![CANDRIAM - A NEW YORK LIFE INVESTMENTS COMPANY]

Index rebalancing:

looking beyond the figures to invest more effectively

About the author.

Damien Vergnaud

Portfolio Manager,
Equity Market Neutral

Damien Vergnaud has been a portfolio manager at Candriam since 2022.

He joined Candriam from LFIS Capital, where he was a quantitative analyst from 2019, before becoming a portfolio manager in 2021. He began his career in 2012 as an assistant trader at BNP Paribas in the UK, then held a similar position at Exane France in 2014, before working as a financial engineer at La Française.

Damien holds a Master's degree in Engineering from MINES Paris - PSL in France.

Table of contents.

Summary.

Rebalancing of equity indices, which group stocks together to reflect the overall performance of a market or sector, plays a crucial role for investors. It influences both the prices of the stocks that make up the indices and the associated trading volumes. These regular adjustments are essential to maintain the relevance of indices in the face of economic and sectoral developments. By adjusting the weight of securities and changing the composition of indices according to predefined criteria, companies that exploit these indices can generate high market volatility but also create arbitrage opportunities.

The rise of passive management has amplified the effects of these rebalancings. A combination of quantitative and qualitative analysis is crucial to fully understand their impact on markets and investment strategies. A purely quantitative approach can lead to the omission of important factors, such as the effects of exceptional events which were previously anticipated, such as the cancellation of an adjustment due to a health crisis.

This study highlights the importance of combining these two types of analysis in order to better anticipate market movements related to rebalancing, understand their effects on portfolios and identify investment opportunities. An experienced team, with access to large databases and varied expertise, can also be an asset to conduct in-depth and complementary research. Resources such as these enable you to grasp the complexity of the financial markets in all their nuance and comprehensiveness.

1. Introduction : deciphering index rebalancing

> **"**
>
> **If you don't take change by the hand, it will take you by the throat.**
>
> **Winston Churchill**

In an ever-changing financial environment, stock market index rebalancings are major events that can have a significant impact on financial markets and investment portfolios. While traditional quantitative models offer valuable tools for anticipating such adjustments, they do not always reflect the complexity of the factors involved, while stock market indices serve as a key benchmark for assessing market and fund performance.

A systematic approach to rebalancing can, in fact, lead to significant losses during unexpected events. It is therefore crucial for active fund managers, who play a key role in market liquidity, to combine different methodologies in order to develop a more robust model.

This study proposes an innovative approach by analysing both quantitative factors (such as number of entries and volatility) and qualitative factors (such as market events) and highlighting their complementarity. By going beyond statistical correlations, we seek to identify the root causes of market movements caused by index recompositions and to better identify potential investment opportunities.

Firstly, we will examine the reasons leading to index rebalancings and their potential effects on the markets. Next, we will look at the factors that influence these index recompositions. Lastly, we will highlight the value of adopting a hybrid approach for a better understanding of market mechanisms.

2. Understanding index rebalancings and their importance

Stock market indices, such as the S&P 500, the Nasdaq-100, and the FTSE 100, include stocks that represent a specific market or sector. These indices are regularly adjusted to reflect market performance by including or removing certain stocks from their composition. However, these adjustments are not without consequences for investors. Before exploring the different approaches to understanding them, it is essential to understand the reasons behind these adjustments and their effects.

2.1. Why are indices regularly recomposed?

The composition of indices is not fixed; it is periodically adjusted - often quarterly or annually - to preserve their integrity and representativeness.

The rebalancing process of an index involves adding or removing shares based on various predefined criteria, such as market capitalisation level, liquidity, and compliance with index standards. Changes in the characteristics of companies, such as their country of origin or industry, may also lead to changes in the composition of indices. In addition, events specific to the life of companies, such as mergers and acquisitions (M&A) or spin-offs, can also trigger these adjustments.

During an index recomposition, data relating to companies (free float, number of shares, country, sector, etc.) are updated, leading to adjustments in the weight of each stock in the index. These changes are communicated in advance to investors, allowing them to prepare and adapt their portfolios accordingly. Amendments take effect on a predetermined date, usually at the end of a month or quarter.

Reason	Explanation	Example
Reflect market developments	Maintain the composition of companies and their weighting in line with the reality of the market.	Inclusion of fast-growing new companies in a technology-driven index.
Maintain relevance	Adapt the index to economic and sectoral changes so that it remains representative of its objective.	Change in sector classification for a stock.
Ensure better performance of the index	Rebalance the index to improve its diversification, reduce risk and optimise its performance.	Sell stocks from an overweight sector to buy stocks from an underweight sector.

Having explained the reasons why indices are recomposed on a regular basis, let's look at the impact of passive management on this rebalancing.

2.2. The role of **passive management**

Since the 1970s, with the launch of the first index funds, passive management has gained prominence in asset allocation strategies. Their simplicity, liquidity and lower pricing have led many managers to invest through them first in the equity market and then expand to other asset classes such as bonds.

