

Learn How to Calculate SMAPE in Excel: A Step-by-Step Guide with Examples

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Understanding the Symmetric Mean Absolute Percentage Error (SMAPE)

The discipline of [forecasting](#) relies heavily on the use of precise metrics to reliably assess the efficacy of predictive algorithms. Among the essential tools available for measuring error, the [Symmetric Mean Absolute Percentage Error \(SMAPE\)](#) has gained significant traction. SMAPE serves as a robust indicator of the [predictive accuracy](#) of statistical or machine learning models, offering an intuitive, percentage-based measure of deviation. This ease of interpretation makes it exceptionally valuable for communication between technical analysts and business stakeholders who need clear performance benchmarks.

SMAPE was specifically developed to overcome inherent biases present in older metrics, such as the Mean Absolute Percentage Error (MAPE). Its core advantage lies in its symmetrical nature: by normalizing the error term using the average of the absolute actual and forecasted values, SMAPE ensures that the calculation does not unduly penalize instances of over-forecasting compared to under-forecasting. This fundamental characteristic provides a more balanced and reliable assessment of forecast performance, regardless of the data scale or volatility.

A fundamental principle of error evaluation is that a lower SMAPE value signifies a superior [forecasting model](#). For example, achieving a SMAPE of 4% implies that, on average, the model's prediction deviates from the true outcome by only four percent. Mastering the accurate calculation of this metric is paramount for professionals engaged in demand planning, financial analysis, or data science, and the ubiquitous spreadsheet environment of [Excel](#) offers an accessible platform for implementation.

Why SMAPE is Preferred Over Standard MAPE

To fully grasp the critical utility of SMAPE, one must first recognize the fundamental limitations embedded within the traditional Mean Absolute Percentage Error (MAPE). MAPE is calculated by taking the absolute difference between the actual and forecasted values and dividing this by the actual value. This mathematical structure creates a significant asymmetry and potential instability in the resultant error measure.

The primary weakness of MAPE is its sensitivity to actual values near zero. When the actual observation is very small, the denominator approaches zero, causing the resulting percentage error to inflate dramatically, potentially leading to undefined or highly misleading error readings. Furthermore, MAPE introduces a known bias: it tends to penalize negative errors (under-forecasting, or predicting too low) much more severely than positive errors (over-forecasting, or predicting too high). This intrinsic bias can critically distort the true evaluation of a [forecasting model](#), especially when dealing with intermittent demand patterns or volatile time series data.

The [SMAPE](#) metric expertly overcomes these structural deficiencies. It achieves symmetry by

normalizing the absolute error term using the average of the absolute actual value and the absolute forecasted value. This symmetrical denominator ensures that the percentage error remains mathematically bounded, effectively preventing the extreme inflation and inherent bias characteristic of MAPE. Consequently, SMAPE provides a more impartial and reliable measure of [predictive accuracy](#) across diverse datasets.

Deconstructing the SMAPE Formula for Excel Implementation

Translating the concept of symmetric error into a functional spreadsheet formula requires a precise understanding of the mathematical definition of the **Symmetric Mean Absolute Percentage Error**. The calculation essentially involves deriving the average of the normalized Absolute Percentage Error components across every data point in the analyzed time series.

The standard formula for calculating **SMAPE** is defined as follows:

$$\text{SMAPE} = (1/n) * \Sigma(|\text{forecast} - \text{actual}| / ((|\text{actual}| + |\text{forecast}|)/2)) * 100$$

It is crucial to define the individual components of the equation to facilitate accurate implementation in [Excel](#):

Σ - This is the mathematical symbol for **summation**, instructing us to aggregate the normalized absolute percentage errors calculated for all periods or observations.

n - Represents the **sample size**, which is the total count of periods or data points included in the analysis.

actual - Refers to the true, observed **data value** recorded for a specific period.

forecast - Refers to the predicted **data value** generated by the [forecasting model](#) corresponding to the same period.

Our overall objective in the spreadsheet environment is straightforward: calculate the complex inner term for each row, sum those results, and then divide by the total number of periods (n) to arrive at the final aggregated SMAPE percentage. The resulting percentage directly quantifies the model's overall [predictive accuracy](#).

Step 1: Preparing Your Data in Excel for Analysis

The foundational step for any rigorous statistical measurement in [Excel](#) is the efficient organization of raw data. To calculate **SMAPE**, the minimum requirement is two distinct, paired columns of data: one containing the observed (actual) values and one holding the predicted (forecasted) values, ensuring they correspond to the identical time periods.

For this example, we will structure a hypothetical dataset involving 12 consecutive sales periods. We designate Column B for the **Actual** sales figures and Column C for the **Forecasted** sales

figures. This clear, side-by-side arrangement is essential, as it dictates that every calculation in the subsequent steps correctly links the true outcome with its corresponding prediction generated by the [forecasting model](#).

