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

<p><Voice destination> Location: 'Traffic pattern'</p>	<p>This input contains the split of voice traffic according to destination (on-net, off-net fixed, off-net mobile).</p>
<p><Outgoing traffic consumption> Location: 'Traffic consumption'</p>	<p>This category includes the main traffic inputs, including national traffic inputs (for voice, SMS and data), international traffic (voice and SMS), video minutes and VAS (voice and SMS).</p> <p>Inputs include: a) traffic of basic subscriptions; b) traffic of additional packages; c) traffic of volume-based pricing.</p>
<p><Outgoing roaming> Location: 'Traffic consumption'</p>	<p>This category contains the roaming traffic split by in basic bundle, in additional packages and billed on a traffic basis.</p>
<p><Incoming off-net traffic> Location: 'Traffic consumption'</p>	<p>This category contains the off-net incoming traffic for voice, SMS and video minutes.</p>
<p><Speeds in offer> Location: 'Speeds in offer'</p>	<p>This input contains distribution of the users in an offer according to their nominal maximum downstream bandwidth.</p>

2.3.2 Sheet ‘Revenues - Inputs’

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

<p><National tariffs> Location: ‘Tariffs’</p>	<p>This category includes the national tariffs for voice, SMS, data and video calls, including the monthly flat fees and the tariffs for out-of-bundle volumes as well as extra items such as (average charge for) additional packages, any discounts on the monthly fees and maximum and minimum billing thresholds.</p>
<p><Lock-in fees> Location: ‘Tariffs’</p>	<p>This category includes inputs regarding so-called lock-in fees, which are split between:</p> <ul style="list-style-type: none"> • Lock-in fees, which are the pay-back of handset subsidies (in addition to one-off fees paid at the time of the acquisition) • Lock-in invoice reductions, which are related to voluntary lock-in in return for a reduction on the invoice • Breach of lock-in contract fees, which are one-off fees paid in order to exit a contract lock-in.
<p><International tariffs> Location: ‘Tariffs’</p>	<p>This category includes the average international unitary revenues (for voice, including set-up call charge and SMS).</p>
<p><VAS tariffs> Location: ‘Tariffs’</p>	<p>This category includes average VAS unitary revenues for voice, voice set-up call charge and SMS.</p>
<p><International roaming tariffs> Location: ‘Tariffs’</p>	<p>This category includes average international roaming unitary revenues (for voice, including starting price, SMS and data).</p>

2.3.3 Sheet ‘Specific costs - Inputs’

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

<p>< Specific inputs for direct retail costs ></p>	<p>This category includes any specific additional costs for an offer such as e.g. the use of additional services (e.g. Spotify, cloud services). These should be expressed as an average monthly cost per subscriber.</p>
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2.3.4 Sheet ‘Wholesale & IC - Inputs’

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

<p><Wholesale offers> Location: ‘Wholesale Tariffs under MACO market’</p>	<p>This category includes the wholesale costs for the access fee and for the origination and termination tariffs for voice, SMS, video minutes and data.</p>
<p><Wholesale discounts> Location: ‘Wholesale Tariffs under MACO market’²</p>	<p>This category includes the discounts based on traffic (total monthly minutes) or on total monthly turnover.</p>
<p><Termination rates> Location: ‘Termination, roaming and VAS’</p>	<p>This category allows the input of current termination rates. The inputs can be differentiated based on the wholesale offer.</p>
<p><Roaming> Location: ‘Termination, roaming and VAS’</p>	<p>This category allows the input of current average roaming rates. The inputs can be differentiated based on the wholesale offer.</p>
<p><VAS> Location: ‘Termination, roaming and VAS’</p>	<p>This category allows the input of current average VAS unit costs. The inputs can be differentiated based on the wholesale offer.</p>

2.3.5 Sheet ‘Retail costs&revs – Assumptions’

<p><Fixed and variable costs assignment> Location: ‘Retail costs assumption’</p>	<p>In order to correctly estimate the retail costs of operators with different scales, we need to make assumptions regarding the assignment of total costs to fixed costs (i.e. costs that do not scale with the number of subscribers) and variable costs (costs that scale with subscribers).</p> <p>As such, this category includes the fixed and variable costs assignment assumptions for all retail category costs.</p>
<p><Retail costs</p>	<p>As the output of the model is provided at segment level, we need to</p>

² MACO stands for mobile access and origination market.

segment assignment> Location: 'Retail costs assumption'	assign total retail costs to each segment. Therefore, in this category it is included the assumptions for the retail costs assignment to the different segments.
<Retail revenue segment assignment> Location: 'Retail revenues assumptions'	As per above but for specific revenue categories that are added based on historic average data (mobile handsets, MNP, other revenues).