Chart 1:

Change in assets under management (active and passive) since 1993

— **Active Assets**   — **Passive Assets**
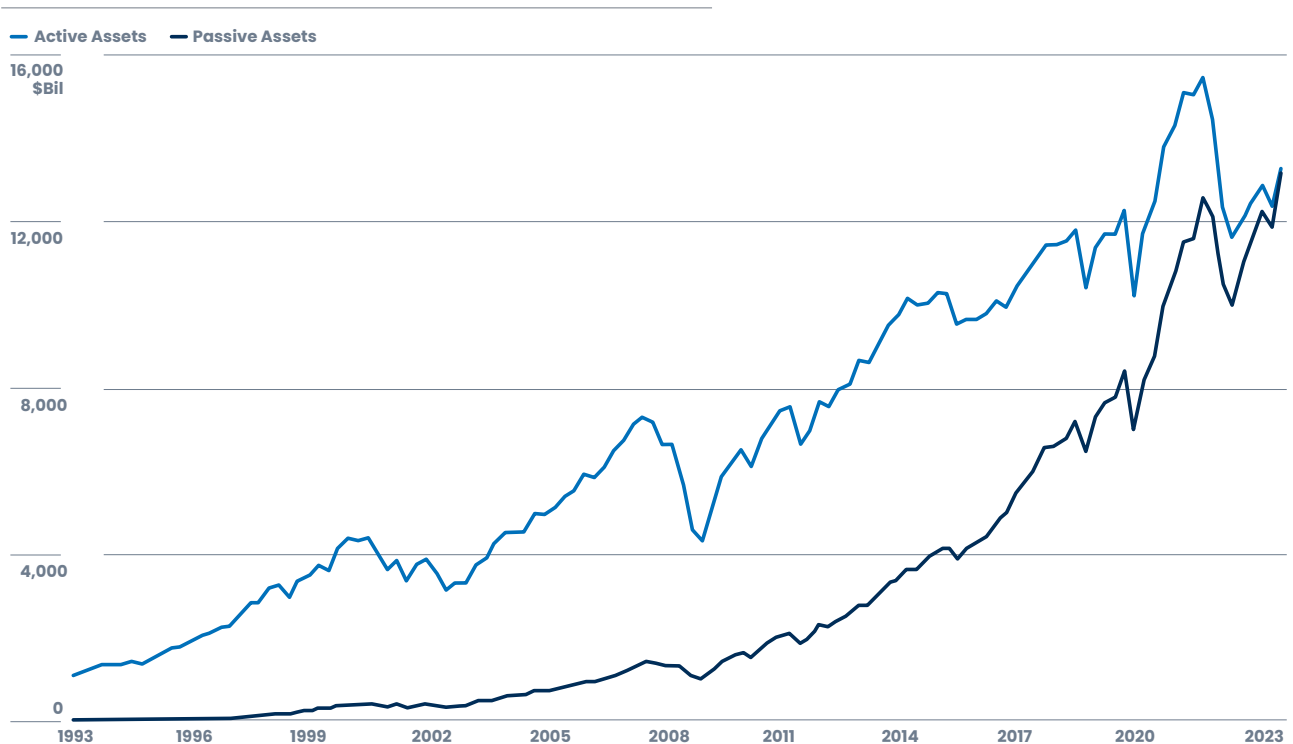
Note:Data at 31 December 2023
Source: Morningstar Direct Asset Flows

As passive management has become more important, its influence on buy and sell flows has also increased. Because of their nature, index funds have a particularly strong influence during index rebalancing operations. During these adjustments, these funds sell companies that are no longer eligible for their benchmark and buy companies that are now included in their benchmark.

2.3. What are the impacts on the markets?

The rebalancing of indices has significant impacts on the financial markets, with these events generally generating some of the busiest trading days of the year.

Notable effects of index recompositions include:

- **an effect on stock market prices:** equities added to an index tend to see their prices rise due to the increased demand generated by index funds. On the other hand, stocks withdrawn from the indices are generally subject to downward pressure on their prices.

- **arbitrage opportunities:** investors often seek to anticipate changes in indices in order to take advantage of the resulting price movements. By buying stocks that can be added to an index and selling those that will be excluded, they can make significant gains.

- **increased volatility:** rebalancing days may lead to a significant increase in market volatility due to high transaction volumes. Institutional investors and index funds adjust their portfolios to incorporate new index components, generating significant buying and selling flows.

Research shows that index recompositions can have a high impact on stock prices and trading volumes. According to our own calculations based on data compiled by Bloomberg, the last six stocks entered[1] in the S&P 500 between September 2023 and June 2024 recorded an average absolute return of 8.08% between the announcement of their inclusion and their actual inclusion in the index. However, these stocks experienced an average fall of 1.41% in the two weeks following their integration. This indicates a significant

upward movement before entering the index, followed by a significant correction thereafter. Trading volumes are twice as high on average after index entry as during the pre-announcement period.

