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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 (MST) that was previously developed in 2016 and rebuilt in 2019–2020, 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 MST developed is referred to as the '2020 MST' in this document. A small number of refinements have been made to this version to develop an updated version of the MST. This will be referred to as the 'September 2023 MST'.

This document provides an overview of the September 2023 MST. It outlines the general structure of the tool and its underlying principles, as well as explaining how to adjust the various inputs and parameters.

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 MST 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 redeveloped all aspects of the MST, in order to simplify the calculation flow and the procedure for updating the MST for each test with new data.

Analysys Mason has further updated the approach with a re-assessment of the inputs for the retail cost component. The parametrisation in the September 2023 MST is still partially informed by the same input data as in earlier versions of the MST, but has been refined following a new data collection exercise undertaken with industry. 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 September 2023 MST. 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 September 2023 MST.

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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 September 2023 MST. This is to increase the transparency of the MST, 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 September 2023 MST [Source: Analysys Mason, 2023]

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 MST and its underlying principles
- Section 3 explains the process for maintaining and updating the September 2023 MST
- Annex A describes how the retail costs have been calculated in the September 2023 MST
- Annex B describes how the retail costs were calculated in the previous versions of the MST.

Information that is considered confidential data within this report is indicated by the use of the scissor symbol '✂'. Such information should not be included within any published documents.

2 General description of the MST

This section describes the structure of the September 2023 MST and its underlying principles:

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

2.1 Structure

The September 2023 MST generates results for a given period, specified by the user.

Figure 2.1 shows the overall structure of the September 2023 MST, including the flow of calculations and the links between the different worksheets.
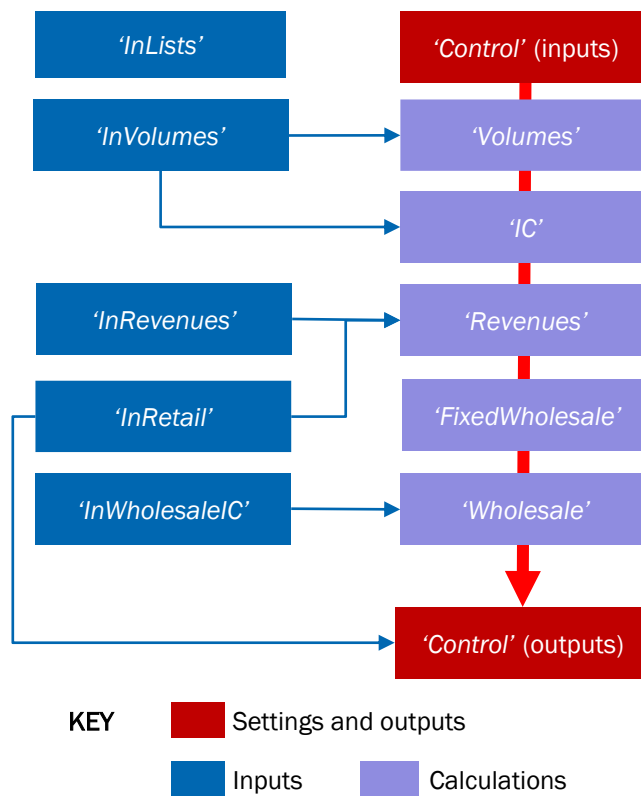