2.4 Model sources

Additionally, the model collates other sources, which are located in the '*Telenor's volume stats*', '*Telenor retail stats*' and '*Market stats*' sheets. A brief overview of each sheet is included below.

' <i>Telenor's volume stats</i> '	This sheet will collate Telenor's data. It will be finalised once we understand in what format Telenor will provide us with the data.
' <i>Telenor retail stats</i> '	This sheet contains retail inputs delivered by Telenor to Nkom through its separated accounts submissions. It contains the main input parameters for the retail cost calculations.
' <i>Market stats</i> '	This sheet collates relevant data from Nkom's statistics, linking data regarding the whole market and Telenor. It includes market data inputs (subscriptions and traffic) at aggregated level. The output of this sheet to the market is related to: <ul style="list-style-type: none"> • retail subscriptions at segment level for Telenor and the market • average call durations.

2.5 Model calculations and outputs

The model has six main sheets for the output calculations:

- traffic ('Volumes - Calculations')
- ARPU ('Revenues - Calculations')
- costs ('Fixed WS – Calculations', 'Wholesale – Calculations', 'IC – Calculations', and 'Retail costs – Calculations').

These sheets are sourced from the control settings, model inputs and model sources and do not need to be changed when updating the model.

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

3 Operating and updating the model

3.1 Operating the model – Control panel

The main settings for the margin squeeze test tool can be found in the *Control* sheet as stated above. In this section sheet the following parameters can be selected:

Settings

In this section, the user can select the main settings of the test. The following options are available:

- wholesale offer used as input: the user can select which wholesale offer is to be tested
- wholesale discount applied: the user can select which model is to be used for calculating wholesale-level discounts.

3.2 Updating the model – inputs and sources

The model developed should be a living document which will need to be run every 6 or 12 months. As such, certain inputs need to be regularly updated. We explain below how to update the inputs and sources of the model.

Model inputs and sources

The model inputs have been requested in the data request sent to Telenor (and other operators) as part of this project and they have been explained in Section 2.3. Model inputs

Some of the key inputs (such as retail prices and wholesale cost) should be updated on the basis of data provided by Telenor and be applied at the time of the update. Nkom should replace the data that populates the model with the new updated data. If the updated data is placed in other locations/sheets, the model will not recognise this new data without adjustment to the formulas and calculations.

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 and segments lists

In the 'Offer definition' sheet, some name lists will need to be updated with the names and weights of the retail offers being tested, as well as the segments and wholesale offers (with their respective efficient market shares).

Frequency of updates

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

Figure 3.1: Indicative list of the frequency with which updates should be applied [Source: Analysys Mason, 2016]

Sheet	Item	Frequency for update
'Offer definition'	Offers to be tested and their distribution	To be checked each time the model is run
'Volumes – Inputs'	Traffic patterns	Each time the model is run
'Volumes – Inputs'	Traffic consumption	Each time the model is run
'Volumes – Inputs'	Speeds in offer	Each time the model is run
'Revenues – Inputs'	Prices and average revenues	Each time the model is run
'Specific costs - Inputs'	Direct retail costs	Each time the model is run
'Wholesale & IC – Inputs'	Wholesale tariffs in the reference offers of Telenor in the market for mobile access and origination	Each time the model is run
'Wholesale & IC – Inputs'	Termination, roaming and VAS	Each time the model is run
'Retail costs&revs – Assumptions'	Splits of retail costs between fixed and variable and between segments	Only if major changes to the market structure
'Telenor's retail stats'	Inputs of costs and some revenues from Telenor separated accounts	Each time Telenor releases a new full-year version of the separated accounts
'Market stats'	Telenor and market subscriptions	Each time the model is run
'Market stats'	Voice traffic and number of calls (used to calculate call duration)	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, model results/outputs will be presented in the same location and using the same methodology, regardless of input data.

Annex A Changes made to the model after public consultation

The following changes have been made to the model after the public consultation.