Such dynamics encourage investors to anticipate these events to take advantage of them. By identifying stocks that could see their weighting increase or decrease, they can make strategic investment decisions, such as buying or selling those stocks before rebalancing takes place.

Given the repercussions of index rebalancings on the financial markets, the challenge for investors is to find an effective model for anticipating these recompositions. A relatively simple initial approach is to incorporate quantitative factors into their model.

---

[1] Blackstone and Airbnb on 15 September 2023, Lululemon Athletica on 17 October 2023, Uber on 15 December 2023, CrowdStrike Holdings and KKR & Co on 21 June 2024

3. Analysis of quantitative factors influencing the extent of index rebalancings

The extent of periodic adjustments in index composition is influenced by a variety of factors. Understanding them is crucial for anticipating market movements associated with rebalancing and optimising investment strategies.

To study this, we have analysed the turnover[2] in index funds associated with S&P indices since December 2014. As a reminder, the S&P 500 includes the 500 largest US companies, the S&P Midcap 400 includes the following 400 companies, representing the US mid-cap segment, while the S&P 600 consists of the 600 US small-cap companies.

Chart 2:

Turnover of US index funds
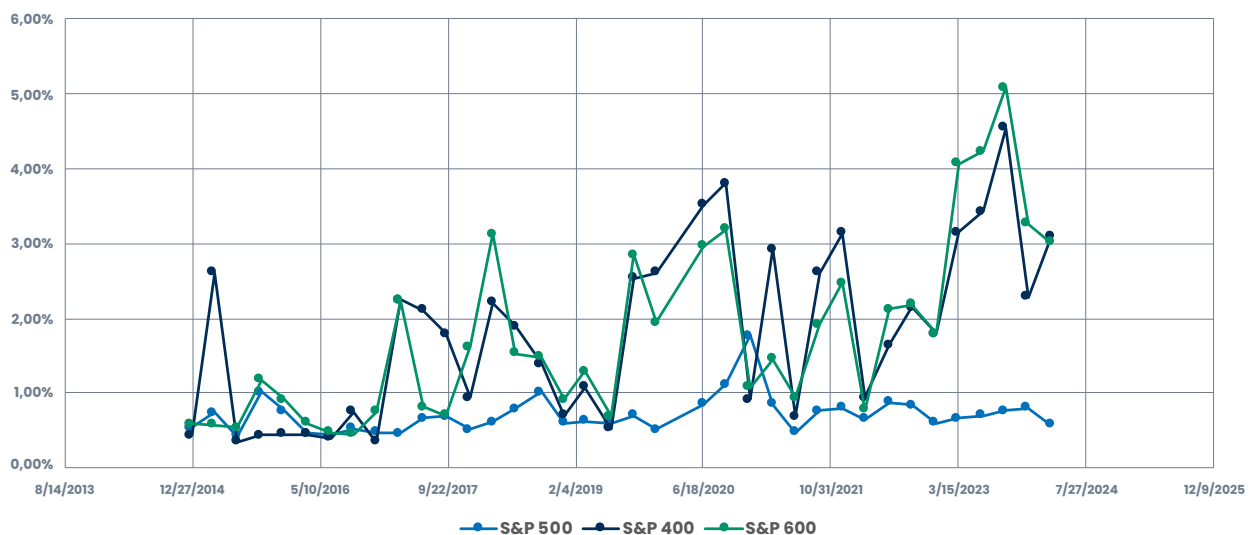
Sources: Bloomberg Data & Candriam

---

2 Turnover corresponds to half of the sum of the absolute values of changes in weight during an index rebalancing

Several observations arise from this analysis:

- the S&P 400 and S&P 600 turnovers show a significant and close correlation, with a correlation coefficient of 83%.

- on the other hand, the turnover of the S&P 500 is much lower and has a less marked correlation with the other two indices.

How can we explain these observations?

3.1. The number of entries and exits in the index

A first hypothesis to explain the previous observations could be that the number of entries in an index is a crucial factor in the dynamics of index recompositions.

Here are the results obtained illustrating the relationship between the turnover and the number of entries in the index:

Chart 3:

Turnover of S&P indices relative to the number of entries in each index

Turnover S&P 500 vs number of entries

Turnover S&P 400 vs number of entries

Turnover S&P 600 vs number of entries
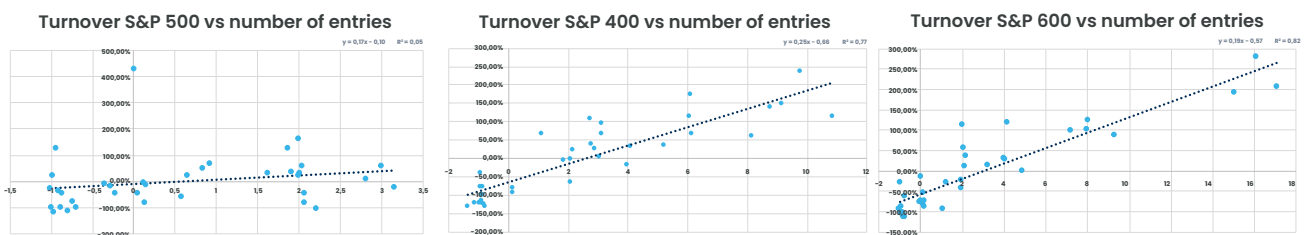
Note: data has been standardised[3] to allow a fair comparison
Sources: Bloomberg Data & Candriam

We note that the relationship is weak for the S&P 500, while a large part of the variance in turnover is explained by the number of entries for the S&P 400 and S&P 600 indices.