Figure 2.1: Overall structure of the MST [Source: Analysys Mason, 2023]
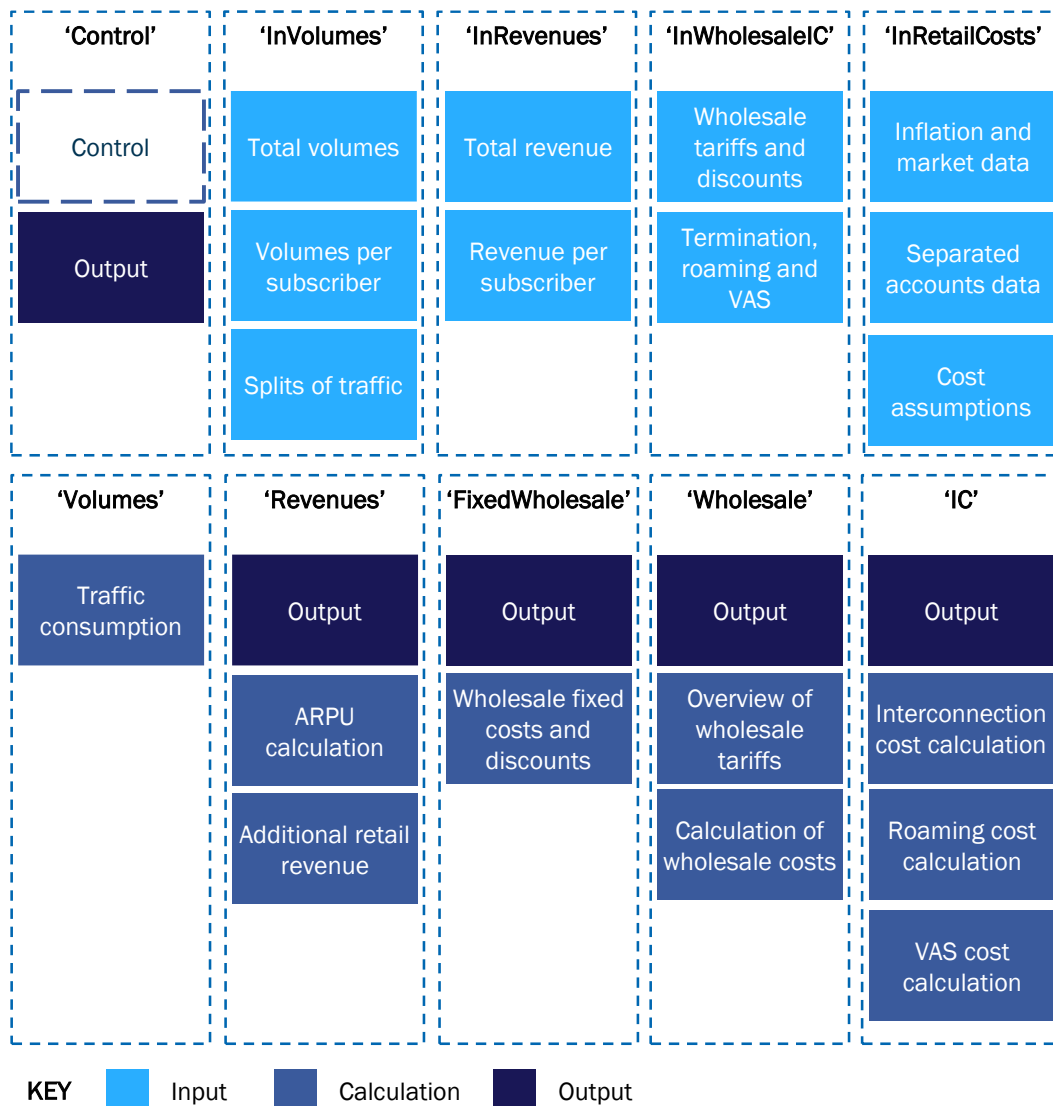
The table below provides a brief description of each worksheet within the September 2023 MST.

Figure 2.2: Overview of the worksheets in the September 2023 MST [Source: Analysys Mason, 2023]

Worksheet	Description
'C'	Lists the worksheets constituting the MST
'V'	Specifies the version history of the MST
'S'	Provides a guide to the styles used in the MST
'L'	Specifies the lists used in the MST
'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 September 2023 MST 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, 2023]

'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 September 2023 MST 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 up to four segments and for each offer within that segment.

Currently only two segments are active. These represent residential and business products, respectively. The definition of both of these segments is that they should exclude any subscriptions that are (i) mobile broadband (MBB)-only, (ii) machine-to-machine (M2M) and (iii) Internet of Things (IoT).

The final output of the September 2023 MST is presented in the *'Control'* worksheet where all calculations are aggregated.

2.2 *'Control'* worksheet

2.2.1 Control parameters

The user can select the settings of the September 2023 MST 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 MST 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 September 2023 MST presents the results at total, segment 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 Inputs

The September 2023 MST 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 September 2023 MST 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).[2]
<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 unit cost and year-on-year cost trend has been estimated for each of the following: • fixed cost for the residential segment • fixed cost for the business segment

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

	- variable cost per subscriber for the residential segment - variable cost per subscriber for the business segment. The unit cost values have been derived based on analysis of data collected in 2023 (superseding the inputs gathered in 2015 and 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 September 2023 MST 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 Calculations and outputs

The September 2023 MST has five main worksheets for the MST 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 September 2023 MST.

