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Explanations for assessing IT forecast quality

Quantifying IT forecast quality

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Introduction

- In this presentation, the tools presented in "Quantifying IT forecast quality" are explained.
- We discuss them in the following order:
  - f/a plot
  - Estimating Quality Factor (EQF)
  - reference cone
  - assessing IT forecast quality
- For more information we refer to our paper.

f/a plot

- f/a plot stands for forecast to actual plot.
- The plot is identical to the now famous *cone of uncertainty* of Barry Boehm.
- It allows for assessing the quality of forecasts and detect possible biases.

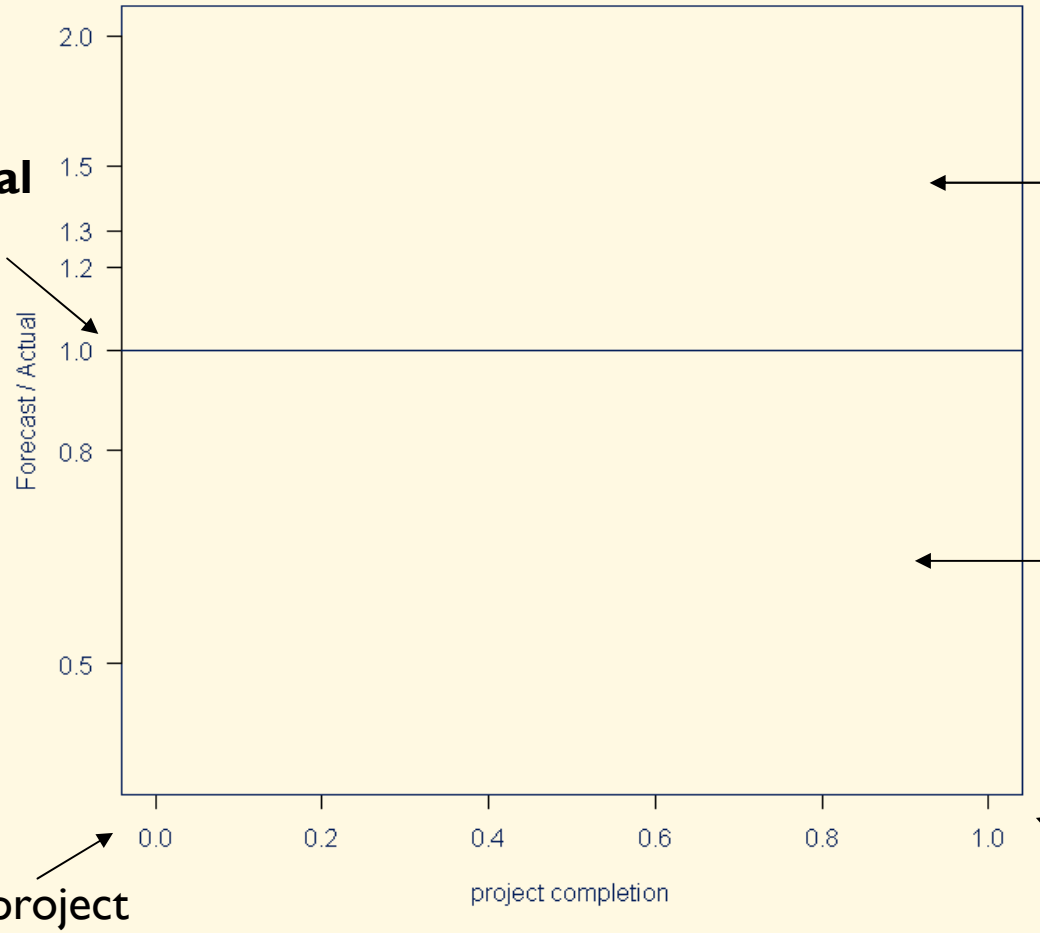
Example forecasts

- Suppose a project started 1/1/2008 and ended 1/9/2008. The project costs were 20 million euro.
- During the project the following forecasts were made:

Forecasted costs (millions)	Date of forecast	Project progression	f/a ratio
30	1/1/2008	0	1.5 (=30/20)
16	19/2/2008	0.2 (= (19/2 - 1/1) / (1/9 -1/1))	0.8
26	2/5/2008	0.5	1.3
24	8/6/2008	0.65	1.2

- It is possible to assess these forecasts using an f/a plot.

fla plot



forecast = actual

perfect forecast

forecast > actual

underrun / overestimate

forecast < actual

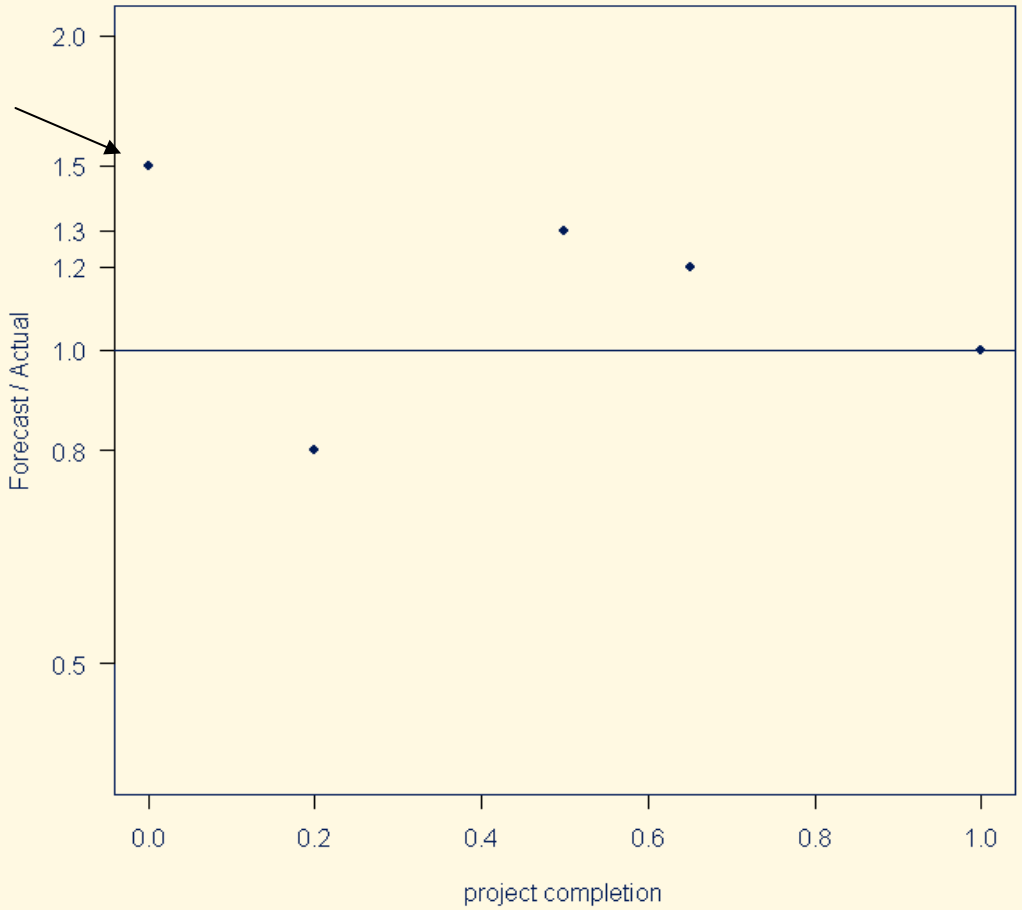
overrun / underestimate

Start of project

End of project

Example forecasts in f/a plot

The closer the forecasts are to the horizontal line f/a = 1, the better the forecast is.