The number of entries and exits may therefore influence the recomposition of indices. But is that the only factor? What about the variable weight of a new entrant in an index?

---

3 Standardisation is a data pre-processing operation that aims to put all quantitative variables on the same scale.

3.2. Does size **matter?**

Given that the share prices of listed companies change over time and that some indices take market capitalisation into account, it may be relevant to examine the weight of a stock to determine whether it can be considered a factor in anticipating index rebalancings. For the S&P indices studied previously, a value can only be added to these indices if its market capitalisation is within the following ranges (in billions of US dollars):

- **S&P 500:** over $18 billion.

- **S&P 400:** between $6.7 billion and $18 billion.

- **S&P 600:** $1 billion to $6.7 billion.

We examined the change in the weight of a new entrant in the S&P indices. This weight may vary depending on the index it joins and its own size, as illustrated in the table below which shows the ratio of the market capitalisation of a new entry into the index to the sum of the market capitalisations of the current members of the index. Data, based on companies' average market capitalisations as of 19 April 2024[4], show that new entrants to the S&P 400 and S&P 600 indices have a greater relative weight than those of the S&P 500.

Table 2:
Weight of a new entrant in an S&P index

	Average weight of a new entrant in the index
S&P 500	0.09%
S&P 400	0.45%
S&P 600	0.32%

Source: Candriam

While a link has been established between the weight of stocks and the S&P 400 and 600 indices, this is not really the case for the S&P 500. It would therefore be interesting to examine other potential explanatory factors. Therefore, given their importance for financial markets, market movements, volatility and dispersion are variables that also merit in-depth analysis.

---

4 For the S&P 400 and S&P 600, the table assumes that the new entry has an average market capitalisation in the middle of the ranges defined for each index. For the S&P 500, although there is no specific cap on this, we have calculated the average market capitalisation of new entrants over the last five years, taking into account the market effect over this period for the different stocks concerned. The adjusted amount at 19 April 2024 thus amounts to $40 billion.

3.3. Volatility and dispersion indicators

Market volatility levels can also play a crucial role in understanding index recompositions. Indeed, periods of high volatility may lead to greater adjustments in indices to reflect new market realities.

Volatility, an explanatory variable?

The VIX is a volatility index calculated from the prices of call and put options on the S&P 500. It provides an overview of the expected volatility in the US stock market in the short term. Rather than reflecting current volatility, it captures investors' expectations of future volatility.

A high level of this index suggests that investors anticipate significant and potentially sudden market movements in the next 30 days. Conversely, a low VIX indicates confidence and stability expectations. This allows investors to better understand market sentiment and anticipate future fluctuations in volatility. In March
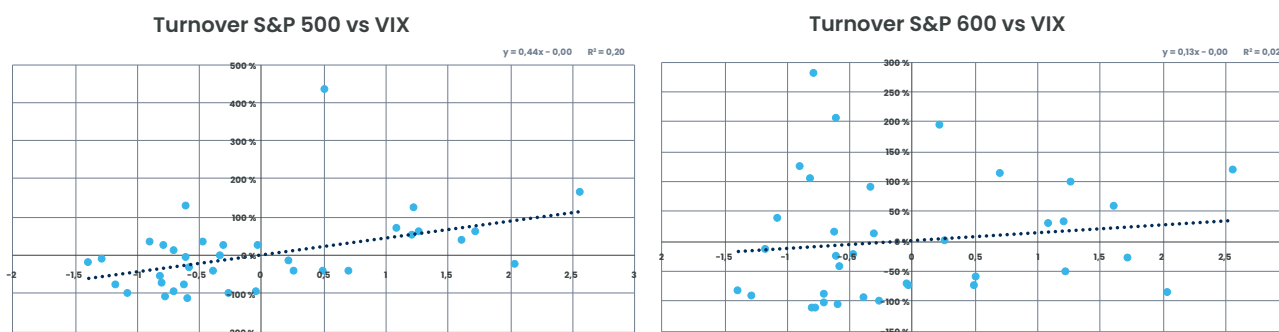
2020, at the start of the Covid-19 pandemic, the VIX average exceeded 57, almost four times the 2019 average.

Here we want to test the following hypothesis: in times of high volatility, share prices vary significantly relative to each other, leading to more frequent changes in indices during subsequent rebalancings.