Within each worksheet, an output per segment and per offer is calculated. These values feed the final results of the September 2023 MST, shown in the *'Control'* worksheet and described in Section 2.2.2.

3 Using the margin-squeeze tool

3.1 Operating the MST

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 MST

The September 2023 MST 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.

Inputs and sources

Most of the inputs in the September 2023 MST 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 MST with the new updated data. If the updated data is placed in other locations/worksheets, the MST 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 MST with the new data, the final versions of the Telenor submission should be linked to the MST 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 MST are to be applied for different items.

Figure 3.1: Indication of how frequently updates should be applied [Source: Analysys Mason, 2023]

Worksheet	Item	Frequency of update
'InLists'	Retail offers to be tested and their weights	Updated each time the MST is run
'InLists'	Wholesale offers	Added each time the MST is run
'InVolumes'	Traffic patterns and consumption	Updated each time the MST is run
'InRevenues'	Revenue	Updated each time the MST 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 MST is run
'InWholesaleIC'	Termination, roaming and VAS costs	Updated each time the MST is run
'InRetailCosts'	Monthly inflation data	Updated each time the MST is run (from SSB[3])
'InRetailCosts'	Market data for Norway	Updated annually
'InRetailCosts'	Separated accounts data for retail revenue and external retail costs, including a split 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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3   https://www.ssb.no/priser-og-prisindekser/statistikker/kpi/maaned

Annex A Re-assessment of retail cost assumptions in 2023

The key cost assumptions required for any given version of the MST tool are a retail cost per subscriber for each of two modelled segments (residential and business), separated into a fixed cost part and a variable cost part.[4] 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.

The fixed retail costs for each segment are then allocated to the modelled subscribers for that segment within the MST tool. In the latest version of the MST tool (i.e. September 2023 MST), these two segments are strictly defined to explicitly exclude MBB-only subscriptions, as well as M2M and IoT subscriptions.

A.1 Data gathering

As a first step, data requests were issued to mobile service providers (MSPs) in Norway. A longer data request was sent to Telenor and a shorter data request was issued to other MSPs.

For the purposes of this update, and Telenor's data request in particular, it was necessary to identify three sub-segments within each of the broader two subscriber segments (meaning six sub-segments in all) to allow the modelled residential and business segments to be isolated.[5]

The longer data request issued to Telenor requested the following data by six sub-segments:[6]

- active SIMs by half-year for the period 2018–2022
- customers / billing relationships
- gross additions
- units of user equipment
- revenue, with handset-related revenues and other revenue separated out
- domestic traffic-related revenue
- international traffic-related revenue
- retail costs by retail category (listed in Figure B.1) and bad debt for the four years 2019–2022

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4   The two subscriber segments are defined to be consistent with those in Nkom's regular statistical reporting ('Ekomstatistikken'), available at https://nkom.no/statistikk/nkom-statistikk.

5   The definition of the sub-segments is the same as that used within Nkom's regular statistical reporting. The M2M/IoT sub-segment is defined as having the attributes Hovedkategori = Mobiltjeneste and Delkategori = "M2M" in Nkom's database. The MBB sub-segment is defined as having the attributes Hovedkategori = Mobiltjenester, Delkategori = "Mobilt bredbånd" in Nkom's database.

6   Residential: M2M/IoT, Residential: MBB, Residential: Other, Business: M2M/IoT, Business: MBB and Business: Other.

- estimate of fixed retail costs for each of the residential and business segments.

The shorter data request sent to other MSPs requested the following (higher-level) data:

- period-end subscribers, split by sub-segment
- operating cost information attributable to the mobile business, excluding staff costs
- capital asset information attributable to the mobile business
- staff cost information attributable to the mobile business.

Responses were received from five MSPs (✂).

A.2 Assessment of fixed retail costs

The 2020 MST included assumptions of separate fixed costs for the residential segment and the business segment. We assessed the latest data received and collated to consider potential updates for the fixed retail costs. Where input values have been revised, these have then been transposed into the September 2023 MST. In this section, we consider data:

- submitted by Telenor
- submitted by other service providers (SPs)
- available from other accounting sources (such as the Proff website).

