



User guide for Nkom

Using and updating the fixed- mobile broadband (FMB) margin squeeze testing tool



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1 Introduction

Analysys Mason has been commissioned to support Nkom on the development of a margin squeeze test for fixed-mobile broadband (FMB) services. It is intended to be used as a price-control tool for the regulation of Telenor's wholesale products for these services.

This document provides an overview of this new testing tool. It outlines the general structure of the test and its underlying principles, as well as explaining how to adjust the various inputs and parameters within the testing tool.

1.1 Background

On 20 December 2018, Nkom published its decision regarding the wholesale market for central access to fixed access networks (Market 3b).¹ In Section 2.4.4.2 of the market analysis underpinning that decision, Nkom concluded that wholesale access to FMB networks should be included within the market.² Telenor was found to have significant market power (SMP) in this market.

On 13 October 2020, Nkom published a subsequent decision on the price regulation of FMB.³ In Section 2.2 of that decision, Nkom concluded on the need to develop and implement margin squeeze tests on Telenor's FMB products, with Telenor subject to an obligation to avoid a margin squeeze on its wholesale FMB products when offered to access seekers.

This document describes the margin squeeze test that has been developed to implement this remedy.

1.2 Key inputs

We have used a range of data sources to build and populate the test, but primarily information provided by both Telenor and alternative operators in the Norwegian FMB market. The main inputs are updated after receiving responses to the data requests sent to Telenor (and other operators where appropriate) twice a year. Please refer to Section 2.3 for a more extensive explanation of the inputs used in the testing tool.

¹ See <https://www.nkom.no/ekom-markedet/markeder/marked-3a-og-3b-lokal-og-sentral-tilgang-til-faste-aksessnett>

² See https://www.nkom.no/ekom-markedet/markeder/marked-3a-og-3b-lokal-og-sentral-tilgang-til-faste-aksessnett/_/attachment/download/90978ba2-503b-493d-9f7d-d3173fa93e91:514828a430cb44ea3ed0e1378948bb28914868d4/Vedlegg%201%20Analyse%20av%20M3a%20og%20b_offentlig.pdf, page 59

³ See https://www.nkom.no/ekom-markedet/markeder/marked-3a-og-3b-lokal-og-sentral-tilgang-til-faste-aksessnett/_/attachment/download/9c5bebc1-b713-4ec6-800a-0c330644d6c3:7af91e89d3fad06a76cfc2033b4b0e8e5611142c/Prisregulering%20FMBB%20varsel%20om%20vedtak.pdf

1.3 Formatting and naming conventions

Consistent cell formatting has been used throughout all worksheets of the testing tool. This is to increase the transparency of the margin squeeze test, as well as making it easier to understand and modify. A number of standardised cell formats are used to distinguish input data (i.e. information from a source), input parameters (i.e. assumptions or a choice by the user), calculations and links. The most important conventions are shown in Figure 1.1 below.

Input Parameter	<input type="text" value="100"/>	unlocked
Input Parameter	<input type="text" value="250"/>	unlocked
Input Parameter	<input type="text" value="300"/>	unlocked
Input Data	<input type="text" value="100"/>	unlocked
Input Estimate	<input type="text" value="100"/>	unlocked
Input Calculation	<input type="text" value="100"/>	locked
Input Link	<input type="text" value="100"/>	locked
Input Link (different Worksheet)	<input type="text" value="100"/>	locked
Input Link (different Workbook)	<input type="text" value="100"/>	locked
Redacted cell	<input type="text" value="100"/>	locked
A-EEO cost input adjustment	<input type="text" value="100"/>	locked

Figure 1.1: Formatting conventions used in the testing tool
[Source: Analysys Mason, 2021]

For this calculation, we also have included a particular conditional formatting (the blue formatting at the bottom of the above list) to highlight where adjustments have been made to cost inputs according to the adjusted-equally efficient operator (A-EEO) principle. These adjustments are described in Sections 2.3.4 and 2.3.5.

This conditional formatting updates automatically based on the input data present. Therefore, it will not work in redacted versions of the model, where some/all input data has been removed.

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

- **Worksheets:** 'XXXXX' (e.g. 'Revenues')
- **Worksheet sub-sections:** <XXXXX> (e.g. <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 test and its underlying principles
- Section 3 explains the process for maintaining and updating the test.

2 General description

This section describes the structure of the testing tool and its underlying principles, covering:

- structure of data in Section 2.1
- the contents of the ‘Control’ worksheet in Section 2.2
- details of the inputs in Section 2.3
- calculations and outputs in Section 2.4.

