

ProfitCents Projections Documentation

The projection feature of ProfitCents uses one of the following methods to calculate projected values:

- Holt-Winters Exponential Smoothing
- Exponential Smoothing
- Trend Analysis, or
- Direct Calculation

Holt-Winters Exponential Smoothing

The Holt-Winters Smoothing Algorithm uses weighted historical trending to predict the future values of an account. It is more accurate for accounts that tend to trend in one direction over time. The modified version of this algorithm looks at the financial data from past years and determines a value to place on the trend itself. For example, if a company's sales rises for 3 consecutive periods, we will weight the trend value more than if sales oscillates over the 3 periods. The following variables are used in this calculation:

Variables

alpha: weight to place on previously predicted values ($0 < \alpha < 1$)

(1-alpha): weight to place on the most recent actual value

beta: weight to place on historical trend ($0 < \beta < 1$)

(1-beta): weight to place on most recent trend

tw: weight to place on the overall trend

a_t = weighted average component of the forecast at time t for the period t+1

t_t = trend component of the forecast at time t for the period t+1 (expected increase from time t to time t+1)

$f_t = a_t + (t_t * tw)$ = forecast at time t for the period t+1

X_t = actual value at time t

Calculation

Step 1: Initialize a, t, and f using oldest historical data

$$a_2 = X_2$$

$$t_2 = X_2 - X_1$$

$$f_2 = a_2 + (t_2 * tw)$$

Step 2: Iteratively calculate a, t, and f

$$a_3 = \alpha * f_2 + (1-\alpha) * X_3$$

$$t_3 = \beta * t_2 + (1-\beta) * (a_3 - a_2)$$

$$f_3 = a_3 + (t_3 * tw)$$

$$a_n = \alpha * f_{n-1} + (1-\alpha) * X_n$$

$$t_n = \beta * t_{n-1} + (1-\beta) * (a_n - a_{n-1})$$

$$f_n = a_n + (t_n * tw)$$

Example

Suppose we had the following historical data for Sales:

$$\text{Sales}_{2020} = \$5,000 [X_3]$$

$$\text{Sales}_{2019} = \$2,500 [X_2]$$

$$\text{Sales}_{2018} = \$1,000 [X_1]$$

For simplicity, we will let $\alpha=0.3$ and $\beta=0.3$. Since sales rose all three years, we will assign τ to be 1 (its greatest possible value)

Step 1: Initialize a , t , and f using oldest historical data

$$a_2 = X_2$$

$$a_2 = \$2,500$$

$$t_2 = X_2 - X_1$$

$$t_2 = \$2,500 - \$1,000 = \$1,500$$

$$f_2 = a_2 + (t_2 * \tau)$$

$$f_2 = \$4,000$$

Step 2: Iteratively calculate a , t , and f

$$a_3 = \alpha * f_2 + (1-\alpha) * X_3$$

$$a_3 = 0.3 * \$4,000 + 0.7 * \$5,000 = \$4,700$$

$$t_3 = \beta * t_2 + (1-\beta) * (a_3 - a_2)$$

$$t_3 = 0.3 * \$1,500 + 0.7 * (\$4,700 - \$2,500) = \$1,990$$

$$f_3 = a_3 + t_3 * \tau$$

$$f_3 = \$4,700 + (\$1,990 * 1) = \$6,690$$

So, our prediction for Sales₂₀₂₁ would be \$6,690

Exponential Smoothing

Exponential smoothing is a forecasting method that relies on a weighted average of historical data values with the more recent values carrying more weight. The following variables are used in this calculation:

Variables

α : weight to place on previously predicted values ($0 < \alpha < 1$)

$(1-\alpha)$: weight to place on the most recent actual value

f_t = forecast at time t for the period $t+1$

X_t = actual value at time t

The Exponential Smoothing Algorithm is computed as follows:

Calculation

Step 1: Initialize f_1 using oldest historical data

$$f_1 = X_1$$

Step 2: Iteratively calculate f_t from historical data

$$f_2 = (\alpha * f_1) + (1-\alpha) * X_2$$

$$f_t = (\alpha * f_{t-1}) + (1-\alpha) * X_t$$

Example

Gross Profit Margin₂₀₂₀ = 58% [X₃]
 Gross Profit Margin₂₀₁₉ = 45% [X₂]
 Gross Profit Margin₂₀₁₈ = 60% [X₁]
 For this example, we will let alpha=0.3

Step 1: Initialize f using oldest historical data

$$f_1 = X_1$$

$$f_1 = 60\%$$

Step 2: Iteratively calculate f

$$f_2 = (\alpha * f_1) + (1-\alpha) * X_2$$

$$f_2 = (0.3 * 60) + (1-0.3) * 45 = 49.50$$

$$f_3 = (\alpha * f_2) + (1-\alpha) * X_3$$

$$f_3 = (0.3 * 49.50) + (1-0.3) * 58 = 55.45$$

So, our prediction for Gross Profit Margin₂₀₂₁ would be 55.45%

Trend Analysis

$$a_2 = \text{Amortization Percent}_{12/31/2020}$$

$$t_2 = \text{Amortization Percent}_{12/31/2020} - \text{Amortization Percent}_{12/31/2019}$$

$$f_2 = a_2 + t_2$$

Direct Calculation

Calculated accounts do not need to be predicted separately because their values are dictated by financial formulas (for example, Gross Profit = Sales - Cost of Sales). For these accounts, we simply determine the expected values for each account in the associated formula and then compute the result of the formula.