Figure A.1: Summary of changes made to the model following the public consultation [Source: Analysys Mason, 2016]

Sheet	Cells	Change	Proposed by
L	n.a.	Deleted traffic destination inputs	Analysys Mason / Nkom
Control	H76:H105	Corrected the link of the interconnection costs (previously pointing at wholesale costs)	Analysys Mason
Control	G34:G63	Reflect the wholesale volume discounts and fixed costs to gross margin level (based on wholesale costs of offer as % of total wholesale costs)	Nkom
Control	G76:G105	Idem	Idem
Control	G108:G147	Idem	Idem
Control	G160:G189	Idem	Idem
Control	L113 and L155	Changed the formula to be the same as in L29 and L71	Nkom
Control	L118:L147 and L160:L189	Changed the formula to be the same as in L34:L63 and L76:L105	Nkom
Control	E16:M190	Added separate revenue input for handset revenues in segment by segment and total tests (but not in gross margin)	Analysys Mason / Nkom
Volumes - Inputs	n.a.	Deleted rows with traffic split for international and roaming	To reflect Telenor comment on Revenues - Inputs sheet
Revenues - Inputs	Rows 47-82	Added specific inputs for the lock-in fees and reductions	Analysys Mason / Nkom
Revenues - Inputs	Rows 149-184	Added specific inputs for the lock-in fees and reductions	Analysys Mason / Nkom
Revenues - Inputs	Rows 251-286	Added specific inputs for the lock-in fees and reductions	Analysys Mason / Nkom
Revenues - Inputs	Rows 353-388	Added specific inputs for the lock-in fees and reductions	Analysys Mason / Nkom
Revenues - Inputs	Rows 83-88 and 96-105	Simplified inputs for international and roaming	Analysys Mason / Nkom

Sheet	Cells	Change	Proposed by
Revenues - Inputs	Rows 183-188 and 196-205	Idem	Analysys Mason / Nkom
Revenues - Inputs	Rows 283-288 and 296-305	Idem	Analysys Mason / Nkom
Revenues - Inputs	Rows 383-388 and 396-405	Idem	Analysys Mason / Nkom
Revenues - Inputs	Rows 11-45, 83-107	Re-structured roaming and VAS inputs so that they flow through the overall table, allowing flexibility to add per offer	Nkom
Revenues - Inputs	Rows 113-147, 185-209	Idem	Nkom
Revenues - Inputs	Rows 215-249, 287-311	Idem	Nkom
Revenues - Inputs	Rows 383-388 and 396-405	Idem	Analysys Mason / Nkom
Wholesale & IC - Inputs	L70:M81	Added both a minimum and a maximum threshold for average data prices per MB	Nkom
Wholesale & IC - Inputs	Rows 84-122	Implemented possibility to define different discount schemes for different wholesale offers	Nkom
Wholesale & IC - Inputs	Rows 142-156	Simplified inputs for roaming	Analysys Mason / Nkom
Retail costs&revs - Assumptions	Rows 10-26	Inserted the fixed vs. variable share numbers provided by Telenor	Telenor
Retail costs&revs - Assumptions	Rows 10-26	Adjusted the fixed vs. variable share numbers provided by Telenor to account for Phonero and ChiliMobile information	Analysys Mason
Retail costs&revs - Assumptions	L36:O52	Inserted the residential vs. business split of costs provided by Telenor	Telenor
Retail costs&revs - Assumptions	Q36:T52 and G36:J52	Inserted mechanics to re-scale the Telenor segment split inputs according to updated subscriber split	Analysys Mason
Retail costs&revs - Assumptions	Rows 87-89	Segment split of the additional revenues is now linked to the re-scaled costs and not the inputs	Analysys Mason

