

Forecasting with Moving Averages: A Practical Guide to Calculations in Excel

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The [moving average forecast](#) is a fundamental technique in quantitative analysis, utilized extensively across numerous industries to predict future values based on historical observations. This indispensable method excels at smoothing out short-term fluctuations, or volatility, within [time series data](#) by systematically calculating the average of various subsets of the complete data record. Fundamentally, this process relies on averaging a specific number of preceding periods to generate a [forecast](#) for the immediate upcoming period, offering a robust, yet remarkably straightforward, mechanism for identifying underlying trends and supporting informed decision-making.

The inherent simplicity and proven efficacy of the moving average technique secure its continued prominence as an introductory tool for constructing [forecasting models](#) across diverse fields, including business management, finance, and operations research. It proves particularly valuable when analyzing data that exhibits stable patterns and lacks pronounced seasonal variations or strong, sustained long-term trends. By focusing exclusively on the most recent [data points](#), this methodology efficiently filters out statistical noise, thereby revealing clearer patterns and offering an actionable vision of potential future outcomes.

This comprehensive guide is meticulously structured to walk you through the precise calculation of a [moving average forecast](#) using [Microsoft Excel](#), the ubiquitous and powerful spreadsheet software essential for data manipulation. We will utilize a practical, step-by-step example to ensure maximum clarity and immediate implementation. Our journey will progress from organizing the initial [dataset](#) to the crucial final stage of objectively evaluating the accuracy of our prediction using the industry-standard metric: the [Mean Absolute Percentage Error \(MAPE\)](#).

Understanding the Simple Moving Average Forecasting Method

The core philosophy of the simple moving average (SMA) forecast rests on the logical assumption that future values can be reliably approximated by averaging preceding observations. Unlike more sophisticated [forecasting models](#), which may assign varying weights to past observations based on their recency or perceived importance, the simple moving average treats every observation within the selected time window equally. As new data is recorded and integrated into the calculation, the oldest [data point](#) is systematically removed, causing the calculated average to effectively "move" or slide across the entire sequence of [time series data](#).

A central and critical decision in the implementation of this technique is the selection of the appropriate number of periods, conventionally denoted as N, for the moving average window. This choice profoundly impacts both the smoothness and the responsiveness of the resulting [forecast](#). For instance, employing a shorter window--such as a 3-day moving average--will cause the model to react quickly to recent shifts, but this high responsiveness often comes at the expense of incorporating more inherent noise or random fluctuations present in the data. Conversely, a longer

period, such as a 10-day moving average, generates a significantly smoother [forecast](#) but may lag considerably behind any genuine, major shifts in the underlying trend. Determining the optimal window length is an empirical exercise, typically depending heavily on the specific characteristics of the data being analyzed and the overall **forecasting** objective.

While the [moving average forecast](#) provides substantial benefits in terms of ease of implementation and clear interpretability, it is essential to acknowledge its inherent structural limitations. Due to its averaging nature, this model inherently lags behind actual trends, meaning it will likely fail to accurately capture abrupt and significant increases or decreases in data values immediately upon their occurrence. Furthermore, it is generally unsuitable for data that displays strong seasonal effects or complex cyclical patterns. Despite these constraints, it remains an exceptional starting point for any predictive exercise and serves as an invaluable baseline model, especially when employed alongside more sophisticated [forecasting models](#) or used for comparative analysis.

Setting Up and Organizing Your Data in Excel

To effectively illustrate the calculation of a moving average forecast within [Excel](#), we will work with a practical [dataset](#) modeling the daily sales figures for a hypothetical organization spanning 20 consecutive days. This sequential type of [time series data](#) is common in business intelligence and provides an ideal foundation for applying and understanding the moving average technique.

The first critical step in this process involves structuring and organizing your raw data within an [Excel](#) worksheet. Conventionally, you should allocate one column to represent the specific period (e.g., Day number or Date) and a second, adjacent column for the observed quantitative values (e.g., Sales revenue). For the purpose of our detailed example, we will assume the actual sales data is meticulously arranged in column B, beginning at cell B2, with the corresponding dates or day identifiers listed in column A. This highly structured arrangement ensures not only visual clarity but also significantly streamlines the subsequent application of Excel formulas.

The image provided below offers a clear visual representation of our example [dataset](#), specifically detailing the total sales recorded by the company over the 20-day observation period. This organized data forms the foundational basis upon which we will build and calculate our 5-day moving average sales prediction.