To do this, we have constructed a graph showing the turnover for the S&P 500 and the S&P 600 according to the observed values of the VIX. Given the similarity of the turnover profile of the S&P 400 and the S&P 600, we chose to show only the results for the S&P 500 and S&P 600

Chart 4:
Turnover of the S&P 500 and S&P 600 relative to the VIX

Turnover S&P 500 vs VIX

$y = 0,44x - 0,00 \quad R^2 = 0,20$

Turnover S&P 600 vs VIX

$y = 0,13x - 0,00 \quad R^2 = 0,02$

Note: data has been standardised to allow fair comparison
Sources: Bloomberg Data & Candriam

The results show a modest impact for the S&P 500 and non-existent for the S&P 600, suggesting that the VIX is not a highly explanatory factor for turnover for these indices.

What about dispersion?

Similar to the VIX, the DSPX is an indicator that measures the dispersion of equity prices within the S&P 500. Constructed from option prices, the DSPX assesses the level of market risk by reflecting the expected dispersion between equities according to option market participants. This index can serve as a barometer of how the market perceives short-term diversification opportunities, or reflect investors' perception of the intensity of short-term risk within the S&P 500 components.

In times of high volatility, the DSPX tends to increase. For example, in March 2020, at the start of the health crisis, this index had exceeded the threshold of 50, well above its 10-year average of around 24. Conversely, a low level of the DSPX indicates a greater correlation between S&P 500 stocks, indicating a more stable market and suggesting a possible period of sector rotation ahead.

To assess the impact of dispersion on index rebalancings, we analysed the results for the S&P 500 and S&P 600 using standardised data. The results also show a limited relationship between the DSPX and turnover for both indices.

Chart 5:
Turnover of the S&P 500 and S&P 600 compared to the DSPX
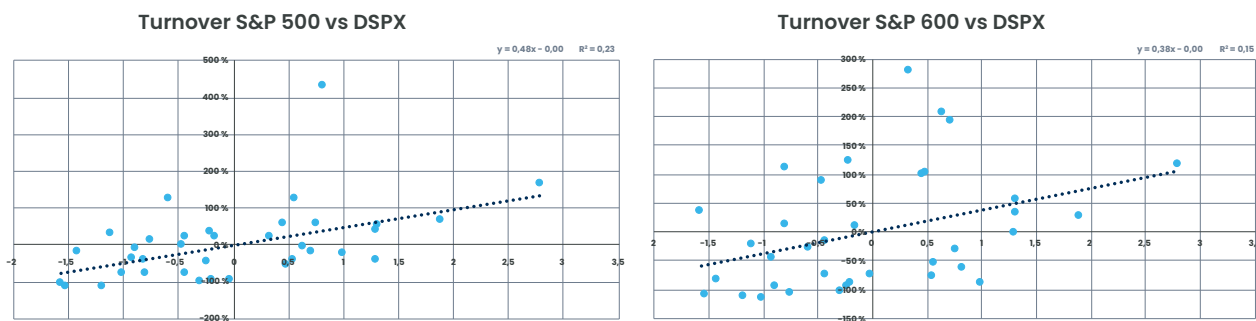
Turnover S&P 500 vs DSPX

$y = 0,48x - 0,00$ $R^2 = 0,23$

Turnover S&P 600 vs DSPX

$y = 0,38x - 0,00$ $R^2 = 0,15$

Note:data has been standardised to allow fair comparison
Sources: Bloomberg Data & Candriam

We used two forward-looking indicators, the VIX and the DSPX, which showed limited relationships with index recomposition. An additional interesting avenue to explore could be the analysis of historical or current data related to market movements. This would make it possible to determine whether large variations in these indicators before rebalancing can be correlated with high turnover.

3.4. Market trends (equities, interest rates, slope of the yield curve)

To further our analysis, we looked at the absolute value of market movements, interest rates, and the slope of rates during the period leading up to the index recomposition. Our objective here is to determine whether these indicators can explain the changes in index turnover.

The results of this analysis did not reveal any significant relationships between these indicators and turnover, as shown in the summary table below:

Table 3:

Summary of the impact of market factors on index turnover

y	x	Management coefficient	Coefficient of determination (R2)
S&P 500	Abs(Perf S&P 500)	0.06	0
S&P 600	Abs(Perf S&P 600)	−0.16	0.02
S&P 500	Abs(Rate Movement)	0.02	0
S&P 600	Abs(Rate Movement)	0.18	0.03
S&P 500	Abs(Yield Slope Movement)	0.05	0
S&P 600	Abs(Yield Slope Movement)	−0.1	0.01

Sources: Bloomberg Data & Candriam

We note that forward-looking indicators, such as the VIX and the DSPX, have interesting relationships with the turnover of the S&P 500, but their relevance is diminishing for other indices. On the other hand, indicators based on past or current data have not shown a significant link with index recompositions.

While quantitative analysis provides valuable insights into index rebalancing, is it sufficient? Can exceptional events such as a health crisis also disrupt these models?

