DIVERSIFICATION DASHBOARD

May 2018

Diversification Ratios®

TOBAM's Diversification Ratio® (DR) measures to what extent a portfolio is diversified.

The DR² (square of the diversification ratio) measures the number of independent sources of risk to which a portfolio is exposed.

As the table shows, the "broad market" indices do not fully utilise diversification capabilities. In addition to a snapshot of each market's DR², the table shows the DR² of a well-diversified portfolio, and the fraction of available diversification used by the index.

Universes	DR² Index diversification	DR² Maximum Diversification®	% diversification used by index
MSCI World	3.95	12.96	30.5 %
MSCI All Countries World	4.20	12.63	33.3 %
MSCI Canada	5.44	11.98	45.4 %
MSCI US Equity	3.33	9.63	34.6 %
MSCI Emerging Markets	3.99	8.97	44.4 %
MSCI Pacific Ex-Japan	3.53	8.20	43.0 %
MSCI UK Equity	3.85	6.61	58.2 %
MSCI Japan	2.75	6.52	42.1 %
MSCI EMU	2.86	6.48	44.1 %
BofA Merrill Lynch US Corporate & High Yield	4.23	6.10	69.3 %
BofA Merrill Lynch Global High Yield	6.00	7.42	80.8 %

Source: TOBAM, figures as of April 30, 2018.

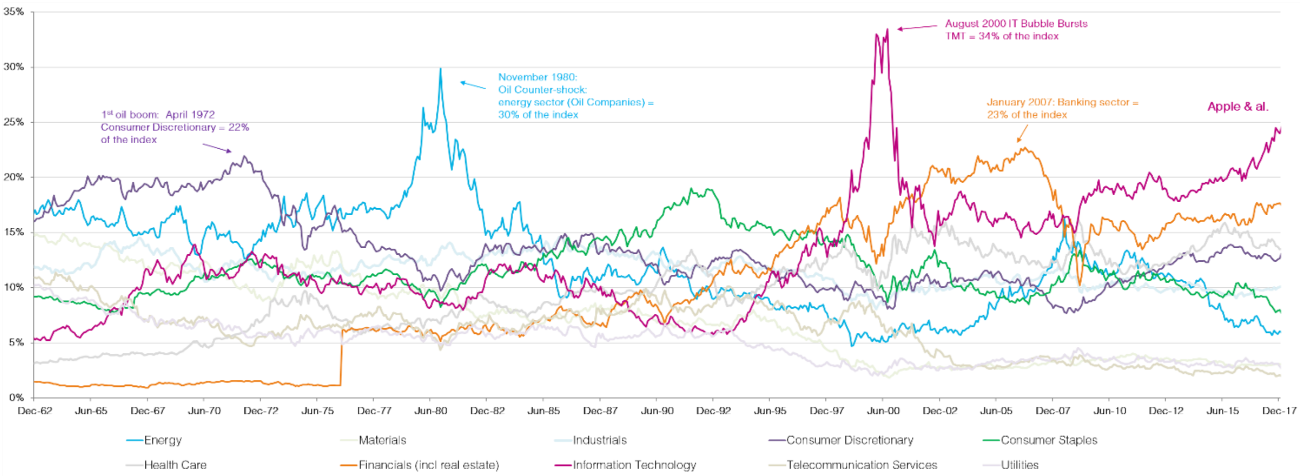
Risk Concentrations in US Equity Markets

The current market environment in US equities leads us to publish this note, which was written at the beginning of the year. The observations remain particularly relevant as we demonstrate how concentrations in US Equities, have steadily increased since mid-2016.

Introduction

Market cap-weighted indices, by construct, can take on heavy structural biases that evolve over time. This methodology makes implicit bets which will maximize an investor's allocation to a specific stock or sector at the worst possible time. Taking a closer look at the US equity market sector weights since December 1963, one can see the behaviour of these implicit bets.