	A	B	C	D	E	F
1	Date	Sales				
2	1/1/2023	8				
3	1/2/2023	10				
4	1/3/2023	12				
5	1/4/2023	12				
6	1/5/2023	13				
7	1/6/2023	10				
8	1/7/2023	11				
9	1/8/2023	13				
10	1/9/2023	15				
11	1/10/2023	18				
12	1/11/2023	20				
13	1/12/2023	23				
14	1/13/2023	28				
15	1/14/2023	18				
16	1/15/2023	19				
17	1/16/2023	20				
18	1/17/2023	25				
19	1/18/2023	28				
20	1/19/2023	30				
21	1/20/2023	27				
22						
23						

Calculating the 5-Day Moving Average Forecast

Our immediate objective is to derive a 5-day moving average forecast. This requires that the predicted sales value for any given day be calculated as the simple arithmetic average of the actual sales values recorded during the immediately preceding five days. For example, the forecast for Day 6 must be the average of the actual sales observed from Day 1 through Day 5. This averaging process is crucial for dampening the impact of short-term volatility and generating a more stable, representative prediction of future sales performance.

To execute this calculation efficiently in **Excel**, we must first establish the correct starting point for our forecast formula. Since we require five prior sales figures to calculate the very first prediction, our initial forecasted value will logically correspond to the sixth day. Assuming our data starts in row 2, the actual sales for Day 6 are found in cell B7. Consequently, the formula for the 5-day moving average forecast for Day 6 must be placed in cell **C7** (or **C8** if you account for the header row, but based on the original structure, the data for Day 6 is in row 7, and the forecast should align with the period being predicted, which is Day 6). Let's use the provided content structure

which suggests starting the forecast on row 8 to align with Day 7, or simply aligning the forecast with the actual period being predicted (Day 6, Row 7).

We will align the forecast value (the prediction for Day X) with the cell corresponding to Day X. Assuming Day 6 is in row 7, the prediction for Day 6 should be in column C, row 7. Let's adjust the original instruction (which placed the formula in C8) to be more accurate to the visual provided where the forecast starts on the row corresponding to the 6th period (row 7 in the visual). Enter the following precise formula into cell **C7**. This formula leverages the built-in AVERAGE function in [Excel](#) to calculate the mean of the actual sales values located in the range B2 through B6, corresponding exactly to the first five days of the [dataset](#):

=AVERAGE(B2:B6)

Once you have accurately entered the formula into the correct starting cell (C7, aligning with the 6th day) and pressed Enter, Excel will immediately display the calculated average sales value for the initial five-day period. To propagate this moving average calculation across the remainder of your time series data, simply select cell **C7** and utilize the fill handle--the small green square located at the bottom-right corner of the selected cell. Drag this handle downwards through the entire column C. This action automatically adjusts the cell references for each subsequent prediction, ensuring that every new forecast is correctly derived from the five preceding actual sales values, demonstrating the 'moving' nature of the calculation.

C7			$\times$	$\checkmark$	fx	=AVERAGE(B2:B6)
	A	B	C	D	E	
1	Date	Sales	5-Day Moving Avg. Forecast			
2	1/1/2023	8				
3	1/2/2023	10				
4	1/3/2023	12				
5	1/4/2023	12				
6	1/5/2023	13				
7	1/6/2023	10	11			
8	1/7/2023	11	11.4			
9	1/8/2023	13	11.6			
10	1/9/2023	15	11.8			
11	1/10/2023	18	12.4			
12	1/11/2023	20	13.4			
13	1/12/2023	23	15.4			
14	1/13/2023	28	17.8			
15	1/14/2023	18	20.8			
16	1/15/2023	19	21.4			
17	1/16/2023	20	21.6			
18	1/17/2023	25	21.6			
19	1/18/2023	28	22			
20	1/19/2023	30	22			
21	1/20/2023	27	24.4			

Interpreting Results and Quantifying Forecast Accuracy

With the moving average formula successfully applied down column C, the generated values now constitute the 5-day moving average forecasted sales. Each resulting figure serves as a prediction for its corresponding day, formulated from the average of the five prior actual sales periods. These forecasted values inherently offer a significantly smoothed representation of the underlying sales trend, which is highly effective in mitigating the disruptive impact of typical daily sales volatility. This smoothing is a core benefit, providing a more stable and reliable indicator of performance than relying solely on the raw data.

For example, if we examine the forecasted sales value for Day 6 in our example, the resulting prediction is **11**. This specific forecast is derived from averaging the actual sales recorded from Day 1 through Day 5. This calculated value stands as our most informed and objective estimate for the sales expected on Day 6, based directly on the company's very recent historical performance. Observing the entire column of forecasted values reveals an immediate pattern: the forecast figures are significantly less erratic and subject to fewer extreme fluctuations than the actual sales,

confirming the powerful smoothing capability of the moving average method.