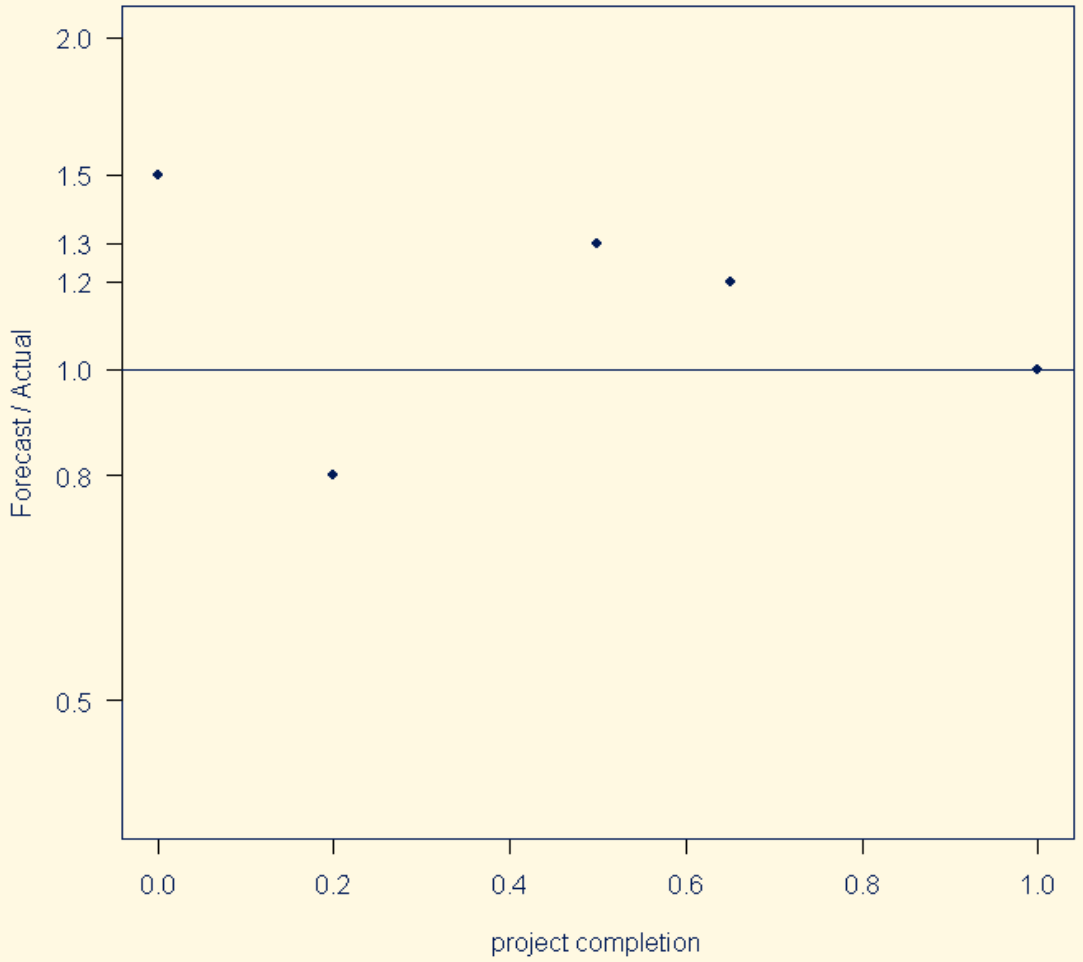


Forecasts of example project plotted in an f/a plot.

EQF

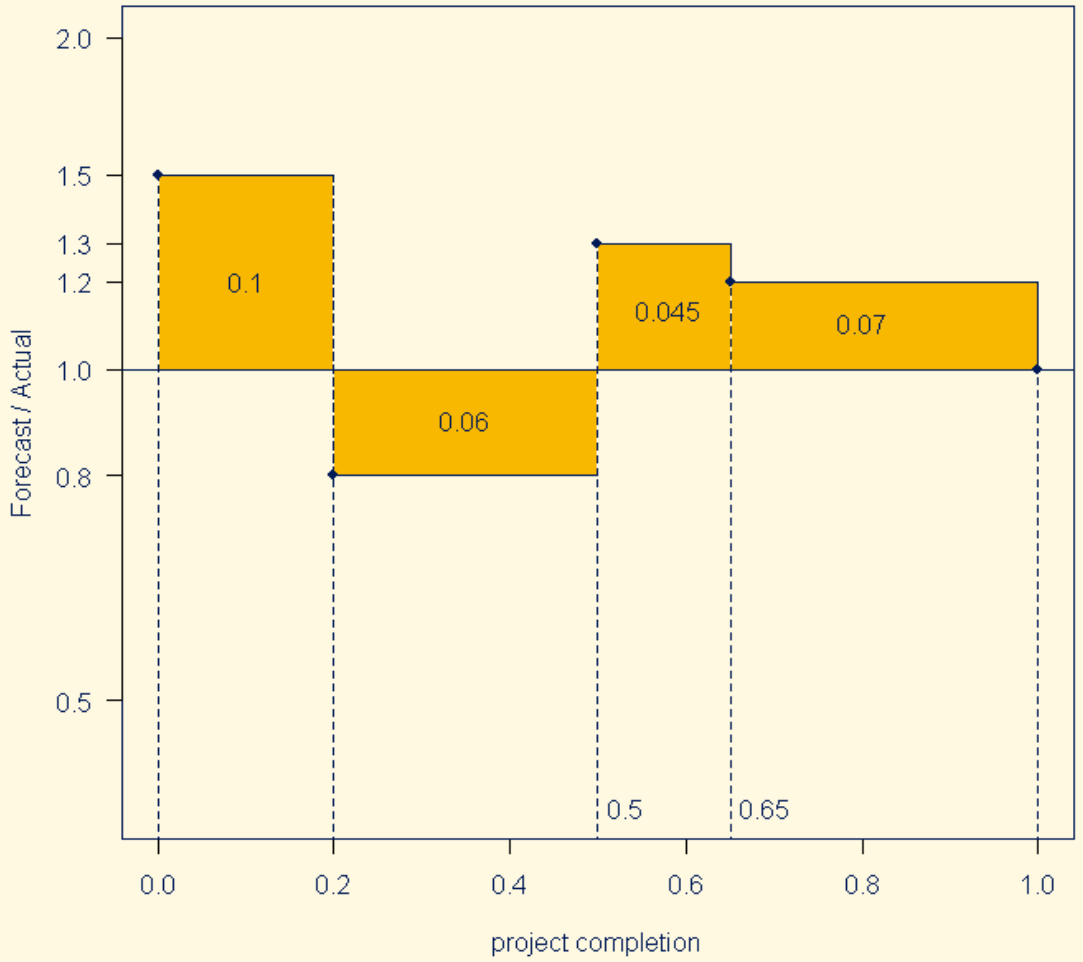
- However, the f/a plot does not quantify the quality of the forecast.
- For this purpose, we use the EQF, which stands for Estimating Quality Factor.
- The EQF is conceived by Tom DeMarco in his book ‘Controlling software projects’.
- The EQF is a measure of the deviation of a forecast to the actual.