4. Combining quantitative and qualitative analysis to build more robust models

While they are essential for identifying trends and correlations, quantitative analyses are not enough to capture the complexity of index rebalancings. Indeed, these events are influenced by a multitude of factors that are not always quantifiable.

Exceptional disruptions, such as those related to the Covid-19 pandemic, can, for example, influence the decisions of companies using stock market indices. It is therefore becoming crucial to complement a quantitative approach with a qualitative dimension, in order to obtain a more complete and nuanced view of the mechanisms underlying index recompositions.

4.1. The limitations of isolated quantitative analysis

Quantitative analysis, using indicators such as the VIX, the DSPX, or the number of entries and exits from an index, reveals correlations of varying strength between these indicators and index turnover. While indicators such as the number of entries showed

significant explanatory potential, others had a much smaller impact.

The table below summarises these indicators as well as their effectiveness according to our analyses presented in the previous section:

Table 4:
Summary of the impact of indicators on index recompositions

Signal	Impact for the S&P 500	Impact for S&P 400 and S&P 600
Number of entries	=	++
VIX	+	=
DSPX	+	=
Market	=	=
Average size of a new entrant	=	+
Rate	=	=
Yield slope	=	=

While quantitative indicators such as the VIX or the number of entries/exits of an index provide valuable information, they capture only part of the reality. For example, an event like Tesla's entry into the S&P 500 is difficult to predict on the basis of quantitative indicators alone. It is the qualitative analysis that makes it possible to understand the reasons for this decision (rapid growth of the company, attractiveness for investors) and assess the consequences on the market.

4.2. The contribution of qualitative analysis

To overcome the limitations of an isolated quantitative approach, it may be useful to supplement it with an in-depth qualitative analysis.

This can be based on several sources of information:

- **index entry and exit reports:** understanding why companies enter or exit indices can provide valuable insights into underlying market trends.

- **specific market events:** events such as mergers and acquisitions, IPOs or regulatory changes can significantly influence index turnover.

Introducing a qualitative dimension into their model can help investors to:

- **identify exceptional events:** M&A, spin-off, pandemic, etc. These events may influence companies using stock indices in their decision-making. As a result, a company about to be acquired is generally removed from all indices on or around the expected delisting date.

- **understand the reasons for market participants' decisions:** why did fund managers anticipate Tesla's entry? Why did S&P decide to cancel rebalancing in 2020?

- **assess the impact of subjective factors:** investor sentiment, regulatory changes, can influence rebalancing in a way that quantitative models cannot always take into account.

- **develop alternative scenarios:** by combining the results of the quantitative analysis with a qualitative view of the issues, it is possible to build more robust forward-looking scenarios.

Another qualitative element that can help to understand and anticipate index rebalancing is the experience and expertise of managers. Years of practice, in-depth observations and knowledge accumulated over time can greatly facilitate the anticipation of potential changes within an index.

Quantitative and qualitative analysis are not competing approaches, but complementary. While the first allows us to identify patterns and statistical correlations, the second brings an interpretative dimension that enriches our understanding of observed phenomena. It is as if quantitative analysis offers us a snapshot of rebalancing, while qualitative analysis allows us to understand the scenario. This helps to better understand the sheet as a whole.

4.3. Concrete case studies: Tesla's entry into the S&P 500 and the unexpected cancellation of a rebalancing

Analysis of Tesla's entry into the S&P 500 in December 2020

The announcement of the inclusion of Tesla (TSLA) in the S&P 500 had a major impact on the market in December 2020. This announcement, made on 16 November 2020 after the market close, anticipated the effective entry of Tesla into the index on Monday, 21 December 2020.

Tesla shareholders prior to the announcement enjoyed significant outperformance. In the space of a month, between the announcement of the inclusion and its effective inclusion in the flagship US stock index, Tesla's share price jumped 70% compared to a 2% gain for the S&P 500 at the same time (see chart below).

Chart 6:

Tesla's stock market outperformance relative to the S&P 500

Performance in % between Monday 16 November 2020 and Friday 18 December 2020

Tesla : +70.3 %

S&P 500 : +2.3 %

Tesla ——— S&P 500
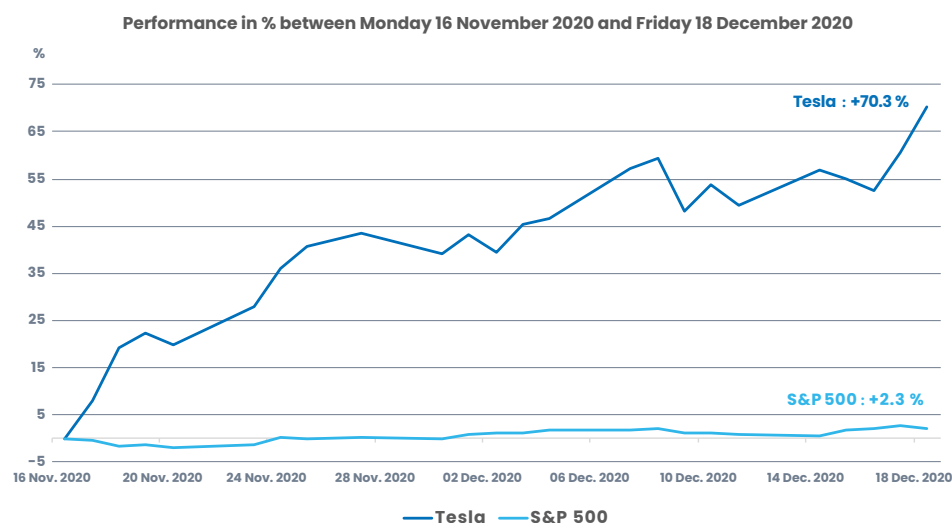
Sources: NYSE, S&P Global & Candriam