Sheet	Cells	Change	Proposed by		
Revenues calculations	- G9	Corrected the link from G416 to G343	Nkom		
Revenues calculations	- n.a.	Deleted the blocks in which other revenues (handsets, NP and other) were added on an offer by offer basis	Analysys Nkom	Mason	/
Revenues calculations	- J6:J11	Added separate outputs for the other revenues (handsets, NP and other)	Analysys Nkom	Mason	/
Revenues calculations	- G198-M229	Added the lock-in fee invoice reductions to the segment by segment ARPU	Analysys Nkom	Mason	/
Revenues calculations	- G344-M375	idem	Analysys Nkom	Mason	/
Revenues calculations	- G490-M521	idem	Analysys Nkom	Mason	/
Revenues calculations	- G636-M667	idem	Analysys Nkom	Mason	/
Revenues calculations	- Rows 751-786	Added the handset lock-in revenues to this segment	Analysys Nkom	Mason	/
Revenues calculations	- Rows 796-831	idem	Analysys Nkom	Mason	/
Revenues calculations	- Rows 841-876	idem	Analysys Nkom	Mason	/
Revenues calculations	- Rows 886-920	idem	Analysys Nkom	Mason	/
Revenues calculations	- Rows 231-266	Re-linked to reflect changes made in Revenues-Inputs for VAS and roaming	Nkom		
Revenues calculations	- Rows 377-412	idem	Nkom		

Sheet	Cells	Change	Proposed by
Revenues calculations	- Rows 523-550	idem	Nkom
Revenues calculations	- Rows 669-704	idem	Nkom
Wholesale-calculations	Rows 138–167	Set fixed per subscriber wholesale fees to 0 if the package has no take-up	Analysys Mason
Wholesale-calculations	Rows 345–374	Idem	Idem
Wholesale-calculations	Rows 552–581	Idem	Idem
Wholesale-calculations	G203:G235 and M203:O235	Reflected the minimum and maximum average data price thresholds	Nkom
Wholesale-calculations	G413:G442 and M410:O442	Idem	Idem
Wholesale-calculations	G620:G649 and M617:O649	Idem	Idem
Wholesale-calculations	G827:G856 and M824:O856	Idem	Idem
IC-calculations	Rows 344–685	Simplified roaming cost calculation	Analysys Mason / Nkom

A.1 Re-scaling of residential and business split

This section provides an explanation of how the model splits retail costs (and revenues), which are sourced from Telenor’s separate accounts, between the residential and business segments.³

The model uses inputs from Telenor (cross-checked against submissions from Phonero and ICE during the public consultation process). These inputs from Telenor require some elaboration before being used in the model, as they refer to the mix of residential and business subscribers and costs / revenues that Telenor had at the time of the public consultation. Nkom does not intend to change these inputs on an annual basis, but only if and when there is a strong reason to do so. However, these inputs cannot be used directly in the model, since:

- the hypothetical modelled operator has a different mix of residential and business users from Telenor (reflecting the overall market mix)
- the mix of residential and business subscribers of Telenor and of the market as a whole can change over time.

³ The model has the capability to add another two segments but adding these segments would require a re-statement of all the splits which would require sourcing new data from the market

The model has been modified following the public consultation so that it can handle the above mentioned changes in the mix of residential vs. business users for Telenor and/or the market as a whole. The model handles this in two calculation steps:

- Step 1: the split of costs is re-scaled to the current residential vs. business split of Telenor subscribers
- Step 2: the split of costs is modified to reflect the residential vs. business split of subscribers in the market as a whole (as opposed to those of Telenor).

These steps are discussed in further detail below.

It should be noted that the above steps are not used for revenues, as in this case an average revenue per user is calculated.

The adjustments discussed in this section enable the model to handle changes in the total cost and subscriber structure of Telenor, but they assume that the ratio of the average cost per business user to the average cost per residential user remains constant (on a line-item by line-item basis). However, if this were not the case, Nkom would need to update the inputs into the model.⁴

Step 1: Re-scaling to Telenor's current residential vs. business split

Figure A.2 below shows where this re-scaling takes place in the model. The block of cells marked with a '1' in the figure are the inputs received from Telenor for the percentage of each cost item that should be allocated to residential vs. business segments. This block of cells also includes the subscribers blend of Telenor between the two segments as of 2015 (cells L33:O33), the date for which the split of costs provided by Telenor applies.

In the cells marked with a '2' in Figure A.2, the residential and business costs are expressed as the average cost per business subscriber relative to the average cost per residential subscriber (with the latter indexed to 1.00). For the cost category *Mobile handsets (external cost)*, for example, the average cost per business subscriber is [\geq] the average cost per residential subscriber. The values in this block of cells are derived from block '1'. To illustrate this further, the formula used in the cell R36 is the following:

$$=IF(OR(M$33=0, $L36=0, L33=0), 0, (M36/M$33)/($L36/L33))⁵$$

⁴ As an example: the model currently, based on the inputs provided by Telenor, assumes that the per subscriber cost for Mobile handsets (external costs), see Figure A.2, of a business user is [\geq] that of a residential user regardless of the change in the total costs for handset subsidies. It is possible that Telenor aggressively changes its strategy for approaching the business and/or residential segments so that this ratio changes. If this happens, the model inputs would need to be updated manually.