Example forecasts



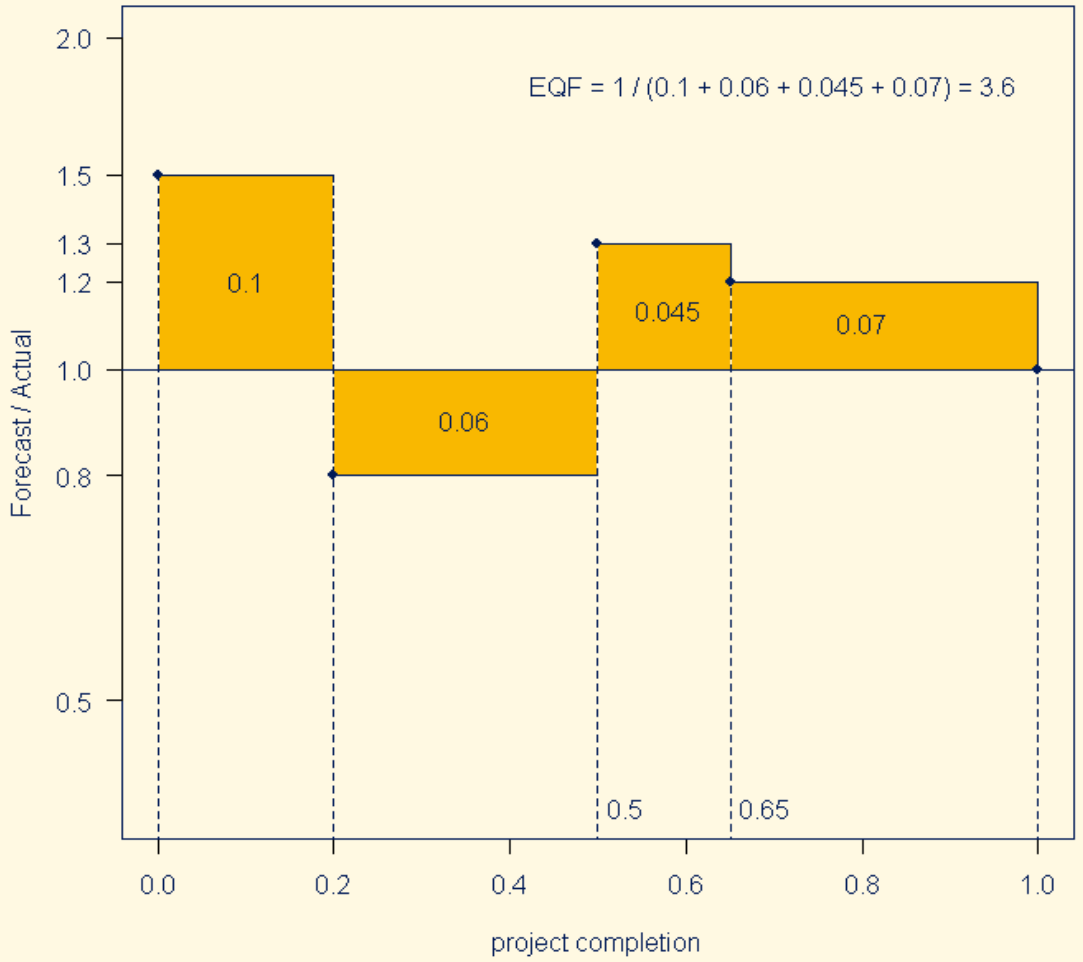
To explain the EQF we use the same example forecasts as before.

Example forecasts



For each forecast we calculate the deviation to the actual by computing the surfaces between forecast and actual.

Example forecasts



The EQF is one divided by the sum of these surfaces.

For our example project the quality of the forecasts in terms of EQF is 3.6.

Estimating Quality Factor

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- For each project it is possible to compute an EQF value in this way.
  - A low EQF value means the forecasts are of low quality. That is, the deviation of the forecast to the actual is large.
  - A high EQF value means the forecasts are of high quality. That is, the deviation of the forecast to the actual is small.

- With the EQF it is possible to compare the forecasts of projects with each other.

Reference cone

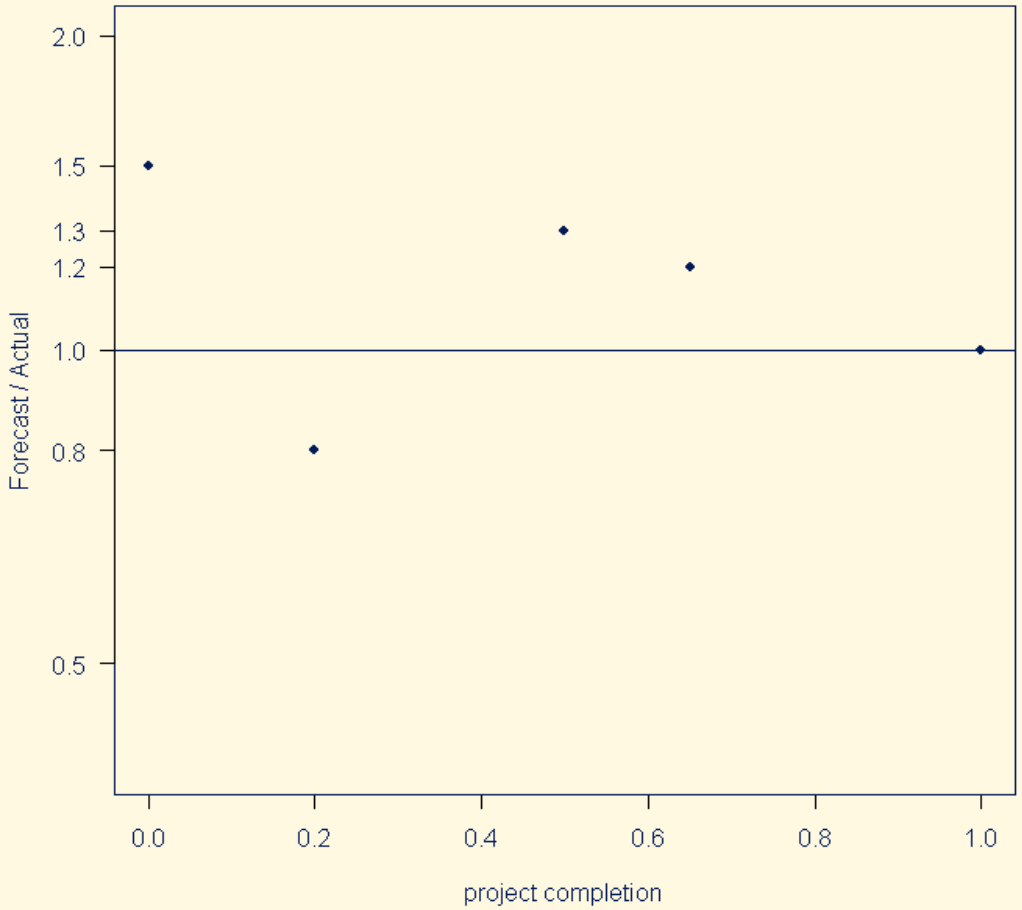
- The EQF allows for an overall assessment of the forecasts made for a project.
- Yet, it does not allow us to see whether individual forecasts are worse or better than others.
- For this purpose we use the reference cone.

Reference cone

- A reference cone shows what the f/a ratios should look like when an infinite number of forecasts are made.

- The reference cone allows to compare f/a ratios in an f/a plot to how they should behave.