Figure 1: US Equity Markets – Sector weights



Source: TOBAM calculations. Figures as of December 2017. Key Risks: The value of your investment and the income from it will vary and your initial investment is not guaranteed.

The chart above demonstrates that an investor tracking this index (i.e. a passive investment in US equities) maximises his/her allocation to any one particular stock or sector at precisely the worst possible time. For example, during the dot com bubble of the early 2000's IT stocks wound up representing more than 30% of the S&P 500 due to the hype surrounding the advent of a new technology driven era. By the end of 2002, IT tumbled and represented approximately 15% of the S&P. The same pattern can be seen leading up to the financial crises of 2007.

In the first section of this paper we present the current state of concentration in US equities, while in the second section we examine the contribution and behaviour of the mega-cap stocks which are responsible for a relatively large proportion of the performance.

1. Who Rules the Index in US Equities?
The Current State of Concentrations within the MSCI USA Index

1.1 A Sector Perspective

As shown in the sector allocation of the MSCI USA in Figure 2 (3rd column) below, nearly 24% of the index is allocated to IT, and 15% to Financials. What this shows is that, essentially, two out of eleven sectors account for close to 40% of the index, as measured by weight. By construction, market cap-weighted indices bet on past successes. The strong performance of IT and Financials over the past few months, as shown in Figure 3, has driven-up their weights in the MSCI USA[1].

Conversely, when a sector or stock does not perform well relative to other stocks & sectors in a market cap weighted index, their allocations will ultimately decline, compounding the concentrations in those which outperform.

In Figure 2 we can also see that the weighting of IT and Financials over an 18-month period from June 2016 to December 2017, has increased by 20.7% and 20.8% respectively. 7 of the 11 GICS sectors' index weighting decreased over the period, demonstrating the compounding nature of the market cap weighted methodology.

Figure 2: Variation in weights of GICS in MSCI USA
From June 30, 2016 to December 29, 2017

Sector	30/06/2016	29/12/2017	Delta Weight	Variation
Financials	12.23%	14.77%	2.54%	20.8%
Information Technology	19.85%	23.97%	4.11%	20.7%
Industrials	9.34%	9.92%	0.58%	6.2%
Materials	2.97%	3.06%	0.09%	3.0%
Consumer Discretionary	13.07%	12.67%	-0.40%	-3.1%
Health Care	14.99%	13.54%	-1.45%	-9.7%
Real Estate	3.47%	2.98%	-0.50%	-14.3%
Energy	7.16%	6.07%	-1.08%	-15.2%
Utilities	3.65%	2.89%	-0.76%	-20.8%
Consumer Staples	10.40%	8.03%	-2.37%	-22.8%
Telecommunication Services	2.86%	2.10%	-0.76%	-26.5%

Figure 3: Sector Performance MSCI USA
From June 30, 2016 to December 29, 2017

Sector	Annualized Return
Information Technology	58.0%
Financials	57.5%
Materials	34.9%
Industrials	34.6%
Consumer Discretionary	30.9%
Health Care	18.7%
Energy	9.0%
Real Estate	4.2%
Consumer Staples	8.1%
Utilities	4.9%
Telecommunication Services	-0.9%

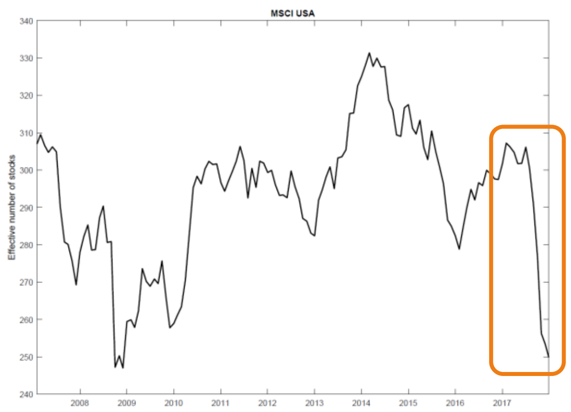
Source: TOBAM and Bloomberg. Data as of December 29, 2017.