Analysis of market flows during the Tesla integration reveals that index funds had to acquire large amounts of Tesla shares to align their portfolios with the new index composition. This high demand contributed to the sharp rise in Tesla's share price.

A quantitative analysis highlights the extent of price changes, exceptionally high trading volumes, and the impact of this event on the composition of the index. Although Tesla was the largest company ever added to the S&P 500 in a single transaction[5], requiring significant rebalancing of index fund portfolios, this alone was not enough to fully anticipate the effect of its entry into the S&P 500.

Other factors could also explain the exceptional impact of this event. A pioneer in the exciting electric car industry, the company, considered a high-growth technology stock, was already very popular with investors and took centre stage in the media. Its inclusion in such an iconic index has strengthened its legitimacy and attracted new investors, generating increased demand for its shares as it joins the S&P 500.

By combining a quantitative approach with a qualitative analysis, it becomes possible to better understand the mechanisms that led to this high volatility, while nudging the interpretation of the figures. This event also highlights the importance of anticipating and managing flows during index rebalancing. Investors who had anticipated the impact of Tesla's entry were able to benefit from the rise in its share price, while those who had not anticipated it missed a significant opportunity.

March 2020: S&P 500 rebalancing cancelled

On 12 March 2020, in response to the extreme market volatility caused by the Covid-19 pandemic – with the VIX index jumping to 75.47 from 13.74 a month earlier and an average of 15.39 in 2019 – S&P decided to postpone the planned rebalancing. This decision had a significant impact on investors who based their strategies on these index adjustments.

Indeed, many investors had taken early positions on equities that were expected to enter or exit indices during the upcoming adjustments. The cancellation of these transactions forced these investors to liquidate their positions, resulting in significant losses.

Analysis of market flows during the cancellation of the S&P rebalancing shows that investors who adopted systematic strategies suffered substantial losses. On the other hand, those who have shown flexibility and adapted to market conditions have managed to limit their losses.

5 Source: Bloomberg, Tesla to Join S&P 500 Next Month as Largest-Ever New Member

Expected market flows for stocks in excess of $200 million for S&P indices

| Data	Results
Return weighted by investment flows	–5.29%
% of flow in the opposite direction to S&P decision	73.68%
% of flow in line with S&P decision	26.32%
Biggest gain	5.67%
Biggest loss	–11.88%

Source: Candriam

A long-short strategy with leverage of 1[6], investing in each relevant share in proportion to the expected flows for these securities, would have recorded a loss of 5.29%, which is significant. About 73% of flows moved in the opposite direction to the expectations that investors had held prior to the cancellation of the S&P 500 rebalancing.

Below, the distribution of returns for securities with flows above $200 million, recorded the day after the cancellation of the March 2020 rebalancing for the S&P indices, shows that some stocks suffered losses ranging from 9% to 12%.

Chart 7:

Performance breakdown of S&P securities with flows in excess of $200 million
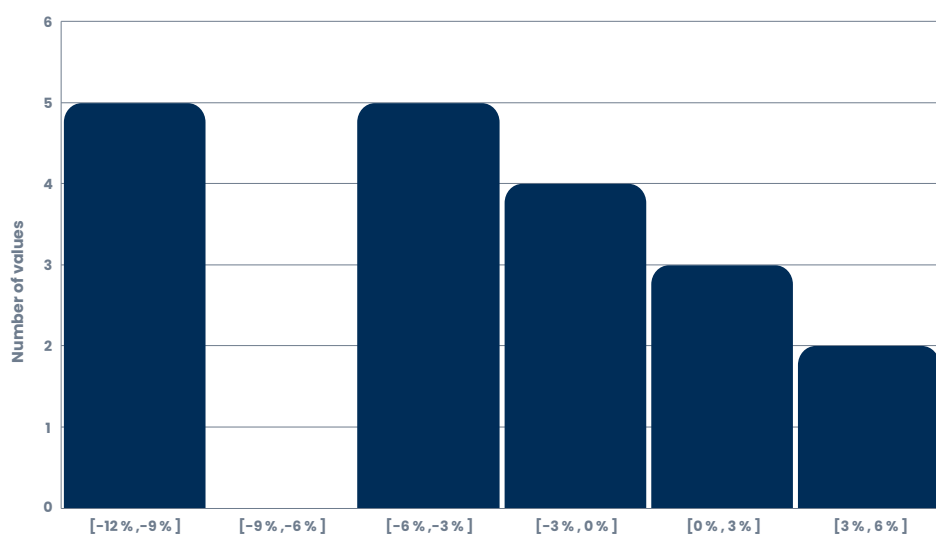
Note: performances taken for the day following the cancellation of the rebalancing
Source: Candriam