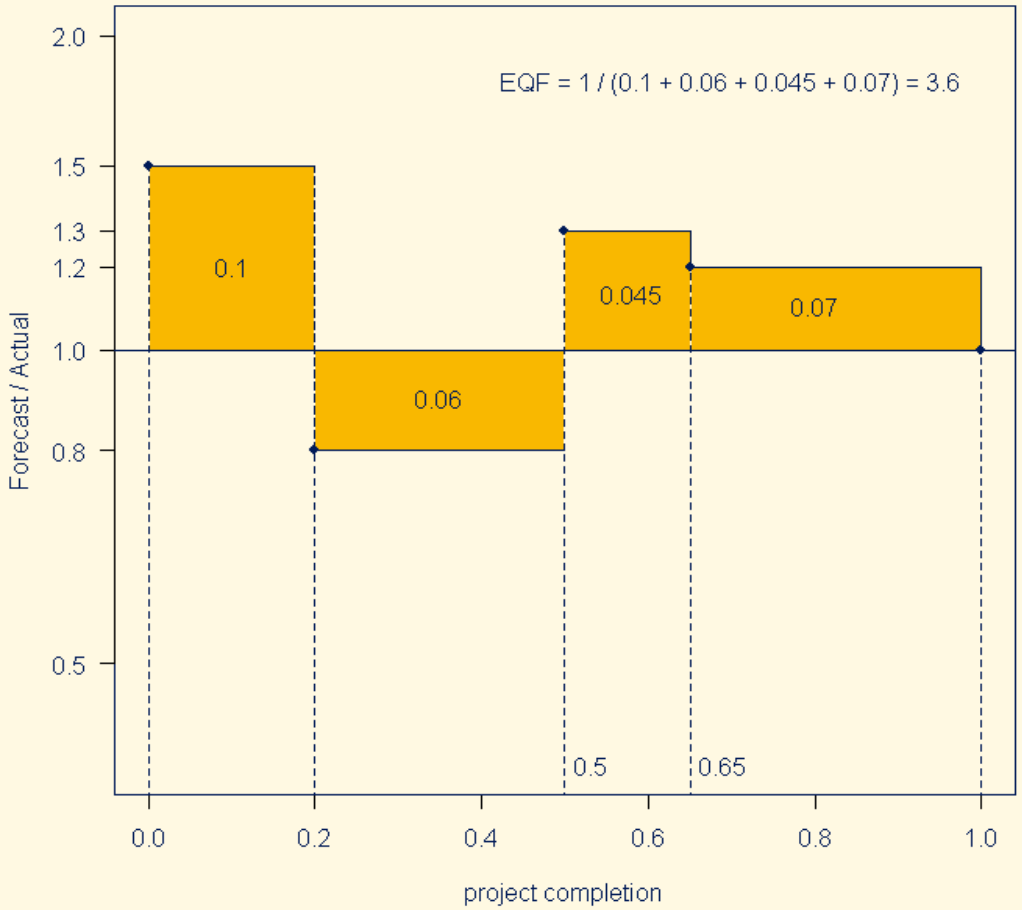
Example forecasts



With the f/a plot it is possible to see whether the forecasts are biased or not and what the spread of the forecasts is.

But it is difficult to assess how good an individual forecast is. For instance, is the first f/a ratio of 1,5 reasonable?

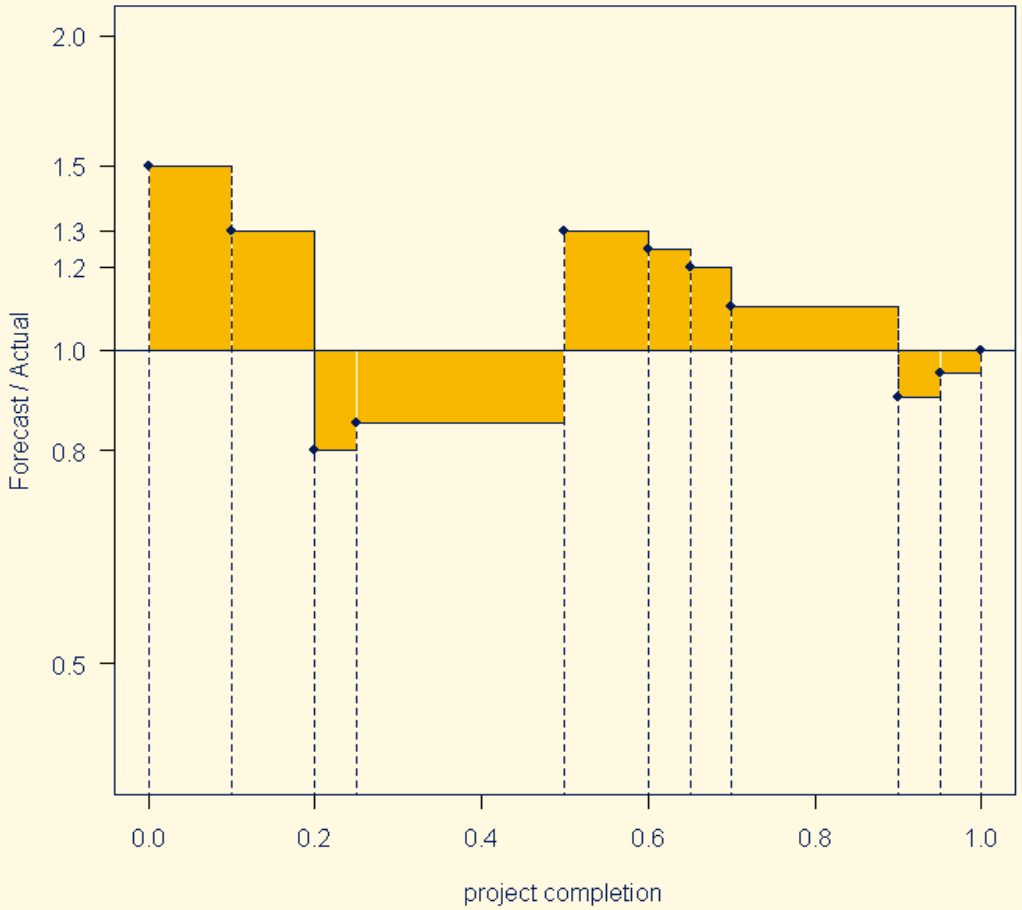
4 example forecasts



With the EQF it is possible to quantify the quality of all forecasts made for a project.

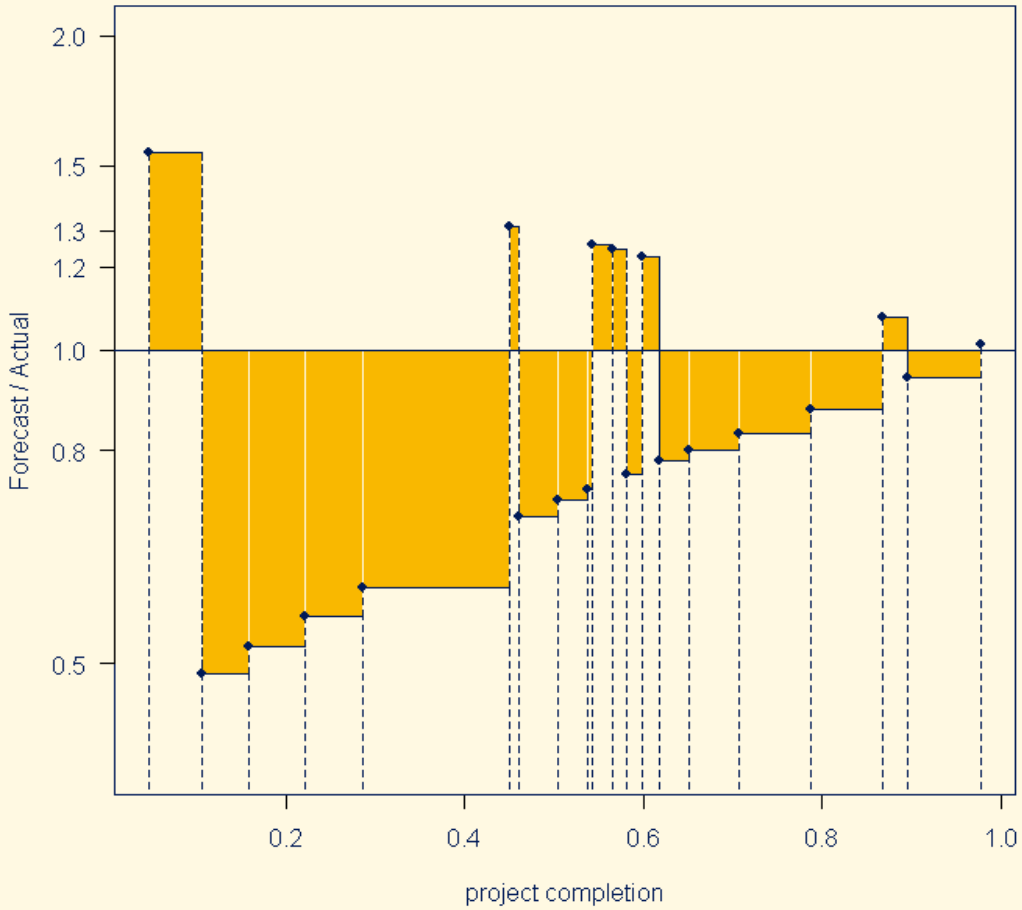
However, this does not allow us to see whether the first forecast was good. It is only possible to assess the forecasts overall.