Calculation Methods for Each Account

Below is a table detailing the method used to calculate the projected values for each account.

Sales	Holt-Winters Exponential Smoothing
Cost of Sales	Projected Sales x (1-Gross Profit Margin)
Gross Profit	Projected Sales – Projected Cost of Sales
Gross Profit Margin	Holt-Winters Exponential Smoothing Note: Use the historical gross profit margins in this equation
Depreciation Percent	Holt-Winters Exponential Smoothing Note: To get historical Depreciation percent figures, divide Depreciation by Gross Fixed Assets

Depreciation Expense	<p>Depreciation Percent x Prior Period Gross Fixed Assets</p> <p>Note: The Depreciation Percent is calculated using the HW Exponential Smoothing method</p>
Amortization Percent	<p>Holt-Winters Exponential Smoothing</p> <p>Note: To get historical Amortization percent figures, divide Amortization by Gross Intangible Assets</p>
Amortization Expense	<p>Amortization Percent x Prior Period Gross Intangible Assets</p> <p>Note: The Amortization Percent is calculated using the HW Exponential Smoothing method</p>
Overhead	Holt-Winters Exponential Smoothing
Other Operating Income	Prior Period Figure
Other Operating Expenses	Prior Period Figure
Interest Percent	<p>Holt-Winters Exponential Smoothing</p> <p>Note: To calculate Interest Expense for each of the historical periods, see equation below:</p> <p>Interest Percent = Interest Expense / [Short Term Debt + Current Portion LongTerm Debt + Other Current Liabilities + Long Term Liabilities]</p>
Interest Expense	Interest Percent x [Short Term Debt + Current Portion Long-Term Debt + Other Current Liabilities + Long Term Liabilities]
Other Income	Prior Period Figure
Other Expenses	Prior Period Figure
Adjusted Owner's Compensation	Prior Period Figure
Taxes Paid	<p>Prior Period Tax Rate x Projected Net Profit Before Taxes</p> <p>Note: You can calculate the prior period tax rate by taking the prior period taxes paid and dividing by prior period net profit before taxes</p>
Net Income	Direct Calculation
Cash	Projected Cash Flow Statement
AR Days	Holt-Winters Exponential Smoothing
Accounts Receivable	<p>Use the AR Days calculated above. Plug it into the below equation to get Accounts Receivable.</p> <p>[Accounts Receivable / Projected Sales] x 365 = Projected AR Days Solve for "Accounts Receivable" in the above equation.</p>
Inventory Days	Holt-Winters Exponential Smoothing
Inventory	<p>Use the Inventory Days calculated above. Plug it into the below equation to get Inventory.</p> <p>[Inventory / Projected COGS] x 365 = Projected Inventory Days Solve for "Inventory" in the above equation.</p>

Other Current Assets	Holt-Winters Exponential Smoothing
Gross Fixed Assets	Holt-Winters Exponential Smoothing
Accumulated Depreciation	Prior Period Accumulated Depreciation + Depreciation Expense
Gross Intangible Assets	Holt-Winters Exponential Smoothing
Accumulated Amortization	Prior Period Accumulated Amortization + Amortization Expense
Other Assets	Holt-Winters Exponential Smoothing
Accounts Payable Days	Holt-Winters Exponential Smoothing
Accounts Payable	Use the AP Days calculated above. Plug it into the below equation to get Accounts Payable. $[\text{Accounts Payable} / \text{Projected COGS}] \times 365 = \text{Projected AP Days}$ Solve for "Accounts Payable" in the above equation.
Short Term Debt	See the loan analysis tab. You can view an amortization schedule for the debt.
Current Portion Long-Term Debt	See the loan analysis tab. You can view an amortization schedule for the debt.
Other Current Liabilities	Holt-Winters Exponential Smoothing
Senior Debt	See the loan analysis tab. You can view an amortization schedule for the debt.
Subordinated Debt	See the loan analysis tab. You can view an amortization schedule for the debt.
Other Long-Term Liabilities	See the loan analysis tab. You can view an amortization schedule for the debt.
Preferred Stock	Prior Period Figure
Common Stock	Prior Period Figure
Additional PIC	Prior Period Figure
Other Stock/Equity	Prior Period Figure
Ending Retained Earnings	Projected Statement of Equity