

## S&P 500 1-Year Index Analysis

With a fixed-indexed or registered index-linked annuity from MassMutual Ascend Life Insurance Company, you can allocate funds to 1-year term indexed strategies that earn returns based on the S&P 500 Index. This index includes stocks issued by 500 of the top companies in leading industries in the U.S. economy. Let's take a closer look.

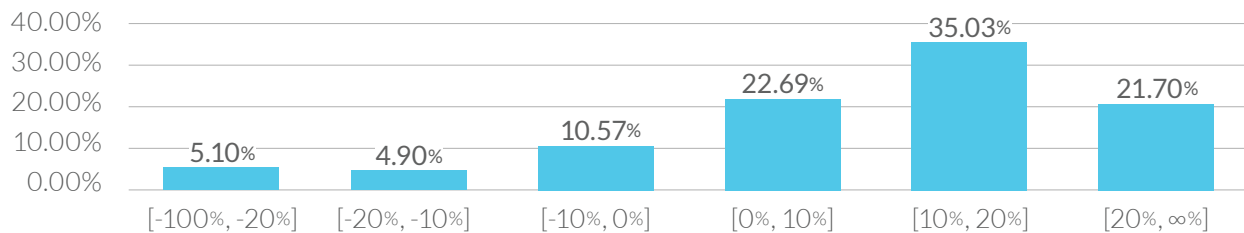
### S&P 500 returns using rolling periods

The data below uses 1-year rolling returns<sup>1</sup> of the S&P 500 price return index (SPX) from December 31, 2004 through December 31, 2024, for a total of 4,958<sup>2</sup> observations.

Average Performance			Positive Performance		Negative Performance	
Average Return	Average Gain	Average Loss	Maximum Return <sup>3</sup>	Num of Gains	Minimum Return <sup>4</sup>	Num of Losses
9.59%	15.80%	-14.33%	74.77%	3,937 (79.41%)	-48.82%	1,020 (20.57%)

### S&P 500 return distribution

Using the same data set and assumptions, the return distribution graph below illustrates how frequently the annualized returns fell into specific ranges. The table below the graph shows the average return by range.



Return Range	[-100%, -20%]	[-20%, -10%]	[-10%, 0%]	[0%, 10%]	[10%, 20%]	[20%, ∞%]
Average S&P 500 Return by Range	-34.63%	-14.35%	-4.53%	5.30%	14.66%	28.61%

<sup>1</sup> 1-year rolling returns refers to every 1-year period that started on a business day after December 30, 2004 and ended before January 1, 2025.

<sup>2</sup> One flat year, in which the S&P 500 return was 0%, is included in the number of total observations.

<sup>3</sup> Maximum return: 1-year period ending 3/23/2021

<sup>4</sup> Minimum return: 1-year period ending 3/5/2009

## S&P 500 annual returns over last 20 years

The examples on the previous page showed a comprehensive analysis using rolling S&P 500 returns from 2005-2024. For reference, the table below shows annual end-of-year S&P 500 returns over the last 20 years.

Year	Return	Year	Return
2005	3.00%	2015	-0.72%
2006	13.61%	2016	9.53%
2007	3.52%	2017	19.41%
2008	-38.48%	2018	-6.23%
2009	23.45%	2019	28.87%
2010	12.78%	2020	16.25%
2011	0.00%	2021	26.89%
2012	13.40%	2022	-19.44%
2013	29.60%	2023	24.23%
2014	11.39%	2024	23.30%

MassMutual Ascend offers several types of annuities, which have varying levels of upside potential and downside protection. Annuities also offer benefits such as tax deferral and guaranteed lifetime income. Talk with your financial professional about how an annuity can fit into your portfolio and help you reach your goals.

MassMutual Ascend's registered index-linked annuities can only be sold through a Broker/Dealer that is contracted with MassMutual Ascend<sup>SM</sup>. This material must be preceded or accompanied by a prospectus. To obtain a copy of the prospectus, please visit [MassMutualAscend.com/RILArates](https://MassMutualAscend.com/RILArates).

Annuities are long-term investments and may not be suitable for all investors. Withdrawals from an annuity contract may have tax consequences.

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