10 example forecasts



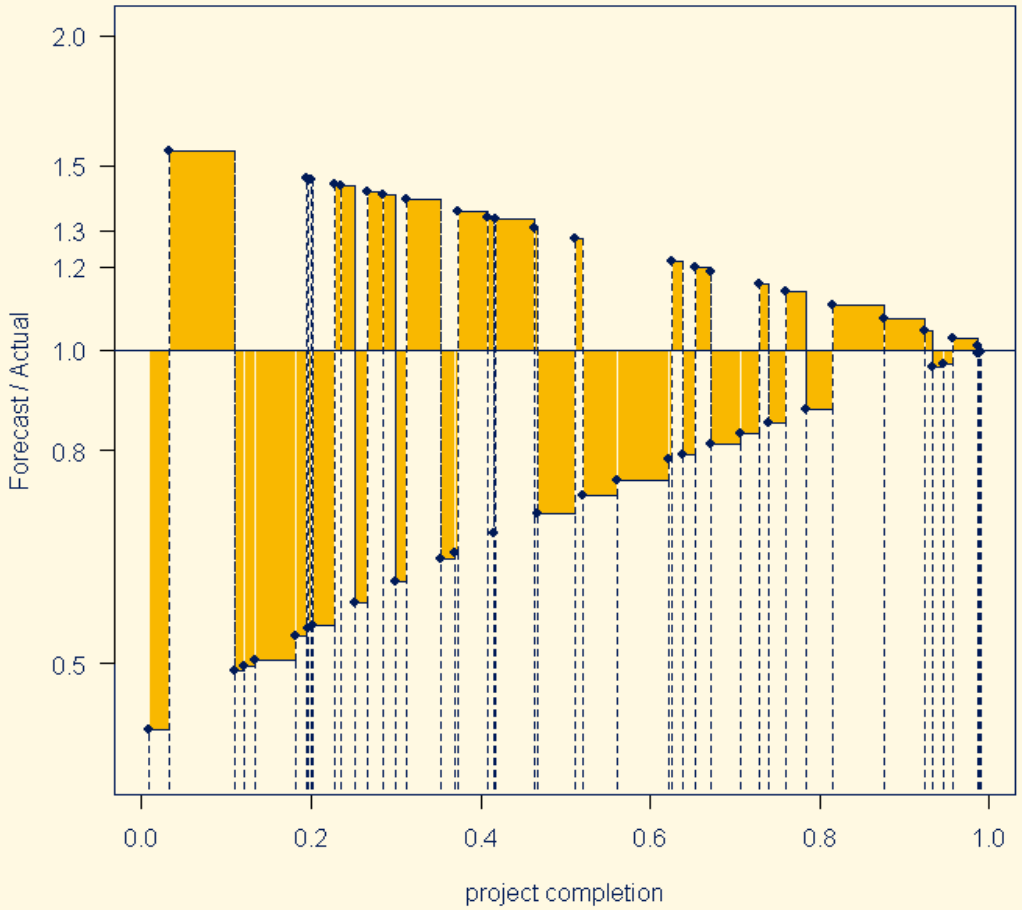
Now, suppose we would have made 10 forecasts for our example project with similar EQF quality.

20 example forecasts



Suppose we would have made 20 forecasts for our example project with similar EQF quality.

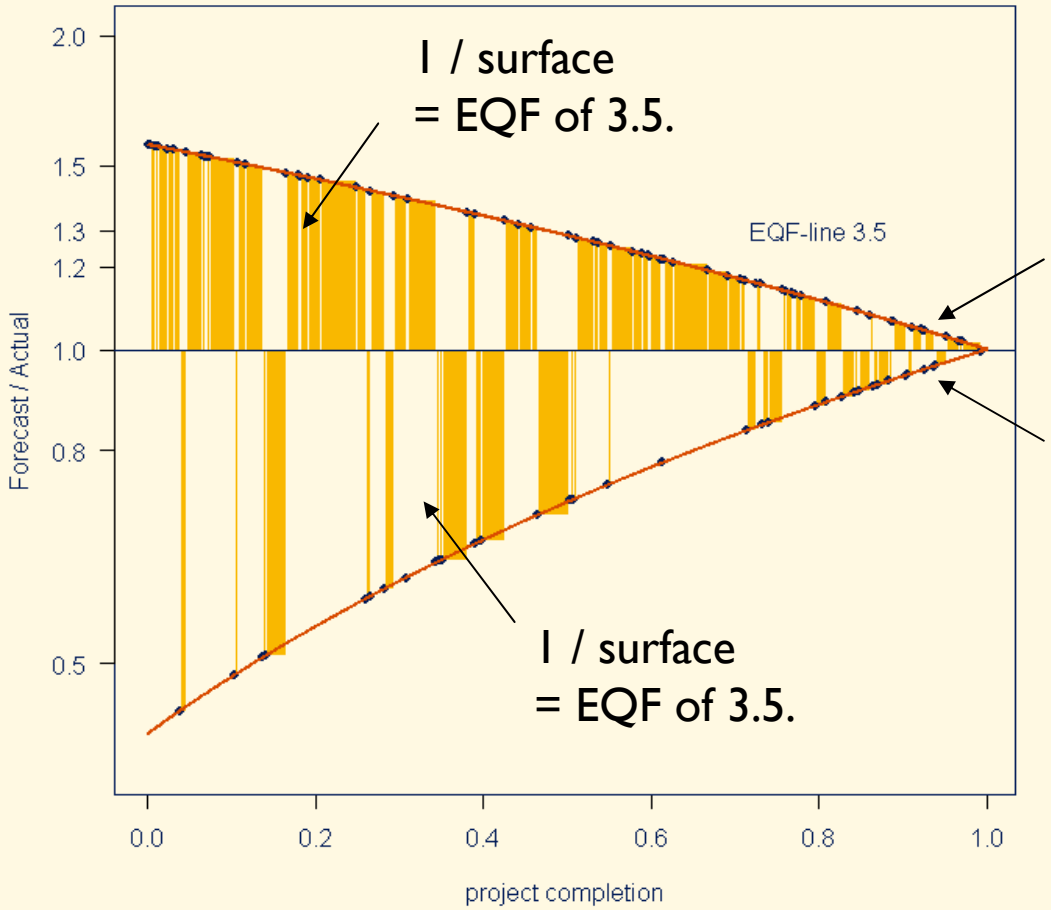
50 example forecasts



Suppose we would have made 50 forecasts for our example project with similar EQF quality.

100 example forecasts

When we would make an infinite number of forecasts for a particular project, the f/a ratios will form a line which we named the reference lines.

