XU100 Seasonality
April 26, 2023

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XU100 seasonality: sell in May, go away

Historical data between 2000-2022 suggest that May is the least profitable month, up only 35% of the time, with an average return of -2.90% followed by February with an average return of -1.80%.

April is the strongest month

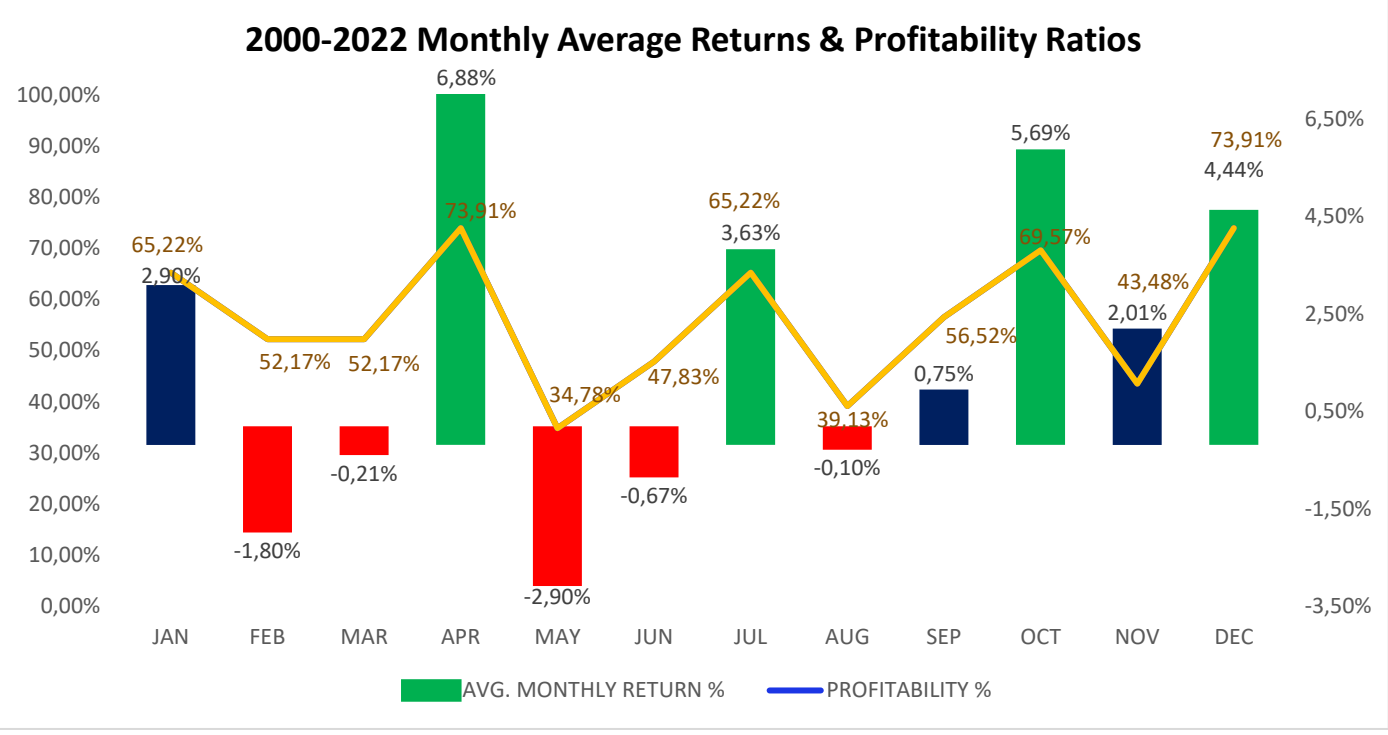
April has the strongest seasonality, as the most profitable month with the highest average rate of return. The XU100 index is up 74% of the time in April and December with average returns of 6.88% and 4.44%. October is the second-best month, up 70% of the time with an average return of 5.7%. July stands in third rank, up 65% of the time, with an average return of 3.6%. November is a "month on the rise" in terms of seasonality, even though it is not among the strongest yet, data indicates increasing YoY returns in the last 4 years *(see November Cumulative Return Graph, page 7)*.