However, relying only on visual assessment is insufficient for evaluating a predictive tool. To truly ascertain the effectiveness and reliability of this [forecasting model](#), we must quantify its accuracy objectively. The standard industry metric for this purpose, particularly prevalent in business and economic [time series data](#) analysis, is the [Mean Absolute Percentage Error \(MAPE\)](#). MAPE provides a highly interpretable measure of forecast accuracy by expressing the error relative to the actual value, normalizing the measurement and making it easy to compare results across different models or products.

Implementing the Mean Absolute Percentage Error (MAPE) Calculation

The **Mean Absolute Percentage Error (MAPE)** is specifically designed to deliver a clear indication of prediction error, expressed conveniently as a percentage. A lower MAPE figure unequivocally signifies a more accurate forecast, meaning the predicted values are, on average, closer to the actual observed outcomes. Before we implement the calculation in Excel, understanding the underlying mathematical formula is crucial for context:

$$\text{MAPE} = (1/n) * \sum(|\text{actual} - \text{forecast}| / |\text{actual}|) * 100$$

We can break down this formula into its constituent components for immediate clarity:

$\sum$ - This symbol denotes "summation," requiring us to aggregate all the calculated individual percentage errors across the observation window.

n - This represents the total number of [data points](#) for which a matching pair of both actual and forecasted values exists.

actual - This is the true, observed data value for a given period.

forecast - This is the predicted data value generated by the [forecasting model](#) for that exact same period.

[|actual - forecast|](#) - This critical component calculates the **absolute value** of the difference between the actual result and the predicted result, ensuring that positive and negative errors do not improperly cancel each other out during aggregation.

To calculate the **Mean Absolute Percentage Error (MAPE)** for our 5-day moving average forecast, we must first determine the individual percentage error for every period where both actual sales and a forecast are available. We will designate a new column, column D, to systematically store these calculated individual percentage errors.

For the first valid period (Day 6, corresponding to row 7), we input the following formula into cell **D7**. This formula first calculates the absolute difference between the actual sales (B7) and the forecasted sales (C7), then divides this difference by the actual sales (B7) to obtain a relative error,

and finally multiplies by 100 to present the result as a percentage:

=ABS(B7-C7)/B7*100

Press Enter after typing the formula. The ABS function is essential here as it guarantees that the error is always positive, preventing the unintended cancellation of errors. Once the formula is correctly entered in cell **D7**, click on the cell and drag the fill handle down to the last row where you have both actual and forecasted values (in our example, this extends to cell D21). This step completes the calculation of the individual percentage errors across the observed range.

D7					✖	✔	f_x	=ABS(B7-C7)/B7*100
	A	B	C	D				E
1	Date	Sales	5-Day Moving Avg. Forecast	Abs. Percent Error				
2	1/1/2023	8						
3	1/2/2023	10						
4	1/3/2023	12						
5	1/4/2023	12						
6	1/5/2023	13						
7	1/6/2023	10	11	10				
8	1/7/2023	11	11.4	3.636363636				
9	1/8/2023	13	11.6	10.76923077				
10	1/9/2023	15	11.8	21.33333333				
11	1/10/2023	18	12.4	31.11111111				
12	1/11/2023	20	13.4	33				
13	1/12/2023	23	15.4	33.04347826				
14	1/13/2023	28	17.8	36.42857143				
15	1/14/2023	18	20.8	15.55555556				
16	1/15/2023	19	21.4	12.63157895				
17	1/16/2023	20	21.6	8				
18	1/17/2023	25	21.6	13.6				
19	1/18/2023	28	22	21.42857143				
20	1/19/2023	30	22	26.66666667				
21	1/20/2023	27	24.4	9.62962963				
22								

Finally, to obtain the overall **Mean Absolute Percentage Error (MAPE)** for this **forecasting model**, we need to calculate the average of all the individual percentage errors in column D. Locate an empty cell, such as **D22**, and enter the following formula. This formula utilizes the AVERAGE function to sum all the individual percentage errors from D7 to D21 and then divides by their count, providing the definitive mean absolute percentage error.

=AVERAGE(D7:D21)

The following screenshot visually demonstrates how to apply this final average formula in practice, yielding the comprehensive MAPE for your 5-day moving average forecast.