[1] For a deeper analysis of the performance of Technology and Financial sectors please refer to the appendix.

1.2 The Effective Number of Risk Contributors

By computing the Herfindahl index, a commonly accepted measure of concentration, of the MSCI USA we are able to determine the effective number of risk contributors to the overall MSCI USA index. The higher this number will be, the greater the number of stocks/companies contributing to the overall risk of the MSCI USA will be. As Figure 4 below shows, this number as of the end December 2017 was close to the lowest levels observed since 2009. It illustrates the dangerously low levels of risk contributors to the overall MSCI USA risk.

Figure 4: Volatility weighted Herfindahl Index of MSCI USA from Dec 31, 2006 – Dec 29, 2017



- Risk concentration is reaching levels not seen since the Financial Crisis

Source: TOBAM and MSCI.

2. Beyond sectors: the mega-cap factor

2.1 Return Contribution of Top 10 Stocks in MSCI USA Index

Perhaps as interesting as an analysis of sector concentrations is a review of the top 10 stocks of the MSCI USA. From June 2016 to December 2017, the performance of the MSCI USA index can be explained by a very small group of actors. The top 10 holdings together contributed to nearly 22% of the index's return; with two sectors (IT and Financials) contributing nearly 60%.

Figure 5: Return Contributions to the MSCI USA, June 30, 2016 to December 29, 2017

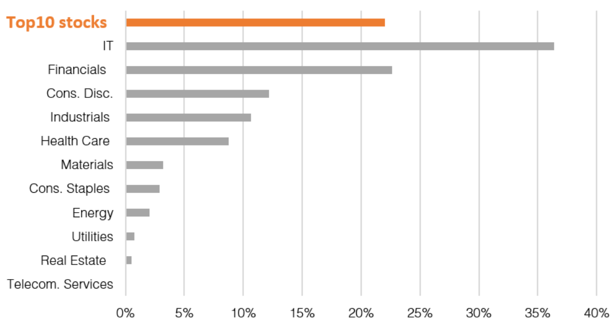


Figure 6: Top 10 market cap weighted stocks As of December 29, 2017

	Stock	Sector
1.	Apple Inc	IT
2.	Microsoft Corp	IT
3.	Amazon.Com Inc	Cons.Discretionary
4.	Facebook Inc-A	IT
5.	JPMorgan Chase & Co	Financials
6.	Johnson & Johnson	Healthcare
7.	Exxon Mobil Corp	Energy
8.	Alphabet Inc-Cl C	IT
9.	Alphabet Inc-Cl A	IT
10.	Bank Of America Corp	Financials

Source: TOBAM and MSCI.

This phenomenon can be attributed to what has commonly been referred to as the "FAANG" stocks - a group of mega-cap stocks that have delivered significant relative outperformance versus the rest of the benchmark's 622 constituents. 7 of the top 10 holdings in terms of market-cap weighting (8 if we include Amazon), are made up of predominantly IT and Financials.

These mega-cap stocks represent implicit bets of the benchmark, meaning that when one invests in the MSCI USA index, it is based on the expectations that these stocks will continue their out-performance streak and thus help to further concentrate the index.

2.2 Correlation Analysis: Top 10 holdings of the MSCI USA Index

To qualify the degree of risk concentrations of the US equity market top-10 holdings, we look at the rolling pair-wise average correlation of the top 10 holdings and compare them to the full universe of the MSCI USA. By placing the behaviour of the top ten holdings within a historical context to the rest of the market we are able to determine if such a pattern has previously occurred.