Ranking by chance of profit

Historical data suggests that December has better seasonality and chance of profit compared to October, which is the 2nd best month in terms of monthly average returns. December is up 74% of the time as well as April, whereas October is up 70% of the time.

Months to avoid

With the lowest chance of profit of 35% and average return rate of -2.9%, May has the weakest seasonality and therefore is the least profitable month. August stands in second place, up only 39% of the time. February is stronger in terms of chance of profit, up 52% of the time, however, stands in 2nd place in terms of weakest return rate, with an average return of -1.8%. June is also a month to avoid due to its low performing nature, with a negative average monthly return of -2.9%.



In this chart, the columns represent the average return of each single month between 2000-2022. The yellow line represents the likelihood of resulting in a positive return for each month.

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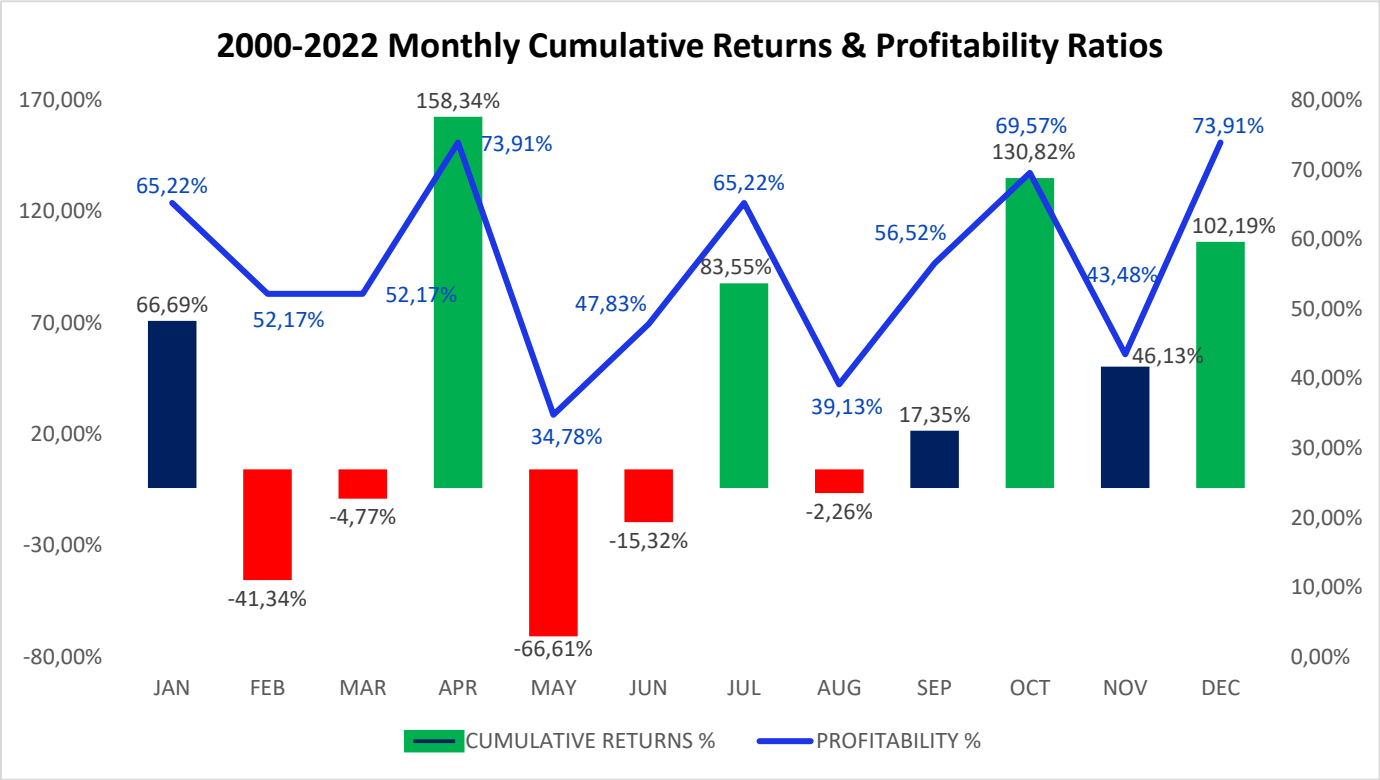
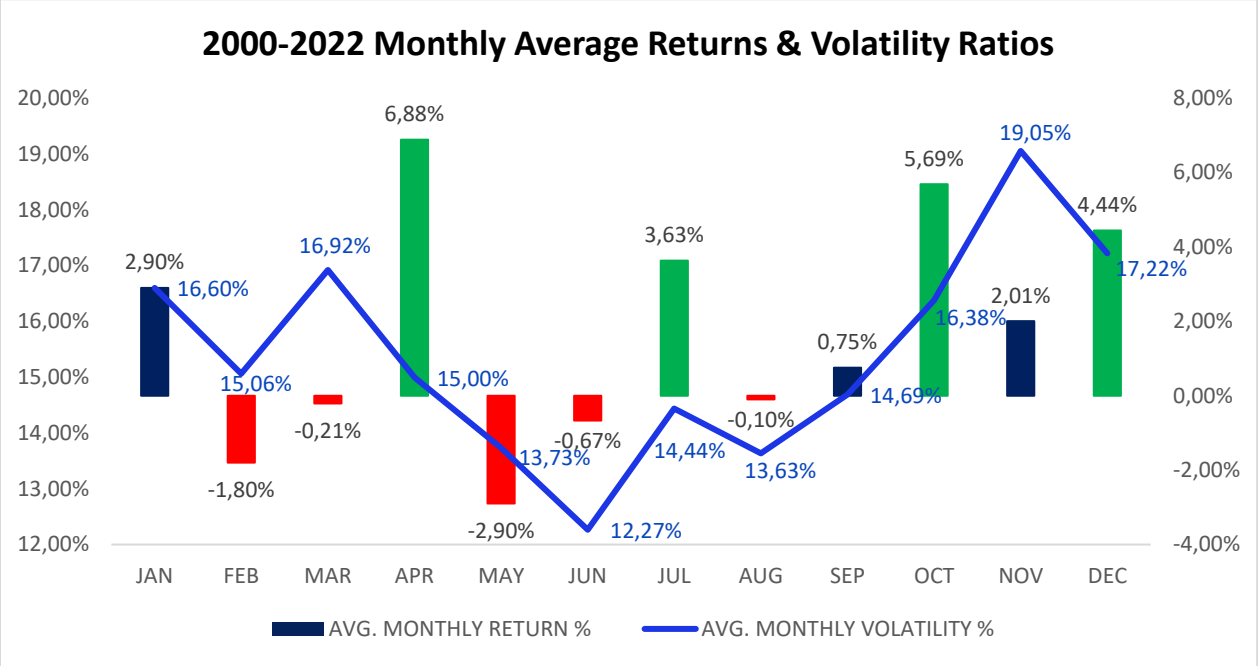


In this chart, the columns represent the cumulative returns of each single month from 2000 to 2022, meaning the return an investor would have achieved if they held their XU100 securities only during the given month for 23 years. The blue line represents the likelihood of resulting with a positive return for each month.