D22 ✕ ✓ fx =AVERAGE(D7:D21)					
	A	B	C	D	E
1	Date	Sales	5-Day Moving Avg. Forecast	Abs. Percent Error	
2	1/1/2023	8			
3	1/2/2023	10			
4	1/3/2023	12			
5	1/4/2023	12			
6	1/5/2023	13			
7	1/6/2023	10	11	10	
8	1/7/2023	11	11.4	3.636363636	
9	1/8/2023	13	11.6	10.76923077	
10	1/9/2023	15	11.8	21.33333333	
11	1/10/2023	18	12.4	31.11111111	
12	1/11/2023	20	13.4	33	
13	1/12/2023	23	15.4	33.04347826	
14	1/13/2023	28	17.8	36.42857143	
15	1/14/2023	18	20.8	15.55555556	
16	1/15/2023	19	21.4	12.63157895	
17	1/16/2023	20	21.6	8	
18	1/17/2023	25	21.6	13.6	
19	1/18/2023	28	22	21.42857143	
20	1/19/2023	30	22	26.66666667	
21	1/20/2023	27	24.4	9.62962963	
22			MAPE	19.12227272	
23					
24					

Analyzing Performance and Planning Iterative Improvement

Upon completing the MAPE calculation, we find that the **Mean Absolute Percentage Error (MAPE)** for our 5-day moving average forecast model is approximately **19.12%**. This numerical result provides a robust, quantifiable assessment of how accurately our predictions align with the actual sales figures. Interpreting the meaning of this percentage is paramount to understanding the model's overall effectiveness in a real-world context.

A MAPE of 19.12% indicates that, on average, the forecasted sales values generated by our 5-day

moving average method deviate from the actual observed sales by about 19.12%. Practically speaking, this suggests that our predictions generally fall within roughly one-fifth of the actual sales outcome. It is crucial to remember that there is no universal benchmark for a "good" MAPE; acceptability is highly dependent on factors such as the industry's tolerance for error, the specific product being forecast, and the inherent volatility of the underlying data. While 19.12% might be deemed acceptable for highly fluctuating data or as a preliminary baseline, higher precision applications would necessitate a lower error rate. The central goal in predictive [modeling](#) is always to minimize MAPE, signifying greater reliability and predictive accuracy.

The calculation and evaluation of the 5-day moving average represent a vital foundational step, but it is rarely the final stage in developing robust predictive capabilities. Effective modeling involves continuous experimentation. The 5-day window we initially selected is arbitrary; alternative intervals might yield significantly better accuracy. We strongly recommend repeating this entire process using an alternative interval, such as a 10-day moving average. By recalculating the forecast and subsequently its MAPE, you can perform a direct, objective comparison of how different smoothing periods affect accuracy. If the 10-day model achieves a lower MAPE, it suggests that a longer smoothing window is more suitable for capturing the long-term trends in your sales data while simultaneously reducing noise.

Beyond simply adjusting the moving average interval, analysts should consider exploring more advanced [forecasting](#) models if the data exhibits complex characteristics like strong seasonality or pronounced trends that the simple moving average cannot fully capture. Techniques such as exponential smoothing (e.g., Holt-Winters methods) or even more rigorous ARIMA models can offer superior predictive accuracy in these scenarios. The foundational insights derived from this initial moving average analysis provide a solid, structured pathway for transitioning into these complex methods, thereby continually enhancing your predictive modeling skills and supporting increasingly precise decision-making.

Further Learning and Essential Resources

Developing mastery in [forecasting](#) techniques, particularly within [Excel](#), is an indispensable skill for professionals dealing with [time series](#) analysis and predictive analytics. To maximize your understanding and significantly expand your expertise, it is highly beneficial to delve into additional resources concerning advanced Excel functionalities and various sophisticated forecasting methodologies.

The following areas of study and related topics will further explain how to execute complex tasks and implement advanced prediction techniques both within and outside of the Excel environment:

Understanding other essential **Excel** statistical functions, such as `AVERAGE.S` and `STDEV.P`, for comprehensive data summary.

Exploring **Excel's** integrated Forecast Sheet feature, which offers quick and automated predictive analysis using established algorithms.

Learning about advanced exponential smoothing methods, including Simple Exponential Smoothing, Holt's Linear Trend, and the Holt-Winters' Seasonal Method, specifically designed for data exhibiting strong trends and seasonality.

Delving into regression analysis capabilities within **Excel**, crucial for accurately identifying complex relationships between multiple variables and subsequently generating robust forecasts.

Investigating advanced statistical models like ARIMA (AutoRegressive Integrated Moving Average) for sophisticated analysis of complex, non-stationary time series data.

Studying alternative forecast error metrics beyond MAPE, such as Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE), to achieve a holistic understanding of model performance evaluation.

Continuous education in forecasting techniques will empower you to construct increasingly accurate and sophisticated predictive models, ultimately driving superior strategic decision-making in any data-driven professional environment. The fundamental knowledge acquired through mastering moving average forecasts in **Excel** serves as a powerful and essential gateway into the wider domain of statistical time series analysis.