---

6 A long-short strategy with a leverage of 1 means that a manager with €100 in cash will buy a stock for €100, anticipating its rise. At the same time, he will short another stock that he does not yet own and that he will borrow for the same amount, hoping to buy it back later at a lower price and thus make a gain.

Unquantifiable elements, such as the exceptional context of the crisis, played a crucial role in S&P's decision to cancel this rebalancing. The main objective of this decision was to preserve market stability in times of high uncertainty. In the absence of rebalancing, managers had to adjust their strategies, which could lead to distortions in the composition of portfolios.

This event highlights the risks inherent in systematic investment strategies based on index rebalancing. It is essential to take market conditions into account and maintain flexibility in the management of portfolios to avoid significant losses in the event of unexpected events.

The analysis of exceptional events, such as the inclusion of Tesla in the S&P 500 and the postponement of S&P rebalancing in 2020, provides a better understanding of the complexity of market movements. It also offers a better understanding of the risks inherent in index changes, whether they are large losses or missed investment opportunities, as can be the case with systematic management.

5. Conclusion :
the importance of a combined approach, the usefulness of an experienced team

The dynamic of index rebalancings is a complex phenomenon that significantly influences financial markets, affecting both stock prices and trading volumes. These periodic adjustments in the composition of indices are essential to maintain their relevance and representativeness in the face of economic and sectoral developments.

Companies managing stock indices, by changing the weight of equities and adding or removing securities according to strict criteria, impact market volatility and can create arbitrage opportunities. The rise of passive management and its growing role in asset allocation further accentuate these effects.

To fully understand the forces at play during index recompositions and anticipate the resulting market movements, it is crucial to combine quantitative and qualitative analyses. A purely quantitative approach is not enough to comprehend the complexity of markets. The integration of an in-depth qualitative dimension makes it possible to capture the nuances and impacts of index adjustments on portfolios and investment strategies.

Due to the complexity of rebalancing, having an experienced team specialised in this type of event can also be a valuable asset. To be effective, such a team must have a diverse background and access to extensive databases to conduct the necessary research in depth.

Using a hybrid approach, investors can not only better anticipate and react to market fluctuations, but also optimise their investment strategies, limit risks and more effectively identify potential opportunities.

Candriam's approach

Candriam stands out in anticipating index rebalancing thanks to our unique approach that combines:

- **in-depth expertise:** with more than 21 years of experience, Candriam has acquired in-depth knowledge of rebalancing methodologies and factors influencing index movements.

- **integrated quantitative and fundamental analysis:** Candriam uses sophisticated quantitative models in combination with rigorous fundamental analysis to identify potential investment opportunities.

- **real-time adaptability:** Candriam constantly monitors the markets and adjusts our strategy according to economic developments and changes in index criteria.

- **culture of innovation:** Candriam is committed to remain at the forefront of research in anticipating index rebalancing, continually developing new methods and tools to optimise its performance.

€149 B
**AUM at end
June 2024***

+600
**Experienced and
committed professionals**

+ 25 years
**Leading the way in
sustainable investing**

This document is for informational and educational purposes only and may contain Candriam opinions and proprietary information. It does not constitute an offer to buy or sell financial instruments or investment advice and does not confirm any transaction, unless expressly agreed otherwise. Although Candriam carefully selects the data and sources used, errors or omissions cannot be excluded. Candriam cannot be held liable for any direct or indirect losses as a result of the use of this document. Candriam's intellectual property rights must be respected at all times; the content of this document may not be reproduced without prior written authorisation. Past performance of a given financial instrument or index or investment service, or simulations of past performance, or future performance forecasts are not reliable indicators of future performance. Gross performances may be impacted by commissions, fees and other expenses. Performances expressed in a currency other than that of the investor's country of residence are subject to exchange rate fluctuations, with a negative or positive impact on gains. If the present document refers to a specific tax treatment, such information depends on the individual situation of each investor and may change. Investors are exposed to a risk of capital loss.

*As of 31/12/2022, Candriam changed the Assets Under Management (AUM) calculation methodology, and AUM now includes certain assets, such as non-discretionary AUM, external fund selection, overlay services, including ESG screening services, [advisory consulting] services, white labeling services, and model portfolio delivery services that do not qualify as Regulatory Assets Under Management, as defined in the SEC's Form ADV. AUM is reported in USD. AUM not denominated in USD is converted at the spot rate as of 31/12/2023.