The chart above presents the relationship between the YoY cumulative returns of each month and their seasonality. YoY cumulative returns per month are also in line with the results derived from monthly average returns and profitability ratios. Historical data suggests that April has the strongest YoY cumulative return with a rate of 158%, meaning that if an investor held their XU100 securities only in April between the years 2000 to 2022, their cumulative return would have resulted as 158%, which additionally supports the seasonality data, with a profitability ratio of 74%, mentioned above in chart 1. The 2nd best month in terms of cumulative return is October, with a rate of 130.8% and up 70% of the time. December stands in 3rd place with a cumulative return rate of 102.2%, up 74% at the time. Although in terms of profitability ratios and seasonality December outperforms October and stands in 2nd place, cumulative return results are in line with the monthly average return rankings and places December as the 2nd strongest month. A better way to explain this data would be, even though there is a higher chance of profitability during December, investors who held their XU100 securities only during October between the years 2000 to 2022, out earned those who held during December, by 28.6%. May still is the least profitable month with a cumulative return of -66.6%, meaning that even though it has a profitability chance of around 35%, which results as the weakest seasonality, it also presents the biggest loss among the months of weak seasonality and supports the fact that May is the no.1 month to avoid.

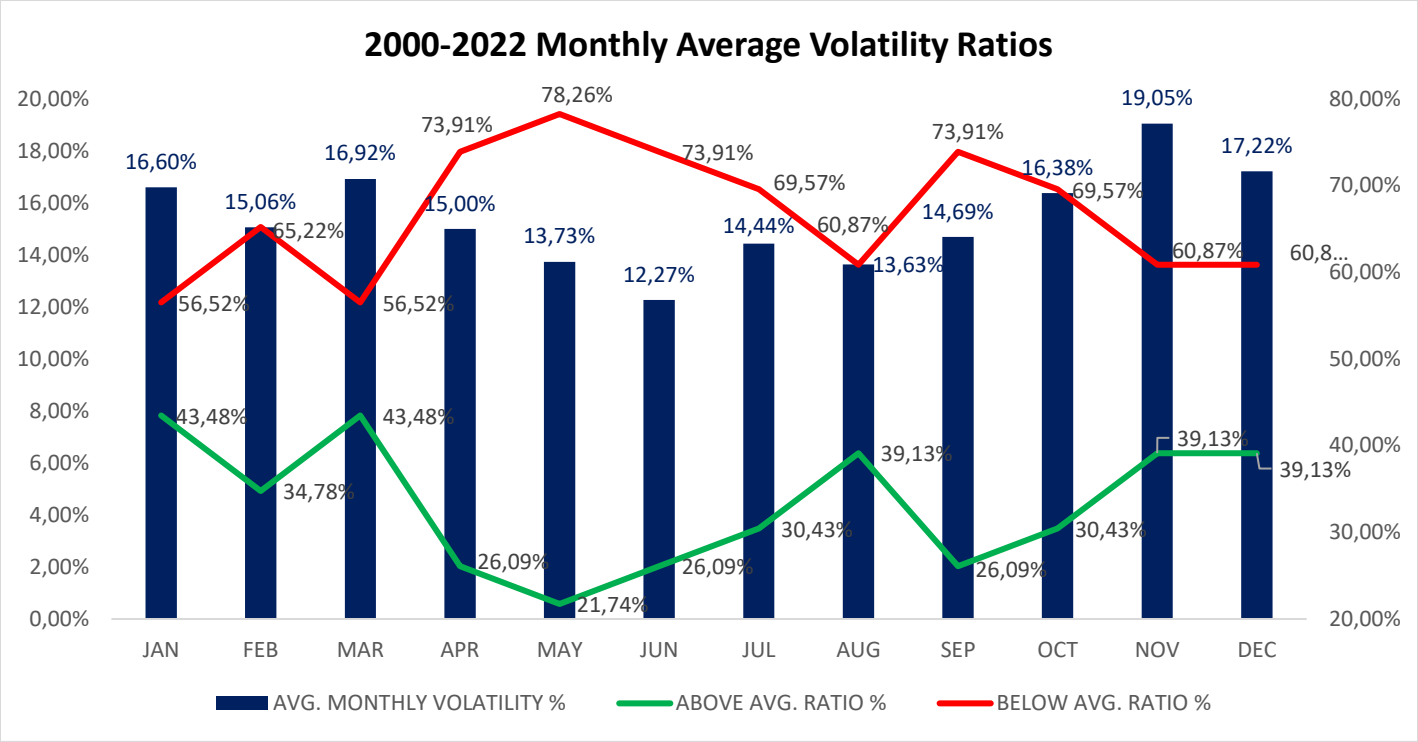
Criteria	***JAN***	***FEB***	***MAR***	***APR***	***MAY***	***JUN***	***JUL***	***AUG***	***SEP***	***OCT***	***NOV***	***DEC***
total # of years	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*
# of profitable months	*15*	*12*	*12*	*17*	*8*	*11*	*15*	*9*	*13*	*16*	*10*	*17*
# of unprofitable months	*8*	*11*	*11*	*6*	*15*	*12*	*8*	*14*	*10*	*7*	*13*	*6*
Chance of Profit %	*65,22%*	*52,17%*	*52,17%*	*73,91%*	*34,78%*	*47,83%*	*65,22%*	*39,13%*	*56,52%*	*69,57%*	*43,48%*	*73,91%*
Chance of Loss %	*34,78%*	*47,83%*	*47,83%*	*26,09%*	*65,22%*	*52,17%*	*34,78%*	*60,87%*	*43,48%*	*30,43%*	*56,52%*	*26,09%*
Avg. Monthly Return %	*2,90%*	*-1,80%*	*-0,21%*	*6,88%*	*-2,90%*	*-0,67%*	*3,63%*	*-0,10%*	*0,75%*	*5,69%*	*2,01%*	*4,44%*
Cumulative Return %	*66,69%*	*-41,34%*	*-4,77%*	*158,34%*	*-66,61%*	*-15,32%*	*83,55%*	*-2,26%*	*17,35%*	*130,82%*	*46,13%*	*102,2%*