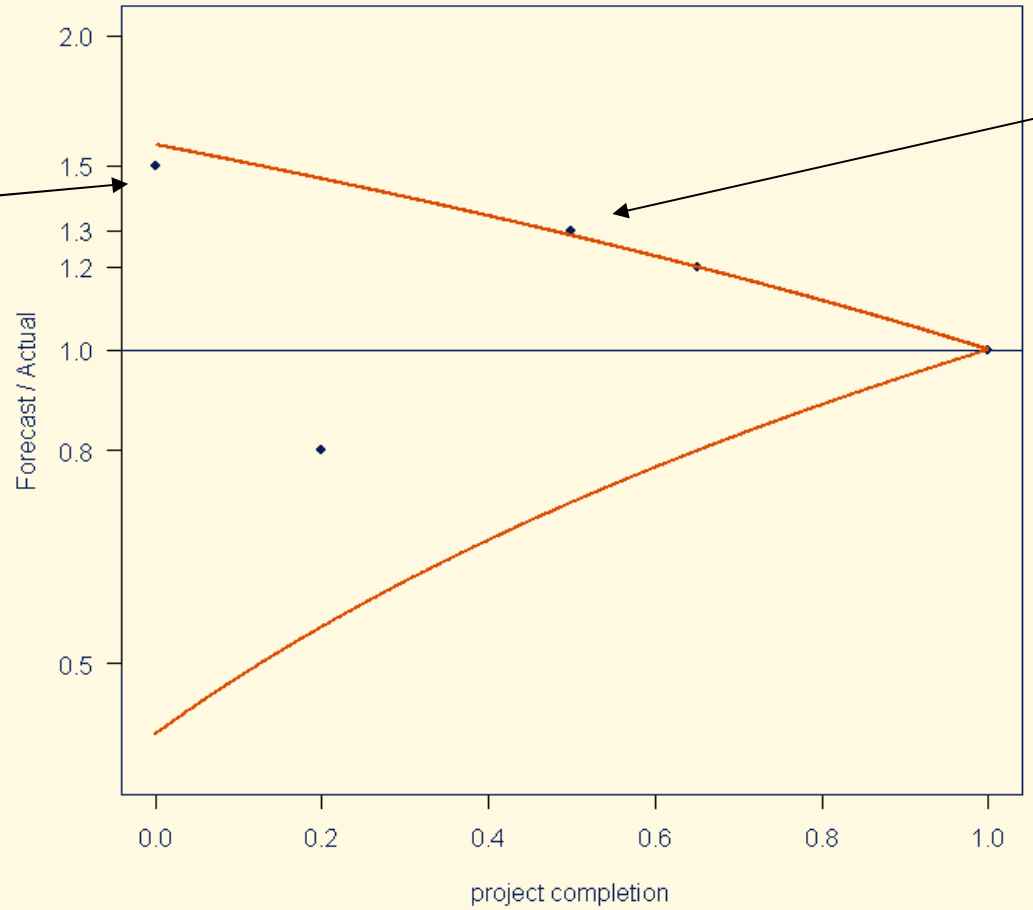


The upper part describes how the f/a ratios behave in case of only underruns / overestimations.

The lower part describes how the f/a ratios behave in case of only overruns / underestimations.

Initial example forecasts

With the reference cone we are able to see that the initial f/a ratio of 1.5 is reasonable.



Note that the EQF value for this project was 3.6 and the reference line had an EQF of 3.5.

It is not necessary for all f/a ratios to be within the reference cone to have a better EQF value.

Assessing IT forecast quality

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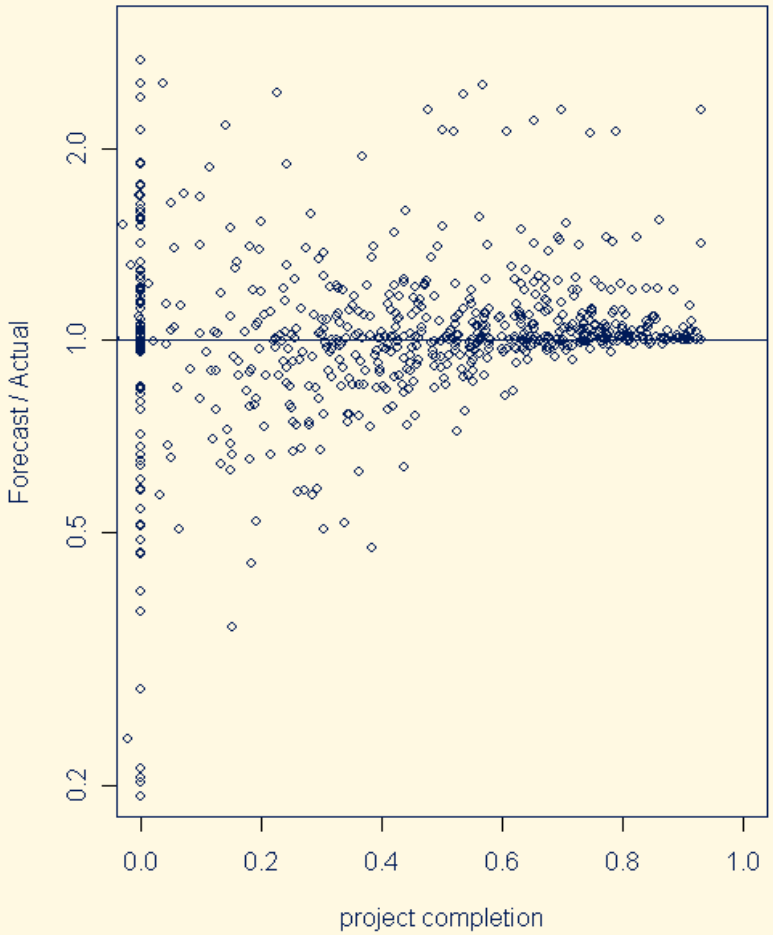
- The f/a plot, EQF values and reference cone allow you to assess the quality of forecasts made in your organization.
- These tools combined, reveal potential biases, quantify the quality and detect outliers.
- We will illustrate this with two real-world cases.

Real-world example

To assess forecasts made in your organization, first plot the forecast to actual ratios in an f/a plot.

Here we plotted 667 f/a ratios of the forecasted costs of 140 projects.