A.2.1 Telenor submission

Telenor provided an estimation of the fixed retail costs for each segment as being ✂, based on a split provided in Figure A.1 below.

Figure A.1: Estimate of fixed retail costs provided by Telenor [Source: Telenor, 2023]

Category	Estimated fixed cost (NOK) ✂
Sales – commissions	
Sales – other	
Marketing	
Customer service	
Management & Administration – IS	
Management & Administration – Other	
Invoicing	
Postage costs	
Project Management	
Service platforms	
Depreciation	
Cost of capital	

No supporting evidence or commentary is provided by Telenor for these values.

A.2.2 Assessment of accounting data submitted by other SPs

Several smaller SPs provided in-year opex in the data request for their one or two most-recent financial years that corresponded to the costs required for their mobile business. Active subscriber information was sourced from Nkom's Ekomstatistikken. Most of these SPs that submitted data only operate in the residential segment (and, in addition, are predominantly either prepaid-focused or postpaid-focused). A plot of submitted opex against subscribers for those MSPs in the residential segment does show some correlation, as seen in Figure A.2.

Figure A.2: Scatter plot of subscribers and expenditures for those SPs active only in the residential segment [Source: Analysys Mason, 2023]

A regression analysis of these datapoints indicates a retail fixed cost for the mobile residential segment of approximately ✂ (this value is the opex corresponding to zero subscribers using the line of regression shown above).

It should be noted that this value does not include any depreciation element (only opex), due to issues/omissions in the submitted capital cost information.

We have also collated additional financial information for Norwegian companies, which is publicly available on the Proff website (https://www.proff.no), and reviewed the data for MSPs represented there. Most MSPs active in Norway are a part of larger companies and therefore costs related to their telecoms operations are not usually separable. However, there are two companies where we consider that these costs are identifiable: Chilimobil and Unifon.

Information for Chilimobil AS is available for the calendar years 2015–2022.[7] Chilimobil is an established, small-scale service provider focused entirely on the mobile residential segment in Norway (with less than 2% of its subscriber base being mobile broadband subscribers). Since 2018, Chilimobil's subscriber base has been predominantly postpaid (similar to Telenor and the Norwegian mobile market overall). Prior to 2018, Chilimobil's subscriber base was predominantly prepaid.

We have estimated in-year expenditures for Chilimobil as the sum of 'staff remuneration', 'ordinary depreciation' and 'other operating expenses'. We excluded cost of goods sold since we assume that

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[7]　See https://www.proff.no/regnskap/chilimobil-as/moss/telekommunikasjon/IGHYNU501PE; data extracted 15/09/2023.

it will be entirely variable. However, this approach should allow an estimation of both the capex and opex elements in a fixed cost to be derived.[8]

Year-end mobile subscriber volumes for Chilimobil have been sourced from Nkom's Ekomstatistikken publication released in May 2023.[9] We have then plotted in-year expenditures against subscribers and observed a linear correlation for subscribers and costs in the years 2018–2022. This can be seen for the pink points in Figure A.3 below. We used a linear regression on these datapoints to estimate a fixed retail cost for the residential segment of NOK36.8 million.
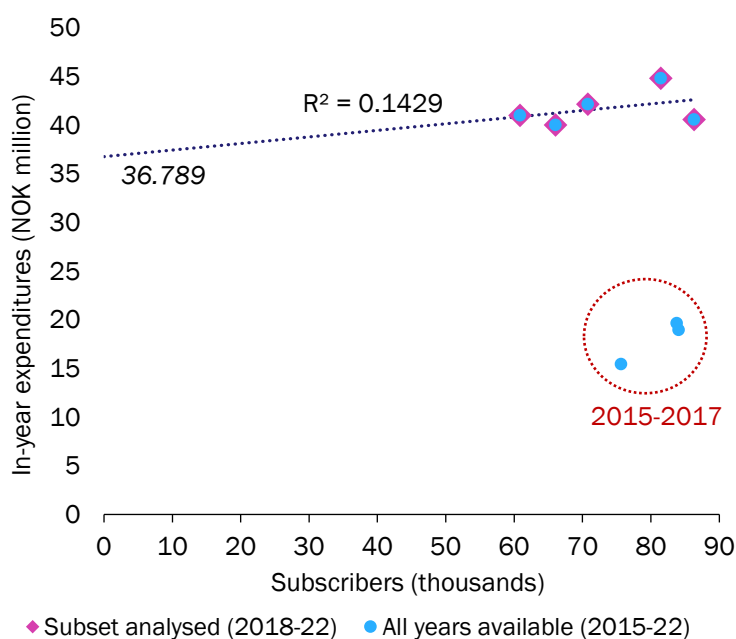