2.1 Structure of the testing tool

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

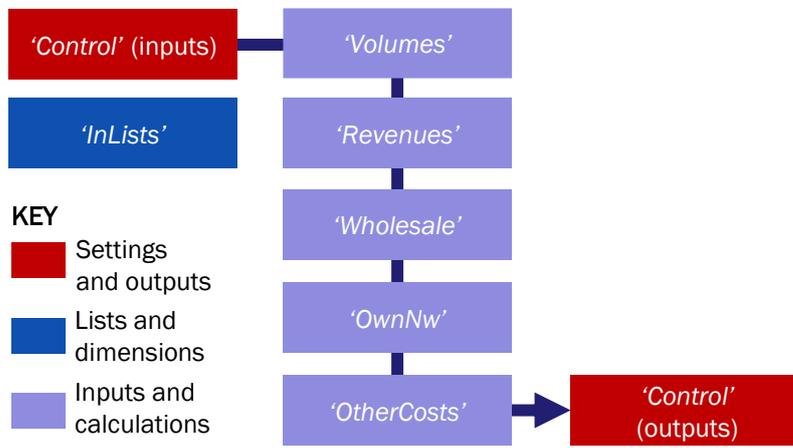


Figure 2.1: Overall structure of the margin squeeze testing tool [Source: Analysys Mason, 2021]

The table below provides a brief description of each worksheet within the testing tool.

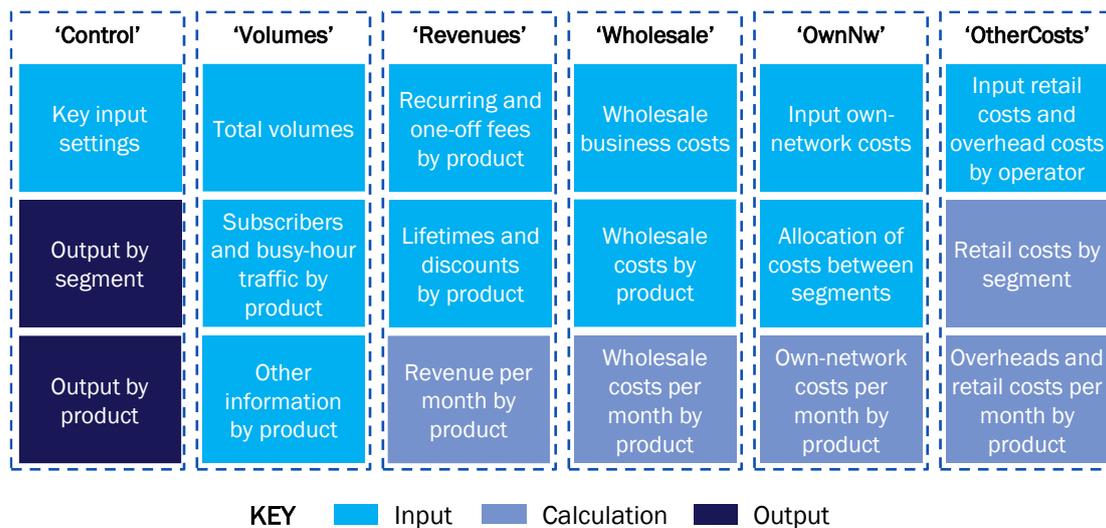
Figure 2.2: Overview of the worksheets in the testing tool [Source: Analysys Mason, 2021]

Worksheet	Description
'C'	Lists the worksheets constituting the testing tool
'V'	Specifies the version history of the testing tool
'S'	Provides a guide to the formatting styles used in the testing tool
'Control'	Contains the key input parameters and assumptions, as well as setting out the outputs of the testing tool
'InLists'	Contains key lists and definitions, including cost items and flagship products
'Volumes'	Includes input data such as subscriber volumes and other details by package This worksheet serves as input for the following worksheets: 'Revenues', 'Wholesale', 'OwnNw' and 'OtherCosts'
'Revenues'	Presents the tariff data inputs, including the monthly fees for the products, one-off fees and any applicable discounts
'Wholesale'	Presents wholesale cost inputs, including recurring costs by product

Worksheet	Description
'OwnNw'	Presents assumptions on the own-network costs applicable to the FMB business, including customer premises equipment (CPE)
'OtherCosts'	Presents assumptions on retail costs and overheads, including fixed retail costs and variable retail costs per subscriber provided by operator. Calculates average retail costs for the test

Each of the main worksheets within the testing tool captures several sets of inputs and calculations, as shown in Figure 2.3 below.