Real-world example

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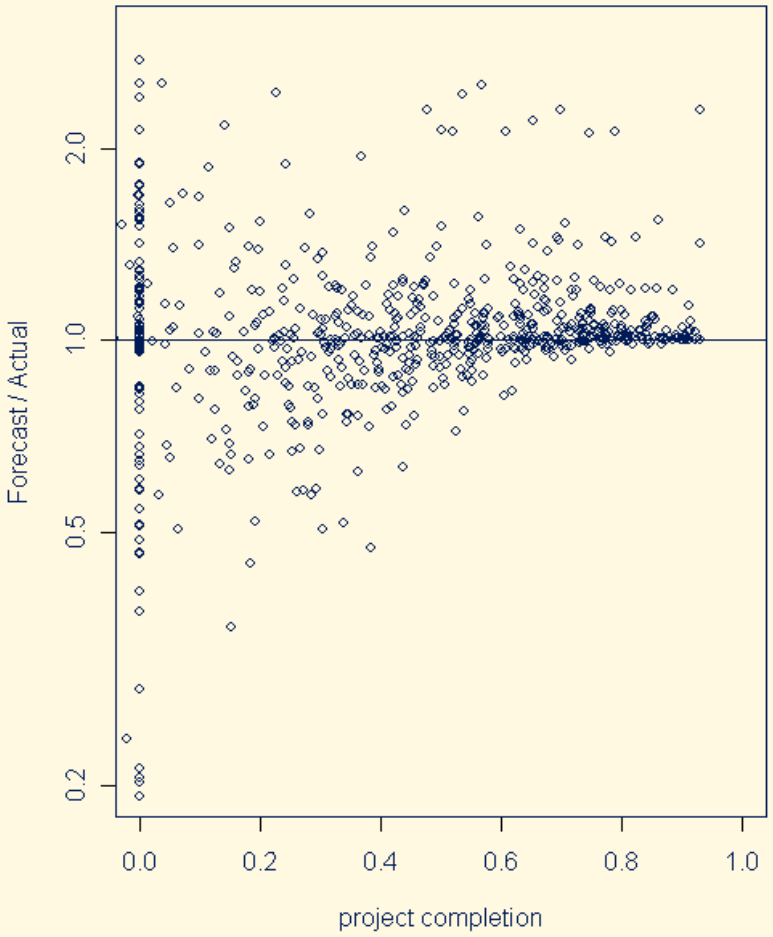
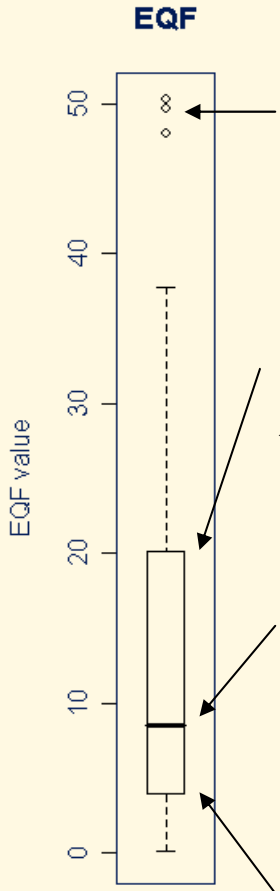
After plotting the f/a ratios, calculate for each project the EQF value.

For this example it resulted in 140 EQF values.

We depict these values using a boxplot on the right of the f/a plot.





These points are extreme values.

75% quantile: 25% of projects has value greater than 20.

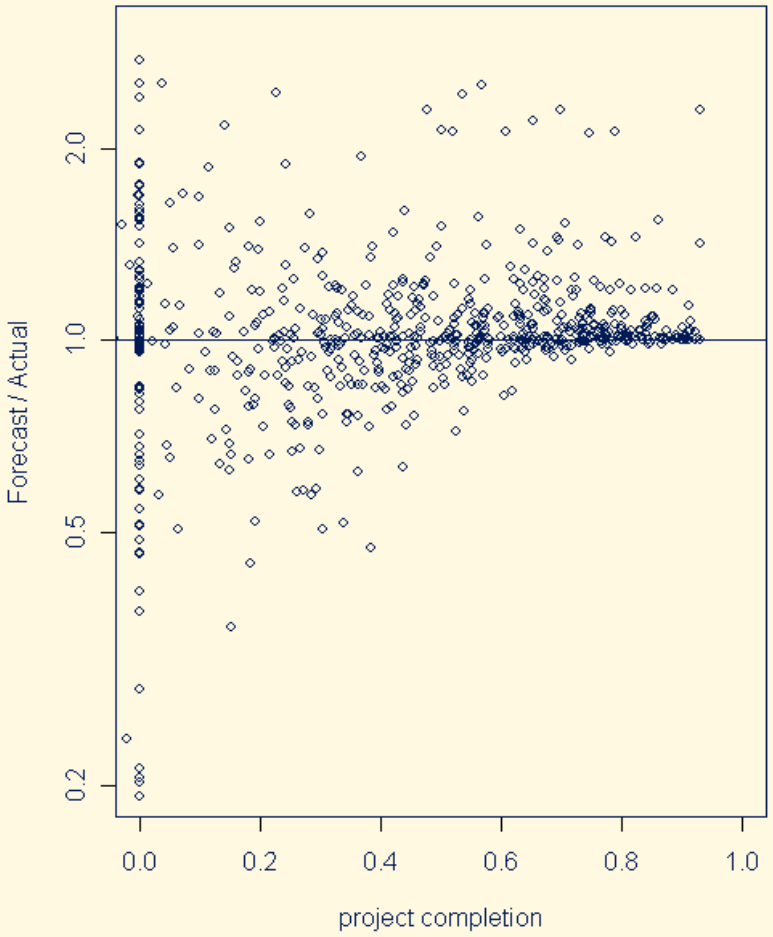
median: 50% of projects has value greater than +/- 9.

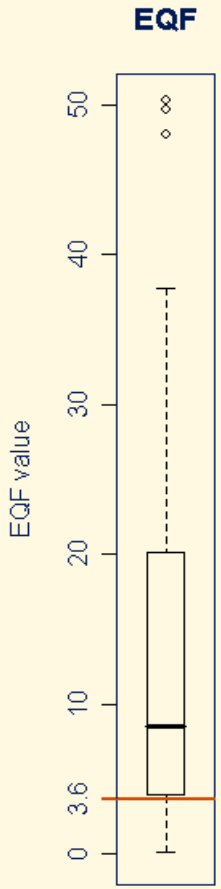
25% quantile: 75% of projects has value greater than +/- 4.

Real-world example

To assess the f/a ratios in the f/a plot, we want to draw a reference cone.

To draw this, we chose the 20% quantile of the EQF values.



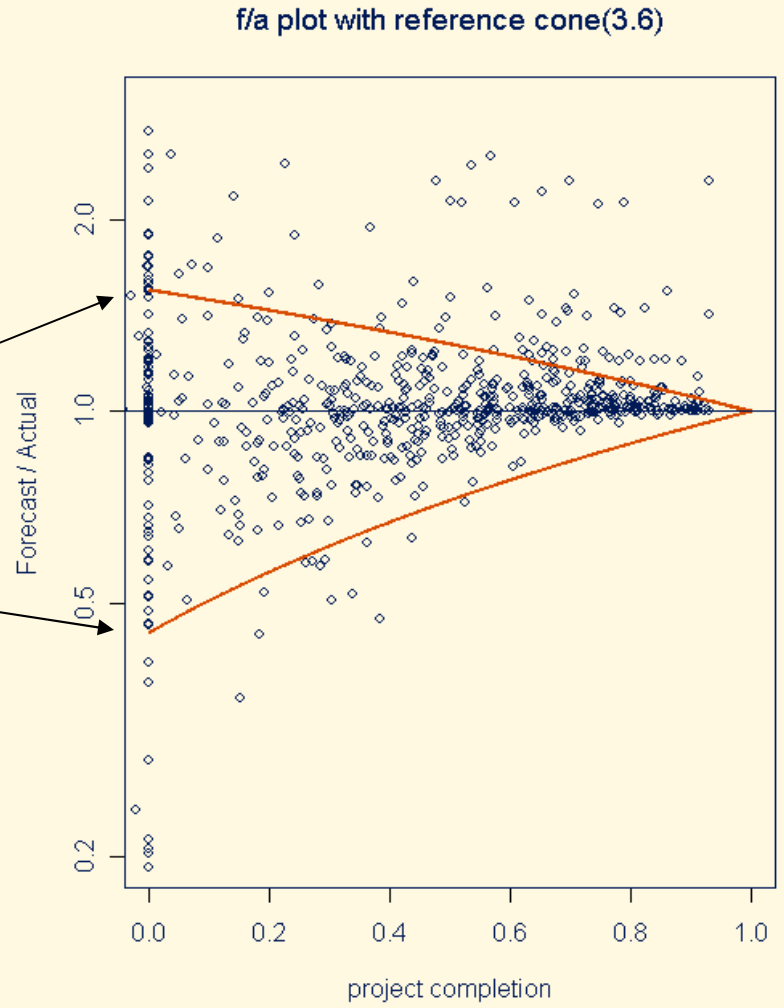


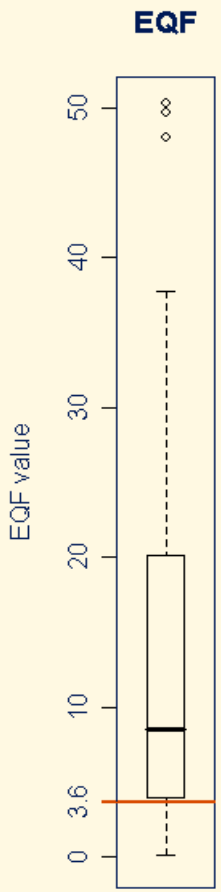
20% quantile: 80% of projects has value greater than +/- 3.6.

