MANAGEMENT AND BUDGET

Revenue Forecast Uncertainty Report

December 2016

Summary of Revenue Forecast Uncertainty for the Current and Next Biennia

In Minnesota's November 2016 *Budget and Economic Forecast*, total revenues for FY 2016-17 are forecast to be $42.382 billion. This forecast was constructed eight months before the current biennium closes. If this forecast turns out to have the same degree of accuracy as the average of our eight-months-ahead forecasts, we can expect FY 2016-17 closing revenues to be between $41.841 and $42.922 billion (+/- $540 million).

Total revenues for FY 2018-19 are now forecast to be $45.321 billion. This forecast was constructed 32 months before the biennium closes. Average accuracy for a 32-months-ahead forecast would mean that FY 2018-19 revenues will end up between $42.407 and $48.235 billion (+/- $2.914 billion).

Estimating Revenue Forecast Uncertainty

The difference between the level of revenues forecast and the amount actually collected at the end of a biennium—the forecast error—is a gauge of forecast accuracy. The mean absolute error (MAE) is the average of the errors' absolute values (that is, treating negative and positive errors the same). Since accuracy in forecasting a single biennium's revenues improves the closer we get to the end of the two-year period, we calculate separate errors for each time a biennium is part of the forecast: 32, 29, 20, 17, 8 and 5 months from actual. We then average those errors over FY 1990-91 to the most recent closed period, FY 2014-15.

We measure our forecast error as the difference between forecast and actual non-dedicated revenues, while the focus in the *Budget and Economic Forecast* is on total revenues. The items making up the difference between these two measures are dedicated revenues, transfers, and prior year adjustments. We base our forecast error on non-dedicated revenues, because it includes all general fund tax and non-tax revenues—the sources that are the most challenging to accurately forecast. For FY 2016-17, non-dedicated revenues are forecast to be $41.890 billion, and the forecast for total revenues is $42.382 billion, with a difference of $492 million.

The current forecast for FY 2016-17 is the third November forecast, eight months ahead of closing. The MAE for eight-months-ahead forecasts is 1.3 percent of non-dedicated revenues, or about $540 million for the current biennium. Consequently, the range of closing values for FY 2016-17 total revenues is $42.832 billion +/- $540 million, or $41.841 to $42.922 billion.

The current forecast for FY 2018-19 is the first November forecast, 32 months ahead of closing. The MAE for 32-months-ahead forecasts is 6.5 percent of non-dedicated revenues, or about $2.914

billion for the next biennium. Consequently, the range of closing values for FY 2018-19 total revenues is $45.321 billion +/- $2.914 billion, or $42.407 and $48.235 billion.

Another way to measure the degree of forecast uncertainty is to calculate a confidence range (CR) for our estimates. A 90 percent CR for our revenue forecast is the range of values that will contain the actual value for total revenues 90 out of 100 times. As with the MAE, we calculate the CR as a percentage of non-dedicated revenues. Both the percentage and the CR get smaller the closer we are to the end of a biennium. The range calculated with the MAE is approximately a 70 percent CR for FY 2016-17 (eight-months-ahead forecasts) and a 60 percent CR for FY 2018-19 (32-months-ahead forecasts).

For FY 2016-17, the 90 percent confidence range for total revenue is $42.382 +/- $825 million (2.0 percent), or $41.557 to $43.207 billion. For FY 2018-19, the 90 percent confidence range is $48.235 +/-$5.608 billion (12.5 percent), or $39.712 to $50.929.