Figure 2.3: Information contained within each worksheet [Source: Analysys Mason, 2021]



The input data to the test is presented at product level. Calculations for each specific category (i.e. revenue, wholesale costs, own-network costs and retail/overhead costs) are performed within each worksheet. We present results for each product. Products are also grouped into two segments (residential and business), with results also expressed for both each segment individually and for all products in total.

The final outputs of the test are presented in the '*Control*' worksheet, where all calculations are aggregated.

2.2 '*Control*' worksheet

2.2.1 Control parameters

The user is able to select the settings used for the test and define the case that will be tested. The main settings are summarised below in Figure 2.4.

Figure 2.4: Key settings on the Control worksheet for the test [Source: Analysys Mason, 2021]

Named range	Description
input.WACC.nominal	Weighted-average cost of capital (WACC)
assumed.market.share	Market share of the Norwegian FMB market assumed for the test (in subscriber terms)
assumed.FMB.operator.data.used	Set of cost inputs to inject into the margin squeeze test (can be of a single operator or an average of multiple operators)
assumed.subscriber.base	Allows for either period-end or period-average subscribers to be used in the margin squeeze test
assumed.fixed.XXXX	Assumed fixed cost applicable in the test
retail.cost.assumptions.used	Set of retail cost inputs assumed by segment
input.lifetime.months	Lifetimes assumed for different categories of one-off revenue and one-off costs (over which they will be amortised): values are expressed in months
input.apply.global.reference.customer.lifetime	Allows user to apply a global customer lifetime across all tested products (if set to 1), or to use the customer lifetimes by product provided (if set to 0)
cost.difference.threshold	If the average alternative operator costs are less than this percentage greater than Telenor's costs, then Telenor costs should be used with 100% weight
cost.weight.Telenor	Assumed weight given to average alternative operator costs if they are greater than Telenor's cost by more than the above threshold (Telenor costs are ascribed the remaining weight)

2.2.2 Outputs

The testing tool presents the results at total (all-segment), segment and product level:

- At the **product** level, the margin is calculated taking into consideration both recurring and one-off retail revenues, as well as wholesale, own-network, retail and overhead costs
- At the **segment** level, the margin is calculated using the weighted outputs of the product level calculation (with the weights being the subscribers of the product as a proportion of all subscribers in the segment)
- At the **all-segment** level, the margin is calculated using the weighted outputs of the segment level calculation (with the weights being the subscribers in the segment as a proportion of all subscribers across both segments).

At each of these levels, the margin is calculated taking into consideration both recurring and one-off retail revenues, as well as wholesale, own-network, retail and overhead costs.

A gross margin is also calculated as total recurring retail revenues less total wholesale costs. Own-network costs, retail costs and overhead costs are not considered.

2.3 Inputs to the test

The test uses a number of input parameters (shown in light blue in Figure 2.3 above), which will be sourced from Telenor, Nkom and other operators such as JetNett, NextGenTel and Telia.

The input data presented in the testing tool has been asked for in separate data requests sent to Telenor and other operators. The main inputs and their location within the testing tool are described below.

2.3.1 'Volumes' worksheet

The volume inputs are provided for each retail product, which are grouped according to the two segments.

<Traffic factors>	This contains the contention factors by segment and the assumed IP transit kbit/s as a proportion of busy-hour kbit/s.
<Residential> <Business>	<p>This contains the following information by product:</p> <ul style="list-style-type: none"> • Telenor subscriber volumes (period-beginning and period-end) • assumed subscriber volumes for the margin squeeze test, using the market share as stated in the principles underpinning the test and the control parameter of either period-end or period-average subscribers • download speed in Mbit/s by product • busy-hour bandwidth per subscriber in kbit/s, calculated as download speed in kbit/s divided by the contention factor • IP transit bandwidth per subscriber in kbit/s, calculated as busy-hour bandwidth per subscriber multiplied by IP transit kbit/s as a proportion of busy hour kbit/s • in-segment weights by product, calculated based on the subscribers assumed in the test