⁵ The first part of the formula is included to avoid excel returning #DIV/0! errors if the value that are in the denominator in the following formula are 0. The last part of the formula calculates the ratio between the average cost per business subscriber and the average cost of a residential subscriber at Telenor's blend in 2015

The block of cells marked with a ‘3’ then re-calculates the percentage split of costs, based on the current split of subscribers between the two segments. To illustrate this further, the formula used in the cell G36 is the following:

$$=G\$33*Q36/SUMPRODUCT(\$G\$33:\$J\$33, \$Q36:\$T36)^6$$

Figure A.2: Screen shot from model segment where cost inputs are re-scaled to the current scale of Telenor [Source: Analysys Mason, 2016]

		RE-SCALED TO CURRENT BLEND				INPUTS AT TELNOR BLEND IN 2015				RETAIL COSTS PER SEGMENT AS MULTIPLE OF RESIDENTIAL			
		Residential	Business	SpareSegm	Sp	Residential	Business	SpareSegm	Sp	Residential	Business	SpareSegm	Sp
		entC	entC	entC	entC	entC	entC	entC	entC	entC	entC	entC	entC
Telenor subscriber by segment		2.29	0.88			2.33	0.88						
Retail costs assignment													
Mobile handsets (external cost)	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Number portability (external cost)	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Other costs (external cost)	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Sales, of which	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Commissions	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Other sales costs	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Marketing	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Customer service	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Management & Administration, of which	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
IS	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Other management & administration	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
invoicing	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Postage costs	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Project Management	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Service platforms	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Depreciation	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-
Cost of capital	% of costs	100%	-%	-%	-%	-%	-%	-%	-%	1.00	-	-	-

Step 2: Modification of the split to reflect the residential vs. business split of subscribers in the market as a whole

Figure A.3 provides a screenshot showing where in the model the residential vs. business split is modified to reflect the market split (rather than Telenor’s own split). This is done by:

- First multiplying the residential vs. business split of costs calculated for Telenor’s actual scale (marked with a ‘3’ in Figure A.2 above) by the number of subscribers in the market divide by those of Telenor in each segment. This is done in the right-hand block of cells shown in Figure A.3 (labelled UN-NORMALISED). To illustrate this further, the formula used in the cell L60 is the following:

$$=IF(G\$33=0,0,G36/G\$33*G\$56)$$

- Then normalising the UN-NORMALISED split so that it sums to 100%. This is done in the middle block of cells in Figure A.3 (labelled NORMALISED).

⁶ The formula calculates the cost for residential subscribers as a share of total costs at the current split of Telenor subscribers across segments (which are provided in cells G33:J33 and will be updated in future runs of the model)

Figure A.3: Screen shot from model segment where cost inputs are re-scaled to the segment blend of the market [Source: Analysys Mason, 2016]

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	analysys mason Retail costs assumptions															
2																
3	Unit															
53																
54																
55																
56	Market mix by segment		million				Residential	Business	SpareSegm	SpareSegm						
57							entC	entD	entC	entD						
58						4.70	1.50	-	-							
59	Retail costs assignation															
60	Mobile handsets (external cost)		% of costs				100%									
61	Number portability (external cost)		% of costs				100%									
62	Other costs (external cost)		% of costs				100%									
63	Sales, of which		% of costs													
64	Commissions		% of costs				100%									
65	Other sales costs		% of costs				100%									
66	Marketing		% of costs				100%									
67	Customer service		% of costs				100%									
68	Management & Administration, of which		% of costs													
69	IS		% of costs				100%									
70	Other management & administration		% of costs				100%									
71	Invoicing		% of costs				100%									
72	Postage costs		% of costs				100%									
73	Project Management		% of costs				100%									
74	Service platforms		% of costs				100%									
75	Depreciation		% of costs				100%									
76	Cost of capital		% of costs				100%									
77																
78																