In this chart, the columns represent the average return of each single month between 2000-2022. The blue line represents the average volatility of each month between the years 2000 and 2022.

The above chart displays the relationship between the average returns and average volatility ratios of each month of the years between 2000 to 2022. Historical data suggests that there is neither a positive nor negative solid relationship between the seasonality and volatility of the months, but certain results can still be pointed out. The gap between the highest and lowest average monthly volatility is fairly close, standing between 19% and 12.3%. Although there isn't a solid relationship between the elements presented in the chart, during April, which has the strongest seasonality with an average return rate of 6.9%, the average volatility of the month, 15%, is pretty close to the average yearly volatility of 15.4% *(see in the table below)*. Looking at the monthly volatility heat map in page 5, this low rate of average volatility during the months of April is due to the fact that majority of the monthly volatilities is fairly low and below average meaning that even though April is the strongest month in terms of seasonality and rate of returns, the historical data suggests that there aren't many chances of entry and if an investor were to take advantage of the high performing month, they would need to be cautious to not miss the train. The highest monthly average volatility belongs to November with a rate of 19% and even though it does not stand between the months of strongest seasonality, November could still be a good option for those who are seeking to trade in the short term. Secondly, the 2nd highest average volatility belongs to December, which is the 2nd strongest month in terms of seasonality. This means there could be multiple entry and exit points throughout the month and could potentially be a better option for investors who are looking to trade compared to November due to its high performing nature. Lastly for May, which is the least profitable month and has the weakest seasonality with an average return of -2.9%, the month's average volatility of 13.7%, with majority of the Mays between the years 2000 and 2022 standing below average *(see volatility heat map in page 5)*, is among the lowest volatile months of the year. This suggests that investors may not find multiple chances of exit and holding to XU100 securities during this month could propose risks to those who are seeking to avoid losses.