Figure A.3: Scatter plot of subscribers and expenditures for Chilimobil, with regression analysis for 2018–2021 shown [Source: Analysys Mason analysis of data from the Proof website, 2023]

Undertaking the same approach using just the datapoints for the years 2018–2021 gives a higher R^2 (of approximately 0.8) and fixed retail costs of NOK27.2 million. We consider that it is not justifiable to exclude the 2022 datapoint (being the most recent year of data). These two regressions indicate a potential range for the fixed retail cost for the residential segment of NOK27–37 million.

Similar financial data is available for Unifon[10] but, as is clear from Nkom's subscriber data, Unifon's subscriber base until recently has been a mix of mobile business subscribers, fixed residential telephony and fixed business telephony. Therefore, any regression analysis will not be applicable to a single telecoms segment. Unifon's business has also evolved significantly (including, for example, the integration of the phonect subscriber base into the company).

In the last three financial years, according to Nkom market data, Unifon mobile subscriptions comprise 75%, 92% and 94% of its total telecoms subscriptions respectively. Mobile subscriptions as a proportion of all subscriptions is significantly lower in earlier years. A linear regression for the period 2015–2022 indicates a total retail fixed cost for its telecoms segments of almost

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8   "Lønnskostnader", "Ordinære avskrivninger" and "Andre driftskostnader" respectively.

9   See https://nkom.no/statistikk/nedlasting-av-datasett for Helår 2022; data extracted 15/09/2023

10   See https://www.proff.no/regnskap/unifon-as/kristiansand-s/telekommunikasjon/IGBOZQGO1PE/

NOK50 million. The significantly higher fixed cost compared to the Chilimobil analysis could be interpreted as the fixed costs arising from their activity in multiple telecoms segments.
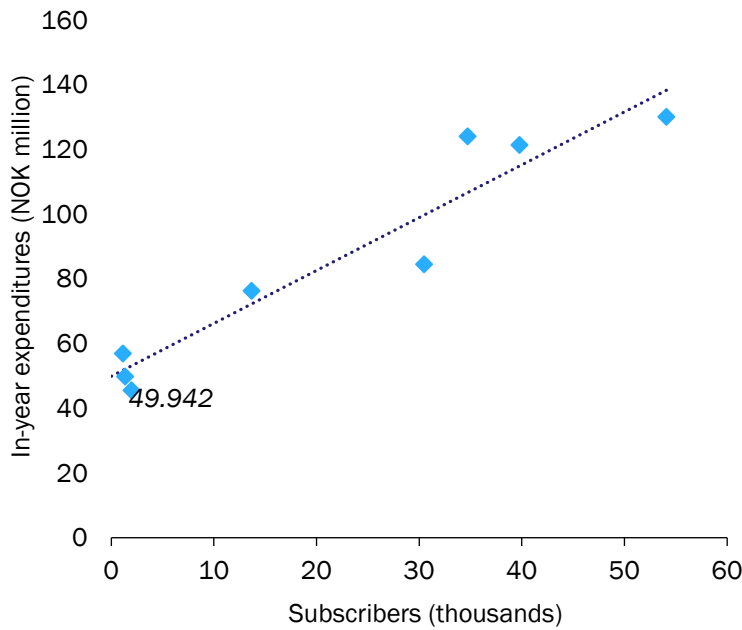

Figure A.4: Scatter plot of subscribers and expenditures for Unifon [Source: Analysys Mason analysis of data from the Proof website, 2023]

✂

A.2.3 Fixed retail costs applied

We therefore have several possible sources to inform the fixed cost for the modelled segments. These are summarised below

Figure A.5: Overview of datapoints derived for the fixed costs of the modelled segments [Source: Analysys Mason, 2023]

Residential segment		Business segment	
Source	Value (NOK million)	Source	Value (NOK million)
Telenor	✂	Telenor	✂
Chilimobil data (Proff)	27–37	Unifon data (Proff)	50
Other MSP data	✂		

The estimates of residential fixed costs submitted by Telenor were not provided with accompanying evidence and therefore we do not believe that any significant weight can be attributed to them. The operator data from the other MSPs does not include a capital element, whilst the accounting data for Unifon is less reliable for this specific exercise due to its activities in a range of market segments.