Note that all of the error measures reported here relate to the state's revenue forecasts. They do not include estimates of errors in forecasting state expenditures.
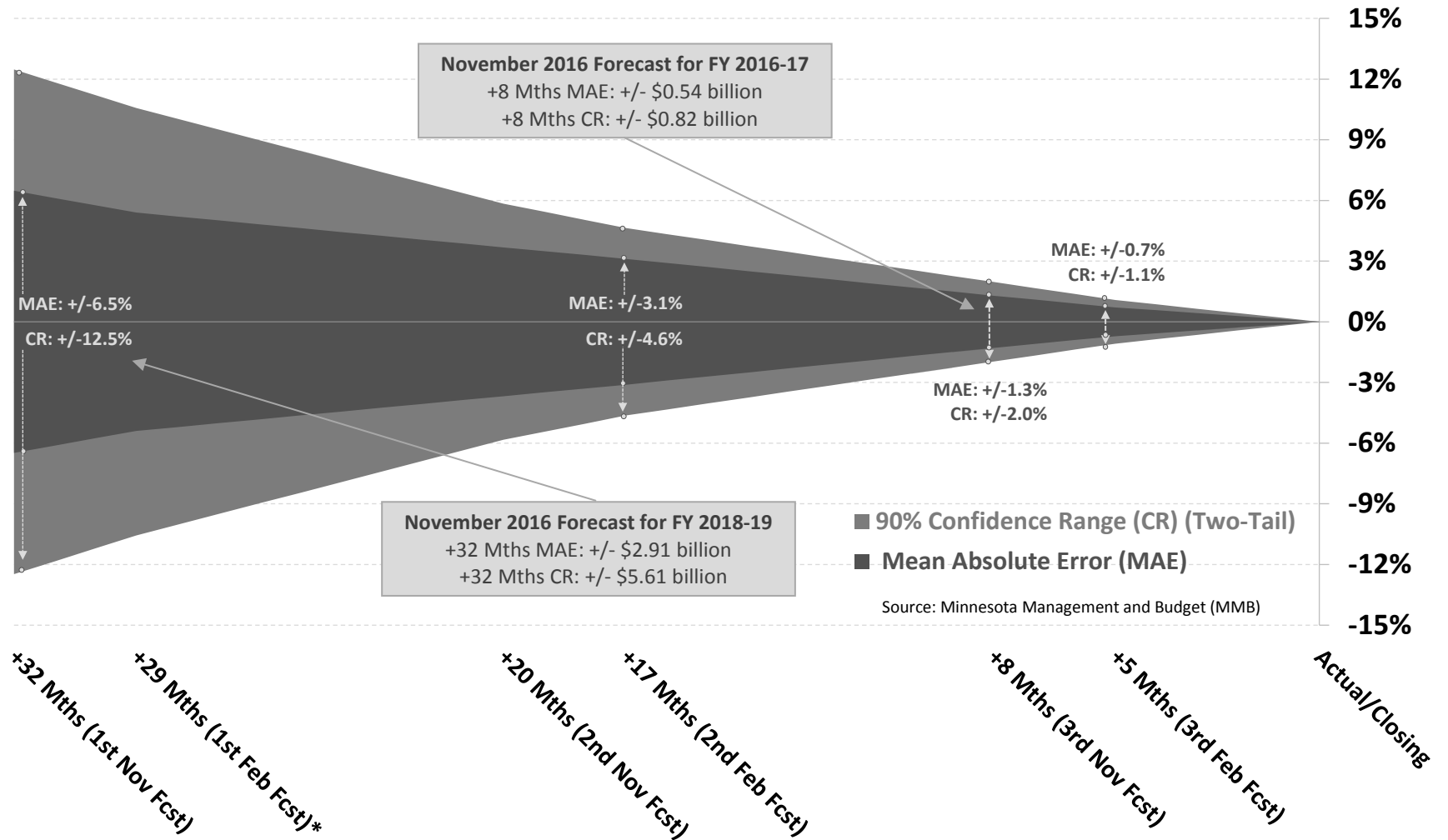
Sources of Revenue Forecast Uncertainty

Actual revenue collections never *precisely* match the forecast for a wide range of reasons. First, economic data from time periods preceding a forecast (such as employment or consumer spending data) are not perfectly measured and are frequently revised after we have used them to construct a forecast. Second, even if past U.S. economic data *were* perfectly measured, modelling errors and the inability to foresee all future impacts on the economy would prevent our macroeconomic consultant from perfectly forecasting the U.S. economy. Third, errors in the U.S. forecast and in Minnesota's data history and our own imperfect modelling introduce inaccuracies into our forecast of the state's economy. Fourth, even if the Minnesota economy *were* forecast with perfect accuracy, our forecasts of Minnesota tax revenues would still contain some error. This is because of imperfections in our revenue forecasting models, mis-matches between the economic and tax definitions of income and spending items, inconsistencies in the timing of receipts from a given year's tax liability, and uncertainty about the revenue impacts of changes in state tax laws.

Minnesota's November 2016 economic and revenue forecasts carry a large degree of uncertainty related to U.S. economic policy. The November 2016 U.S. outlook was released prior to the U.S. election and does not reflect possible post-election U.S. policy changes. There is considerable uncertainty in this forecast about which policy changes may be enacted in the coming years and the economic impact of those changes

Average Revenue Forecast Uncertainty over Minnesota's Budget Cycle

% of Net Non-Dedicated Revenue , Sample Period: FY1990-91 to FY2014-15

November 2016 Forecast for FY 2016-17
+8 Mths MAE: +/- $0.54 billion
+8 Mths CR: +/- $0.82 billion

November 2016 Forecast for FY 2018-19
+32 Mths MAE: +/- $2.91 billion
+32 Mths CR: +/- $5.61 billion

MAE: +/-6.5%
CR: +/-12.5%

MAE: +/-3.1%
CR: +/-4.6%

MAE: +/-0.7%
CR: +/-1.1%

MAE: +/-1.3%
CR: +/-2.0%

■ **90% Confidence Range (CR) (Two-Tail)**
■ **Mean Absolute Error (MAE)**

Source: Minnesota Management and Budget (MMB)

+32 Mths (1st Nov Fcst)
+29 Mths (1st Feb Fcst)*
+20 Mths (2nd Nov Fcst)
+17 Mths (2nd Feb Fcst)
+8 Mths (3rd Nov Fcst)
+5 Mths (3rd Feb Fcst)
Actual/Closing

* +29 Mths (1st Feb) represents the MMB forecast on which the original budget for the biennium was based.
Notes: Adjusted for the effects of legislation. The mean-absolute error (MAE) is calculated by averaging forecast deviations from actual, treating positive and negative errors the same. The smaller the MAE, the more accurate the forecast. The darker area on the chart represents the range of values callculated using the MAE. Under the assumption that tax policies do not significantly change, the 90 percent confidence range (CR) --the lighter area on the chart--will contain the actual value for total revenues 90 percent of the time. The range calculated with the MAE is approximately a 70 percent CR for FY 2016-17 and a 60 percent CR for FY 2018-19.

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