Criteria	***JAN***	***FEB***	***MAR***	***APR***	***MAY***	***JUN***	***JUL***	***AUG***	***SEP***	***OCT***	***NOV***	***DEC***
total # of years	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*	*23*
# of above avg. Volatility months	*10*	*8*	*10*	*6*	*5*	*6*	*7*	*9*	*6*	*7*	*9*	*9*
# of below avg. Volatility months	*13*	*15*	*13*	*17*	*18*	*17*	*16*	*14*	*17*	*16*	*14*	*14*
Avg. Monthly Volatility %	*16,6%*	*15,1%*	*16,9%*	*15,0%*	*13,7%*	*12,3%*	*14,4%*	*13,6%*	*14,7%*	*16,4%*	*19,0%*	*17,2%*
2000-2022 Total Avg. Volatility %	*15,41%*	*15,41%*	*15,41%*	*15,41%*	*15,41%*	*15,41%*	*15,41%*	*15,41%*	*15,41%*	*15,41%*	*15,41%*	*15,41%*
Above Avg. Ratio %	*43,5%*	*34,8%*	*43,5%*	*26,1%*	*21,7%*	*26,1%*	*30,4%*	*39,1%*	*26,1%*	*30,4%*	*39,1%*	*39,1%*
Below Avg. Ratio %	*56,5%*	*65,2%*	*56,5%*	*73,9%*	*78,3%*	*73,9%*	*69,6%*	*60,9%*	*73,9%*	*69,6%*	*60,9%*	*60,9%*



In this chart the blue columns represent the average volatility of each month between the years 2000 and 2022. The total historical average volatility rate between 2000-2022 is 15.41%. The green lines indicate how many times the current volatility of each month of each year surpasses the historical average volatility rate within the given period. The red lines indicate how many times the current volatility of each month of each year stays under the historical average volatility rate within the given period.

The chart above demonstrates the relationship between the monthly average volatilities between 2000-2022 and historical average volatility, which is a rate of 15.4% *(see in the table above, page 3)*. The green and red lines display the ratios of monthly average volatilities to the historical average volatility, as above and below. The first factor that could be pointed out from this chart is that most of the time, monthly volatilities stand below average. This tells us that the months with relatively high volatilities are the main driver of increasing the average volatilities. For instance, the highest average volatility belongs to the month of November with a rate of 19% which is approximately 3.6 p.p. greater than the average historical volatility of 15.4%, but even though November holds the highest average monthly volatility, data suggests that it only beats the historical average 39% of the time. This means that although monthly average volatilities could be a reliable source for those looking to trade, the chances of each month beating the average historical volatility rate are pretty low and most of the time monthly volatilities stay below average. The highest chance of beating historical average volatility belongs to March, above average 43.5% of the time, with the 3rd highest average volatility rate of 16.92% which could evidently be a better option for traders. May has the least likelihood of beating historical average volatility, above only 21.7% of the time with the 2nd lowest monthly average volatility rate of 12.3%. This also supports the fact that investors holding XU100 securities may face difficulties in finding exit points and risks in price actions throughout the month.