Chilimobil is a MSP operating almost exclusively in the mobile residential segment. Therefore, we consider the estimation of a fixed retail cost using its accounting data to be the most reliable estimate of the data available. This gives an estimated fixed cost for the segment of NOK36.8 million.

When comparing this retail fixed cost to the value last derived in 2019 (using 2015–2018 data, described in Annex B), we consider that this effectively corresponds to the result derived and applied in 2019 when adjusted for recent inflation. Therefore, we propose to update the fixed retail costs in the 2020 MST by 13.0%, equivalent to the increase in consumer price index between the middle of 2018 (last year of available data in the previous process) and the middle of 2022 (last year of available data in this latest process). We would apply the same uplift to fixed costs for the business segment.

Finally, we assume the total split of retail costs in a given segment is distributed based on the split by cost category as indicated by the Telenor submission.

A.3 Determination of variable retail costs and cost trends

Telenor provided comprehensive demand, revenue and cost information for each of the years 2019–2022. As a result, an explicit re-calculation of the retail costs associated with the two segments to be captured in the MST going forward (equivalent to the "Residential: Other" and "Business: Other" sub-segments) has been possible.

In particular, the transformations using the 2015 data (as shown in Figure B.2) are no longer required. The fixed retail costs have also been updated based on the analysis in Section A.2. The simplified calculation undertaken is set out in Figure A.6 below.

Figure A.6: Simplified calculation approach for retail costs [Source: Analysys Mason, 2023]
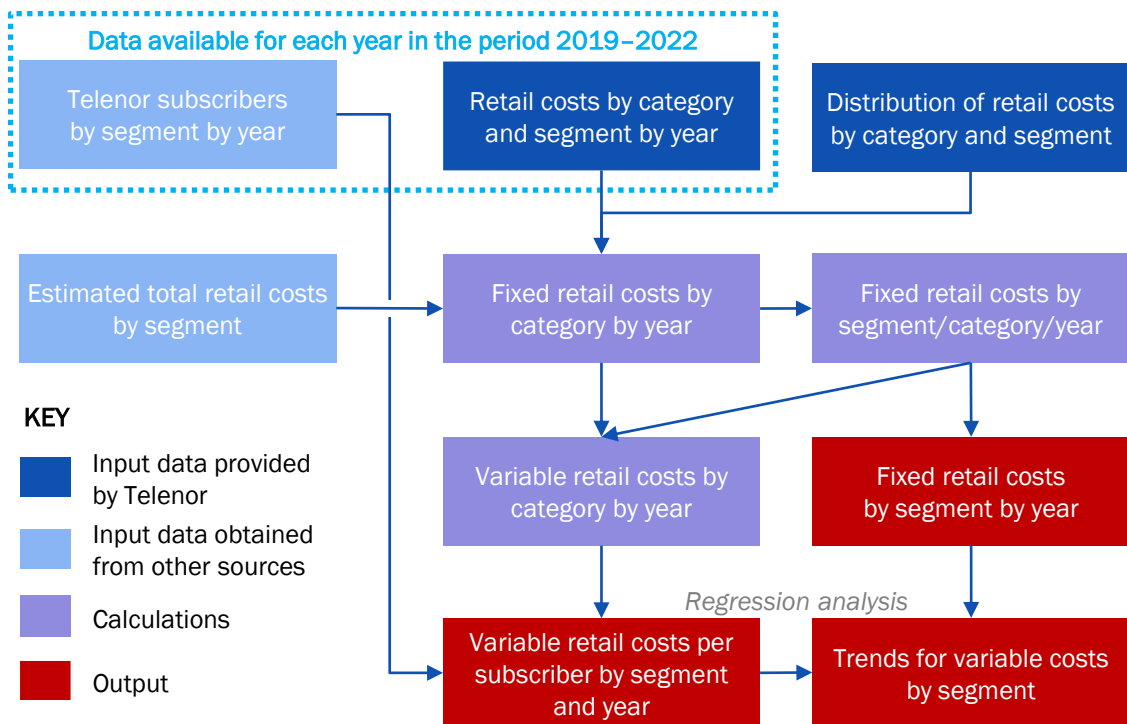
The simplified calculation is undertaken for each year of retail cost data available from Telenor's separated accounts rather than just for the most recent year for which data is available. We have then re-