Real-world example

With the chosen EQF value, we draw the reference cone.

With these tools we are able to assess the forecasting quality.

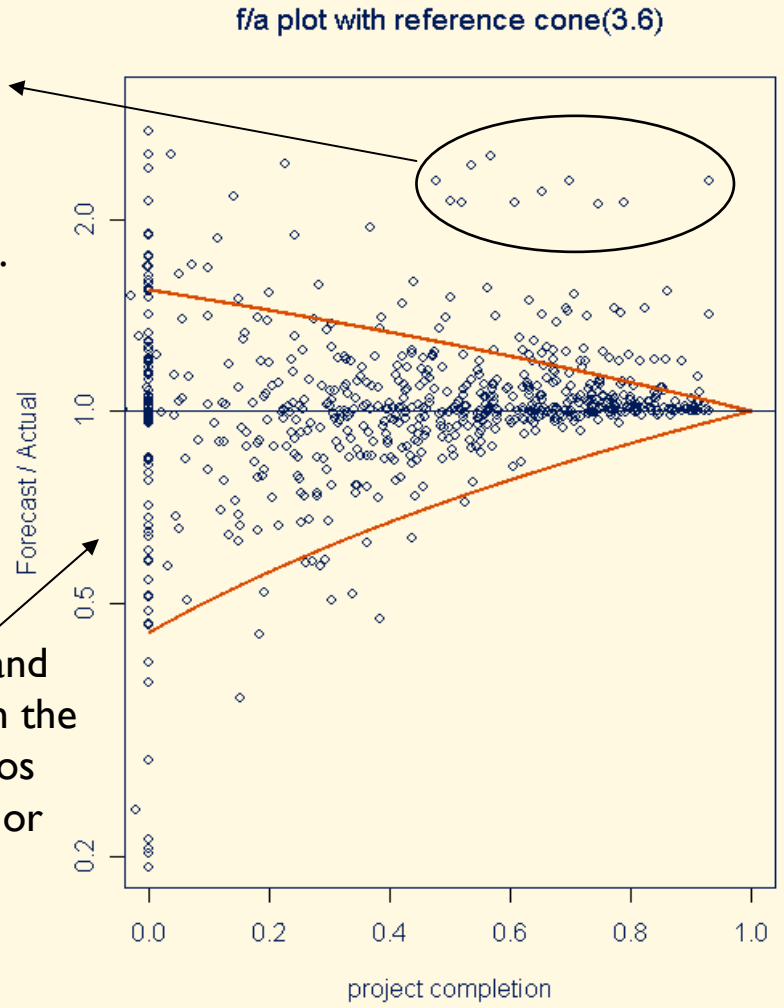


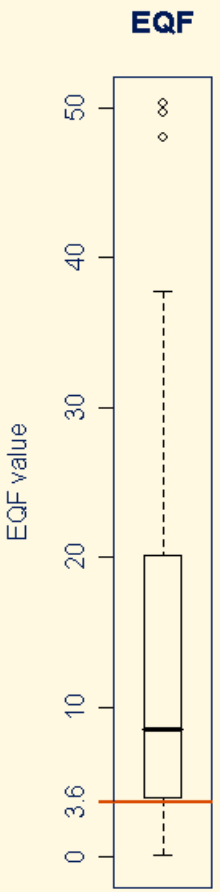


Assessment of example 1

These values are far outside the reference cone. They represent outliers that are interesting to investigate.

The f/a ratios resemble and are in general well within the reference cone. The ratios show no bias for under- or overestimation.



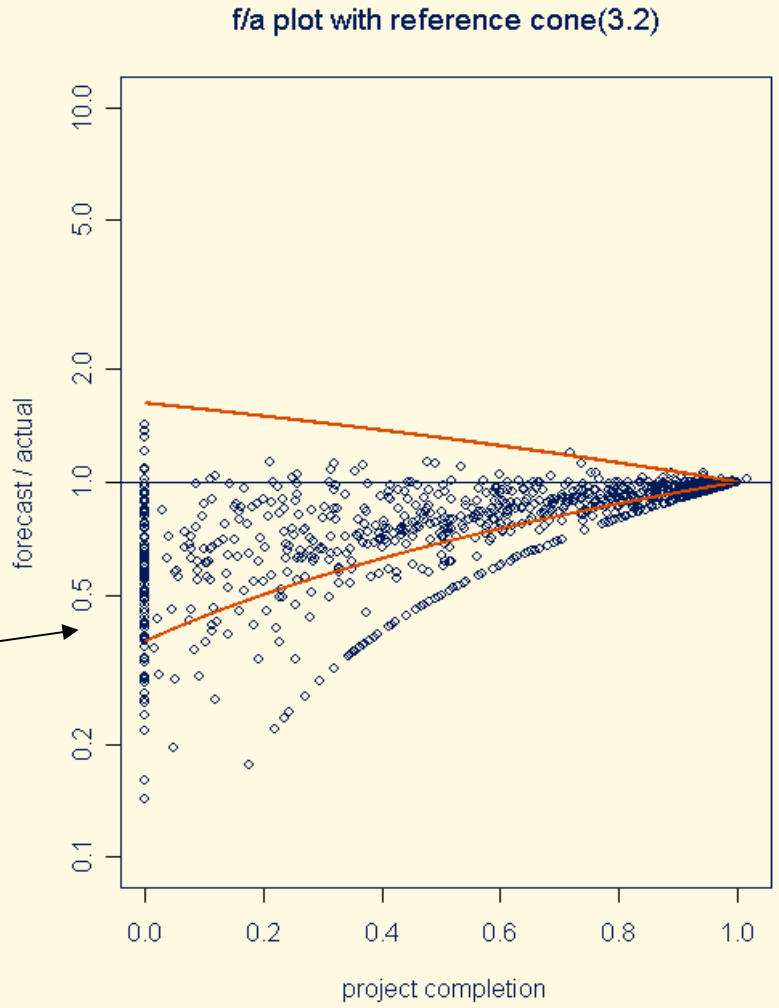


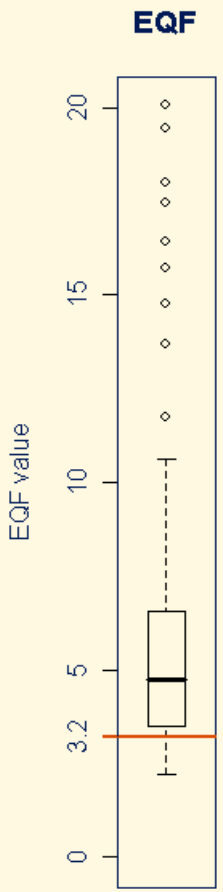
The quality of the forecasts in terms of EQF is reasonable. Half of the projects is able to obtain an EQF value of 9 or higher.

Assessment of example 2

The f/a ratios resemble the reference cone. However, a large amount of ratios is below the reference cone.

This indicates the organization has a bias toward underestimating.





The quality of the forecasts is considerably less than in the previous organization.

75% of the projects has an EQF value of +/- 7 or less.