2000-2022 Monthly Return Heat Map

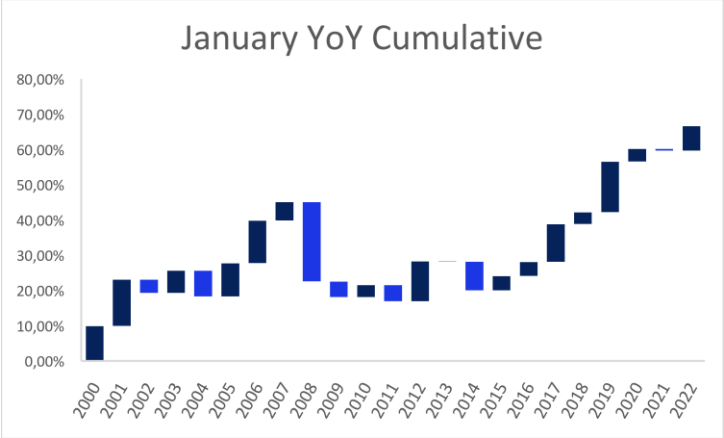
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2000	9,90%	-4,60%	-0,16%	20,64%	-15,62%	-10,74%	-4,12%	-5,32%	-13,57%	19,28%	-35,38%	7,88%
2001	13,22%	-17,72%	-8,75%	54,14%	-12,02%	2,98%	-11,50%	-0,36%	-22,81%	29,15%	18,12%	18,47%
2002	-3,85%	-16,57%	5,63%	-2,03%	-8,98%	-9,93%	9,13%	-6,73%	-7,38%	15,95%	29,73%	-22,03%
2003	6,38%	4,91%	-18,14%	21,40%	-1,12%	-4,37%	-2,87%	9,84%	12,44%	20,66%	-7,40%	27,41%
2004	-7,33%	8,91%	6,89%	-10,74%	-5,61%	4,88%	7,43%	4,32%	8,59%	4,18%	-1,80%	11,06%
2005	9,44%	3,90%	-9,99%	-7,72%	6,97%	6,82%	9,90%	4,37%	7,85%	-4,11%	19,16%	4,43%
2006	12,10%	5,44%	-8,73%	2,21%	-13,10%	-7,00%	1,73%	3,45%	-0,97%	9,90%	-5,95%	2,48%
2007	5,29%	0,53%	6,12%	3,79%	5,95%	0,31%	12,51%	-0,85%	7,40%	6,69%	-6,78%	2,63%
2008	-22,59%	2,79%	-10,64%	11,98%	-7,30%	-12,10%	20,99%	-4,94%	-8,46%	-18,01%	-8,59%	4,79%
2009	-4,47%	-6,00%	8,81%	23,56%	9,40%	3,20%	15,70%	8,21%	2,03%	-2,16%	-2,93%	16,85%
2010	3,47%	-9,18%	12,00%	3,76%	-7,50%	1,18%	10,38%	-0,60%	9,44%	4,56%	-5,89%	0,68%
2011	-4,65%	-3,96%	4,73%	7,67%	-9,44%	0,54%	-1,67%	-14,01%	9,35%	-4,83%	-1,34%	-5,78%
2012	11,41%	6,38%	3,35%	-4,13%	-8,13%	13,46%	3,13%	4,92%	-1,35%	9,44%	0,67%	6,95%
2013	-0,09%	0,36%	8,29%	0,27%	-0,31%	-5,18%	-3,99%	-10,59%	10,44%	3,47%	-2,77%	-10,67%
2014	-8,18%	0,62%	13,11%	5,76%	6,46%	-1,46%	4,61%	-2,50%	-6,86%	7,44%	6,97%	-0,57%
2015	4,09%	-5,61%	-4,22%	3,52%	-1,07%	-0,63%	-3,07%	-5,85%	-0,85%	6,41%	-10,07%	-4,66%
2016	3,97%	3,15%	9,64%	2,82%	-8,73%	-1,41%	-2,30%	-0,34%	0,38%	2,10%	-6,10%	5,51%
2017	10,77%	1,26%	1,40%	6,33%	2,68%	2,64%	6,85%	1,97%	-6,74%	7,00%	-5,91%	10,99%
2018	3,28%	-0,89%	-3,12%	-9,49%	-3,97%	-4,16%	0,89%	-4,53%	8,31%	-9,87%	5,72%	-5,29%
2019	14,38%	0,45%	-10,42%	1,61%	-5,37%	6,81%	3,47%	-4,56%	8,57%	-6,46%	8,32%	6,59%
2020	3,69%	-11,26%	-17,29%	14,53%	5,25%	9,43%	-3,82%	-5,42%	5,88%	-3,28%	14,63%	13,40%
2021	-0,59%	-0,91%	-6,71%	-0,11%	1,45%	-4,78%	2,56%	5,30%	-4,69%	8,80%	18,88%	1,90%
2022	7,05%	-3,37%	13,42%	8,57%	3,51%	-5,83%	7,63%	21,96%	0,37%	24,51%	24,83%	9,17%