run our regression analysis, using the updated fixed retail costs by segment, to derive variable costs per subscriber by segment and a cost trend for that variable cost. These cost trends can then be used to estimate the future evolution in retail variable costs going forward.

Telenor have indicated that there are some uncertainties in the cost splits by sub-segment and category provided for 2019 and 2020. Furthermore, the splits of three retail cost categories by sub-segment in 2019 do not add up to the category totals provided in the 2019 separated accounts. Therefore, we have concluded it is prudent to exclude the 2019 information and restrict our regression analysis to 2020–2022.

A visual comparison of the retail costs arising from the inputs derived from this regression analysis, compared to Telenor's actual retail costs for the period 2020–2022, is shown below.

✂

Figure A.7: Internal retail costs per segment subscriber [Source: Analysys Mason, 2023]

A.4 Summary of proposed values

A comparison of the inputs in the previous version of the MST model and our proposed revisions are provided below in Figure A.8.

Figure A.8: Comparison of retail cost assumptions for the MST model [Source: Analysys Mason, 2023]

Description	Previous value ✂	Proposed revision ✂
Residential segment		
Fixed cost		
Variable internal retail cost per subscriber		
Year-on-year trend in variable cost		
Business segment		
Fixed cost		
Variable internal retail cost per subscriber		
Year-on-year trend in variable cost		

Annex B   Prior calculation of retail cost assumptions

The key cost assumptions required for any given version of the MST 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 a requirement for 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 version of the MST model used prior to April 2019 and then describe the refined approach developed in 2019–2020.

B.1   Approach to deriving inputs prior to 2019

The previous calculation of retail costs in the April 2019 model used data derived from operator submissions 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 MST.

B.2   Approach to deriving inputs developed in 2019–2020

A new simpler calculation of the inputs for the retail cost assumptions in the MST was developed. The inputs underlying the new calculation were the same as those from the April 2019 model and were therefore consistent with that previous approach, with the exception of the proportion of fixed

costs for depreciation and cost of capital.[11][12] The cost inputs used in the new approach are set out in Figure B.1.

Figure B.1: List of cost categories [Source: Previous modelling,[13] 2020]

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 were removed form the margin squeeze tool since they had contained zero cost for several years. The two remaining 'external' cost categories (mobile handsets and other) were treated separately in this refined approach.

These external costs and the corresponding revenues were split between segments and then converted to per-subscriber costs. The splits of these costs/revenues between segments were derived using information from Telenor's separated accounts. These costs and revenues were provided by Telenor in the data request and were provided for the latest financial year in each October submission.

The new 2019 approach considered the remaining retail cost categories in a standalone, one-off calculation of suitable inputs reflecting these retail costs. In the subsequent six-monthly re-runs of the MST, this calculation was not updated. Instead, a set of assumed cost trends were used to update the retail cost assumptions in a predictable fashion for each test. These cost trends were calculated as part of this new approach, but an alternative set of trends could have been used.

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[11] 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).

[12] 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.

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

The calculation applied is set out in Figure B.2. In particular, it removed the transformations using market-level statistics that had been present in the methodology developed prior to 2019.