2.3.2 'Revenues' worksheet

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

<Raw data>	<p>This category specifies the retail pricing by product in nominal currency, including:</p> <ul style="list-style-type: none"> • recurring fees, which include <ul style="list-style-type: none"> – monthly fees – CPE rental – other recurring fees • one-off fees, which include <ul style="list-style-type: none"> – initial fee
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	<ul style="list-style-type: none"> – installation of antenna – CPE and shipping • fees related to moves, adds and changes (currently none assumed). <p>The raw data is assumed to include VAT. Each segment is assumed to have its own level of VAT, which is then divided out in order to derive the assumed revenue per month</p>
<Applicable global discounts>	This specifies any discounts in absolute terms. Discounts can be specified separately for each product and for each of the above pricing components.
<Final input prices>	This calculates the final input prices as the raw retail fees less the applicable discount.
<Assumed recovery period by revenue item (months)>	<p>Set by product and cost category in terms of calendar months.</p> <p>These parameters are used to amortise up-front costs into a monthly amount.</p>
<Information on specific retail discounts (if applicable)>	Allows specific promotions or discounting campaigns by Telenor to be captured.
<Assumed payments per subscriber per month>	<p>Set by product and cost category, assumed to be 1 in most cases.</p> <p>Conceivably, the assumed payments per subscriber per month for moves/adds/changes could be less than 1 (on the basis that these fees are only incurred for a proportion of subscribers and, even for those subscribers, are not incurred every month). However, data has not been provided on the frequency of these particular payments, so they have been set to zero.</p>
<Assumed revenue per month (excluding VAT)>	Calculated using a monthly standard annuity calculation, using a monthly weighted-average cost of capital (WACC) and a reference lifetime expressed in months. The WACC value is pre-tax and in nominal terms.

2.3.3 'Wholesale' worksheet

Recurring wholesale fees by product are provided, as well as the other wholesale business costs.

<Wholesale business costs>	<p>These inputs cover wholesale costs at the business level, comprising:</p> <ul style="list-style-type: none"> • one-off fixed costs (e.g. related to bank guarantees) • one-off variable costs (e.g. SIM profile) • recurring fixed costs (e.g. VPN/APN tunnels) • recurring variable costs (e.g. Operator Connect 10GE interface).
<Wholesale costs per subscriber>	<p>These inputs cover recurring fees that vary by wholesale product.</p>
<Calculated wholesale costs per subscriber per month>	<p>This calculates the overall wholesale monthly costs per subscriber by product.</p>

2.3.4 'OwnNw' worksheet

Own-network cost inputs are provided on this worksheet.

<Inputs>	<p>These inputs cover the following own-network costs applicable to the FMB business:</p> <ul style="list-style-type: none"> • internet service platform (fixed and variable) • core network costs per Mbit/s • IP transit costs per Mbit/s • peering costs per Mbit/s • CPE costs (see next entry). <p>For each cost input, there are two cost options. One is based on average alternative operator data and the other is based on Telenor data. If the average alternative operator value is more than an assumed threshold (currently set at 10%) above the Telenor value, then the final value is calculated as a weighted-average of the Telenor value and the average alternative operator value (the weights are currently assumed to be 30% and 70% respectively). Otherwise, the Telenor value is used.</p> <p>Each cost is then split between the residential and business segments.</p>
<CPE costs by operator>	<p>These inputs capture the costs of CPE, including the cost of materials, installation, shipping, external antenna and the SIM card. Values have been provided by both Telenor and alternative operators.</p>

<Calculated costs>	This calculates the overall own-network monthly costs per subscriber by product, applicable to the FMB business.
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2.3.5 'OtherCosts' worksheet

<Input data for FMB retail costs>	<p>These inputs cover the following categories of FMB-related retail costs:</p> <ul style="list-style-type: none"> • product development • sales/marketing • customer care • general billing. <p>Values for bad debt, cancellation cost per subscriber and direct billing cost per subscriber can also be provided.</p> <p>The values are set out separately according to each operator that has provided data. For each of the four categories listed above, an operator has the opportunity to specify:</p> <ul style="list-style-type: none"> • an initial level of investment (capex fixed cost) • a level of recurring cost per month (opex fixed cost) • a recurring cost per month expressed in per-subscriber terms (opex variable cost). <p>For each of the four categories, most operators have provided the first two items, but not the last item. Each operator has also indicated the number of subscribers that it currently serves (its scale). Therefore, the capex and opex values provided by each operator are assumed to be for that level of scale in subscriber terms.</p> <p>On the 'Control' worksheet, the user is able to specify an assumed fixed opex (effectively the opex incurred assuming zero subscribers) for each of the four categories.⁴ For each operator, the variable opex per subscriber per month is then calculated for each category as:</p> $\frac{[\textit{Opex provided by operator}] - [\textit{assumed fixed opex}]}{[\textit{Current number of subscribers}]}$ <p>Values have been provided by both Telenor and alternative operators.</p> <p>For each data point, a value for an "average alternative operator" is calculated initially based on the straight average of the data points</p>
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⁴ These values have been informed by data from one operator, who provided costs for two different sizes of subscriber base.