This initial setup forms the structural basis for the entire SMAPE calculation process. A robust foundation guarantees the accuracy of the final metric, preventing common errors associated with data misalignment. The arrangement should mirror the visual representation shown below:

	A	B	C	D	E	F	G
1	Month	Actual	Forecasted				
2	January	12	11				
3	February	13	13				
4	March	14	14				
5	April	15	14				
6	May	15	15				
7	June	22	16				
8	July	27	18				
9	August	28	27				
10	September	30	29				
11	October	35	32				
12	November	30	34				
13	December	34	33				
14							
15							
16							
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23							

Step 2: Implementing the Core Symmetric Error Component

To successfully calculate the aggregate **SMAPE**, we must first compute the normalized **Absolute Percentage Error** for each individual observation. This calculation is the most complex part of the process and necessitates the addition of a new column (e.g., Column D) dedicated to holding the result of the core symmetric error formula: $(|\text{forecast} - \text{actual}| / ((|\text{actual}| + |\text{forecast}|)/2))$.

We rely on [Excel](#)'s powerful built-in functions, specifically the `ABS()` function, which is critical for calculating the absolute value. By using `ABS()`, we ensure that the difference between the forecast and actual values is always treated as a positive magnitude of error, regardless of whether the

model overestimated or underestimated the outcome.

For the very first observation (located in Row 2), the appropriate formula to be entered into the calculation column (D2) must accurately reflect the mathematical definition of the symmetric normalized error:

$$(ABS(C2-B2) / ((ABS(B2)+ABS(C2))/2))$$

Once this formula is correctly input for the initial period, it must be efficiently copied down to encompass all subsequent data points (D3 through D13). Completing this step yields the individual normalized error value for every paired set of actual and forecasted data, preparing the data for final aggregation, as demonstrated in the resulting spreadsheet view:

	A	B	C	D	E	F	G	H
1	Month	Actual	Forecasted	SMAPE differences				
2	January	12	11	0.087	=ABS(C2-B2)/((ABS(B2)+ABS(C2))/2)			
3	February	13	13	0.000				
4	March	14	14	0.000				
5	April	15	14	0.069				
6	May	15	15	0.000				
7	June	22	16	0.316				
8	July	27	18	0.400				
9	August	28	27	0.036				
10	September	30	29	0.034				
11	October	35	32	0.090				
12	November	30	34	0.125				
13	December	34	33	0.030				
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Step 3: Aggregating the Components and Calculating Final SMAPE

With the individual normalized error components successfully calculated and residing in Column D, the final stage involves performing the necessary aggregation specified by the **SMAPE** formula.

This requires summing all the components (Σ) and subsequently dividing that total by the overall number of observations (n).

We leverage **Excel's** efficient `SUM()` function to execute the summation of the entire error column (Column D). This sum is then divided by the total count of observations, which in our specific example is 12, corresponding to the defined **sample size**. Since **SMAPE** is universally presented as a percentage, the resulting quotient must then be multiplied by 100.

The complete, concise formula that executes this final calculation can be placed in a dedicated summary cell, such as cell D14:

```
(SUM(D2:D13) / 12) * 100
```

For enhanced flexibility and robustness--especially when dealing with dynamic datasets--it is highly recommended to substitute the hard-coded number 12 with the `COUNT()` function (e.g., `COUNT(D2:D13)`). This substitution ensures the formula automatically adjusts to changes in the data set size. The final calculated result for this specific [forecasting](#) exercise is clearly displayed below.

	A	B	C	D	E	F	G
1	Month	Actual	Forecasted	SMAPE differences			
2	January	12	11	0.087			
3	February	13	13	0.000			
4	March	14	14	0.000			
5	April	15	14	0.069			
6	May	15	15	0.000			
7	June	22	16	0.316			
8	July	27	18	0.400			
9	August	28	27	0.036			
10	September	30	29	0.034			
11	October	35	32	0.090			
12	November	30	34	0.125			
13	December	34	33	0.030			
14			SMAPE	0.0989	=SUM(D2:D13)/COUNT(D2:D13)		
15							
16							
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21							
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26							

For the specific data and methodology employed by this [forecasting model](#), the final calculated **SMAPE** value is **9.89%**. This output provides a quantifiable and clear measure of the average symmetric percentage error, which is essential for benchmarking performance against other predictive algorithms or industry standards.

Interpreting the Results and Strategic Application of SMAPE

The final calculated **SMAPE** value of 9.89% offers a direct, easily interpretable measure of the [forecasting](#) model's performance relative to the **actual data values**. From a strategic perspective, lower percentage values are always preferable, as they indicate a higher degree of alignment between the predictions and the observed outcomes. For effective time series analysis and demand planning, organizations must establish clear, internal benchmarks for acceptable SMAPE levels to accurately determine model viability and measure overall success.

When faced with the task of comparing multiple different [forecasting models](#) (for instance,

evaluating an ARIMA model against a machine learning approach), the model that consistently produces the lowest **SMAPE** is typically the preferred choice, provided it meets all other operational and structural criteria. This metric is invaluable because it provides a standardized, scale-independent methodology for evaluating comparative [predictive accuracy](#).

Mastering the calculation and interpretation of symmetric error metrics is fundamental for engaging in advanced data analysis and driving sound business decisions. We strongly encourage professionals to continue exploring related statistical measures and advanced **Excel** functions designed to streamline and automate complex statistical calculations. The ability to quickly and accurately calculate **SMAPE** is a key skill in the modern analytical toolkit.