Figure B.2: Refined calculation approach for retail costs (excluding external cost categories) [Source: Analysys Mason, 2020]
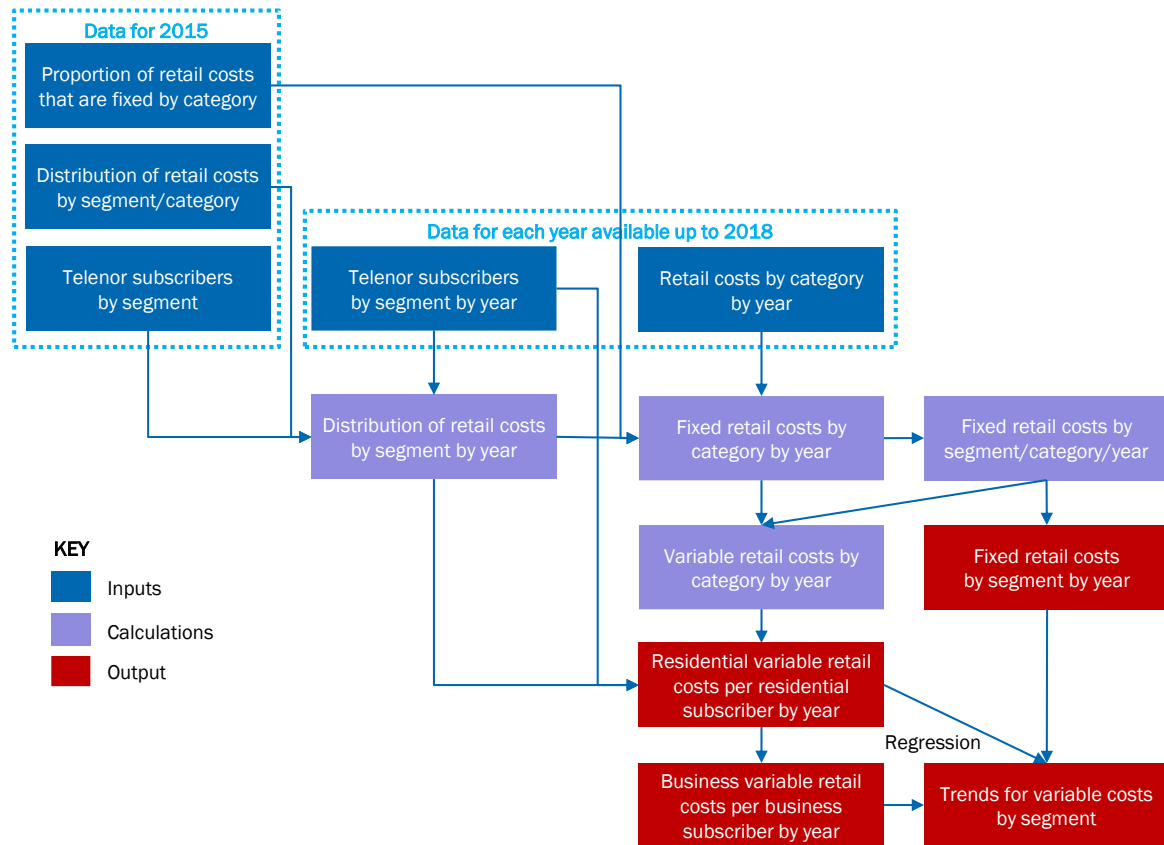
The refined calculation was then undertaken for each year of retail cost data available from Telenor's separated accounts rather than just for the most recent year for which data is available. This allowed cost trends to be estimated over the period 2014–18 for each retail cost assumption required for the 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 were taken from the year 2015 (when the distribution inputs were provided) for use in the MST model.[14] These 2015 unit cost and cost trend values were then entered as inputs into the MST model on the *'InRetailCosts'* worksheet. Going forward, the cost trends were applied as required at each update. Since a six-monthly update schedule was used, half a year of cost trend was applied with each update.

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[14]   This led to different assumed retail costs per subscriber in this post-2019 version of the MST compared to the version in use prior to April 2019. This effect was due to (i) this post-2019 MST not including the transformations using the market-level statistics; (ii) the retail cost assumptions in the post-2019 MST being based on retail cost data for 2015 with a choice of cost trend applied (whilst the pre-2019 MST used retail cost data for 2017) and (iii) the new approach to treating mobile handset costs and external costs in the post-2019 MST compared to the pre-2019 MST.

The unit cost values were not revisited after being set, since the cost trend captured future evolution in costs. The MST model itself allowed the user to choose alternative cost trends for the unit cost values. The two other alternatives were to assume zero trends (i.e. flat in nominal terms) or to increase with inflation (i.e. flat in real terms). This option was chosen on the *'Control'* worksheet.