Figure 7: Volatility-weighted average pair-wise correlation of top 10 holdings and entire universe of MSCI USA

Figure 8: Rolling difference between “Top10” and “All Universe” pair-wise correlation in Figure 8

Source: TOBAM and MSCI. Data from December 1999 to December 2017.
The pair-wise correlation is a measure of the 1-year rolling correlation between any two stocks of the universe.
The figure above plots for each date the average of all the pair-wise correlations for each respective universe (top 10 and MSCI USA).

Looking at the two charts above, there is a clear divergence in trends between the two series of average pair-wise correlations. When framed in a historical context this trend is not consistent. Notice the average pair-wise correlation of the MSCI USA, which is currently trending down, compared to the upward trending average pair -wise correlation of the top 10 holdings of the index.

The divergence highlighted in Figure 7 is placed within a historical context in Figure 8 showing that the difference in correlation levels has reached historical peaks not seen since December 31, 1999. This illustrates how the MSCI top 10 holdings, currently behave differently than the rest of the market in an unprecedented manner when compared to the last18 years.

Conclusion

In this Dashboard we discussed the increasing sector concentrations in US Equities after an 18-month period of IT and Financial sector outperformance, which, combined, made up a massive 60% of the index returns. In addition to this, the top 10 holdings, from an index comprised of 622 constituents, contributed to 22% of returns.

Notably, the behaviour of Mega-cap & FAANG stocks is different from anything observed in recent history. The pattern of correlation is different from what has been observed in the past twenty plus years in US equities. Recent events such as the correction of Facebook in March 2018 can be interpreted as a warning and a reminder of the need to diversify.

It could also serve as a reminder to always look at the risk concentration in portfolios. **As evidenced through this short note and various studies we have published[2], there is a marked difference between being passive (or very close to passive) and being neutral.** It is not fully certain that all investors in passive strategies are aware of the actual risk exposure of their portfolio.

Risk concentrations are a source of concern as history has repeatedly demonstrated that excessive concentrations are eventually corrected. Risk concentrations challenge the most fundamental rule of portfolio management: diversification.

[2] *"An oxymoron gone too far: why passive management isn't suitable as a core investment" - March 2015*
"Active managers can't beat a benchmark, they are the benchmark" – Financial Times January 2016
"Debunking some of the biggest investment myths" – July 2017

Appendix – Focus on IT & Financial Sectors Performance

Here we analyse the 18-month absolute and relative returns of MSCI USA IT and MSCI USA Financials indices to frame the current performance within a historical context.

3.1 Information Technology

The 18-month absolute return level for US IT stocks, above 60%, is reaching record highs which previously were reached on three occasions over a 17-year period (the IT bubble in 2000's, 2004 & 2010). The same pattern can be observed on a relative basis in Figure 10.

Figure 9: 18-month rolling absolute return of MSCI USA IT MSCI USA
(Jun 30, 2000 – Dec 29, 2017)

Figure 10: 18-month relative return of MSCI USA IT vs.

Source: TOBAM and MSCI.

3.2 Financials

Similar patterns can be observed in US Financials. Aside from the re-bound of Financials after the Global Financial Crisis in 2010, current levels of absolute return have reached historical peaks.

Figure 11: 18-month rolling absolute return (MSCI USA Financials)
(Jun 30, 2000 – Dec 29, 2017)

Figure 12: 18-month relative return
(MSCI USA Financials vs. MSCI USA)

Source: TOBAM and MSCI.

For more information

TOBAM is an asset management company offering innovative investment capabilities designed to increase diversification. Its mission is to provide rational and professional solutions to long term investors in the context of efficient markets.

The Maximum Diversification® approach, TOBAM's flagship investment process founded in 2006, is supported by original, patented research and a mathematical definition of diversification and provides clients with diversified core exposure, in both the equity and fixed income markets.

In line with its mission statement and commitment to diversification, TOBAM also launched a separate activity on cryptocurrencies in 2017.
Diversification is our only bet.

TOBAM currently manages US$10 billion (at March 29, 2017). TOBAM's team is composed of 51 professionals.

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