	provided across all alternative operators. If this straight-average value is more than 10% above the Telenor value, then the final value is calculated as 30% of the Telenor value and 70% of the average of these values. Otherwise, the Telenor value is used.
<Retail costs per subscriber per month>	This section calculates the retail costs per FMB subscriber per month to be used for each segment
<Overhead costs>	<p>This section contains cost inputs related to corporate overheads and regulatory costs by operator.</p> <p>Values have been provided by both Telenor and alternative operators. An average alternative operator value is calculated based on the inputs from multiple alternative operators. If the average of these values is more than 10% above the Telenor value, then the final value is calculated as 30% of the Telenor value and 70% of the average of these values. Otherwise, the Telenor value is used.</p>
<Final other costs>	This calculates the retail cost per FMB subscriber per month by product, as well as the overhead cost per subscriber per month by product.

2.4 Calculations within the test and resulting outputs

As described above, the testing tool has inputs and calculations on the same worksheets for the margin squeeze test, covering:

- subscribers and traffic (*'Volumes'* worksheet)
- revenue (*'Revenues'* worksheet)
- costs (*'Wholesale'*, *'OwnNw'* and *'OtherCosts'* worksheets).

These worksheets also source assumptions from the *'Control'* worksheet. Within each worksheet, outputs by product are calculated. These feed into the final results of the test, shown in the *'Control'* worksheet and described in Section 2.2.2.

3 Using the margin squeeze testing tool

3.1 Running the margin squeeze test

The main settings for the margin squeeze test can be found in the ‘*Control*’ worksheet. In this worksheet, the user can specify the following inputs:

- Pre-tax nominal WACC expressed in annual terms
- choice of period-average or period-end FMB subscribers (current default is period-end)
- assumed market share
- operator-specific FMB data to be used
- fixed opex costs per month for customer care, general billing, product development and sales/marketing related to the FMB business
- fixed opex costs per month and a fixed capex for the internet service platform (applicable to the FMB business)
- retail cost assumptions used
- reference lifetimes in months.

This worksheet also summarises several cross-checks. If all of the cross-checks are zero, then the aspect being checked is working correctly.

3.2 Updating the margin squeeze test

The test is an active calculation that can be kept up to date by periodically requesting the most recent data from industry parties and refreshing the inputs used in the test with this most recent data. We explain below how to update these inputs below.

Inputs and sources

Most of the inputs for the test have been asked for in the data request sent to Telenor and the other operators, and they were explained in Section 2.3.

Some of the key inputs (such as retail prices and wholesale costs) should be updated on the basis of data provided by operators and should be applied at the time of the update. The frequency of updates is specified by input in Figure 3.1 below. Nkom should replace the existing data that currently populates the margin squeeze test with the new updated data, in the same locations/worksheets. If the updated data is placed in other locations in the testing tool, the margin squeeze test will not recognise this new data without the need to adjust the formulas and calculations.

Other inputs can be updated each time the margin squeeze test is run. Nkom can choose not to update them if it considers that the changes in the most recent years will have been minimal.

Frequency of updates

Figure 3.1 below provides an overall indication of the frequency with which updates to the margin squeeze test are to be applied for different items.

Figure 3.1: Indication of how frequently updates should be applied [Source: Analysys Mason, 2021]

Worksheet	Item	Frequency of update
'InLists'	<ul style="list-style-type: none"> Retail products to be tested Corresponding wholesale product 	Updated each time the margin squeeze test is run
'Volumes'	<ul style="list-style-type: none"> Contention factors by segment IP transit kbit/s as a proportion of busy-hour kbit/s by segment Subscriber volumes and other characteristics by product Weights by product 	Updated each time the margin squeeze test is run or data is requested by Nkom
'Revenues'	<ul style="list-style-type: none"> Retail prices by product Discounts by product/campaign 	Updated each time the margin squeeze test is run
	<ul style="list-style-type: none"> Assumed recovery period by cost and product in months Payments per subscriber per month 	Should only need to be updated in the event of new information or assumptions
'Wholesale'	<ul style="list-style-type: none"> Wholesale business costs Wholesale costs per subscriber by product 	Updated each time the margin squeeze test is run or data is requested by Nkom
'OwnNw'	<ul style="list-style-type: none"> Own-network costs (applicable to the FMB business) FMB CPE costs by operator 	Updated each time the margin squeeze test is run or data is requested by Nkom
'OtherCosts'	<ul style="list-style-type: none"> FMB retail costs by operator Overhead costs by operator 	Updated each time the margin squeeze test is run or data is requested by Nkom

3.3 Calculations and outputs

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