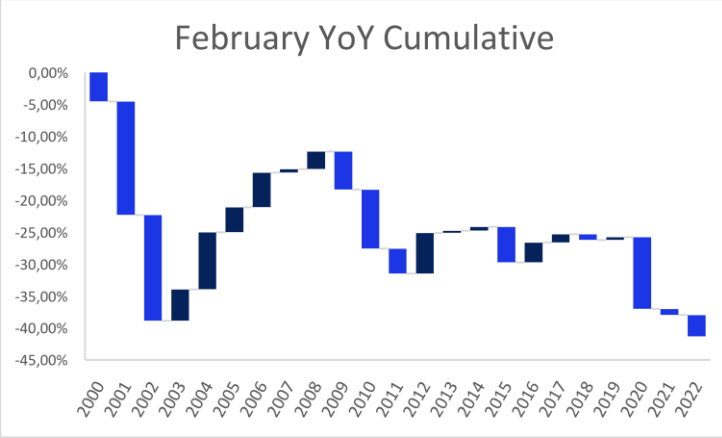
2000-2022 Monthly Volatility Heat Map

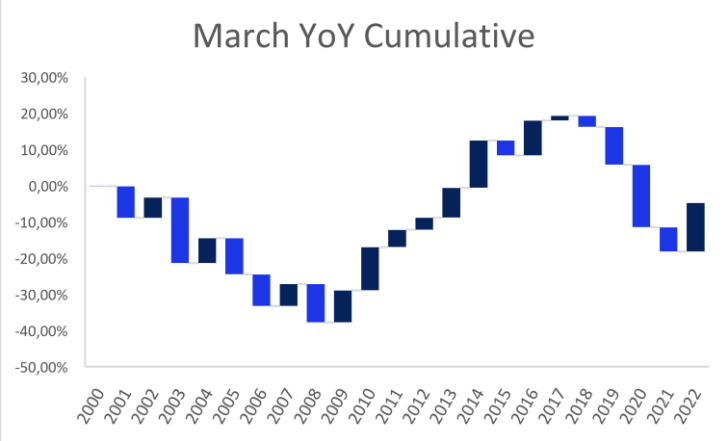
**The months that are below the average historical volatility rate (15.41%) are marked red.*

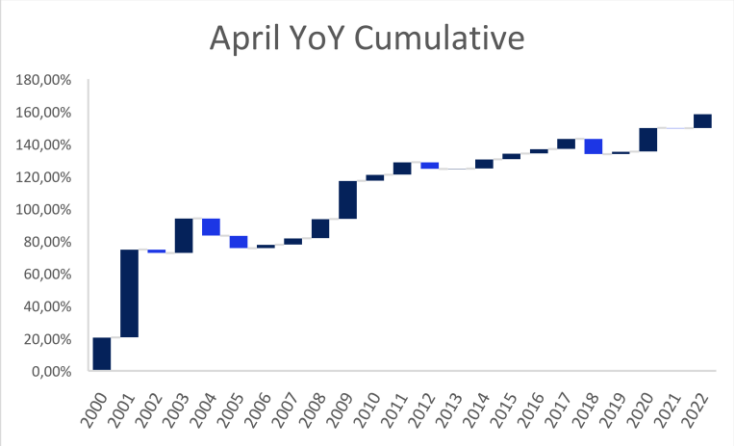
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2000	37,12%	31,93%	21,95%	26,80%	30,02%	20,67%	20,38%	15,89%	29,09%	26,35%	71,60%	51,65%
2001	28,18%	60,34%	37,54%	70,18%	32,88%	16,36%	38,27%	20,37%	44,35%	38,54%	30,01%	25,48%
2002	24,87%	25,98%	16,55%	13,36%	21,10%	24,31%	26,90%	20,39%	11,23%	22,28%	43,45%	34,05%
2003	14,14%	16,10%	31,64%	22,60%	14,29%	11,90%	7,97%	14,79%	23,35%	26,41%	13,16%	27,98%
2004	18,88%	20,31%	14,13%	17,97%	16,26%	8,53%	8,30%	8,83%	12,96%	8,44%	7,96%	12,92%
2005	14,13%	7,60%	18,95%	14,60%	8,66%	9,32%	10,43%	11,65%	10,05%	16,90%	19,48%	7,35%
2006	17,96%	12,22%	18,07%	9,61%	27,80%	25,20%	15,01%	10,36%	7,55%	12,88%	9,74%	7,93%
2007	16,98%	10,25%	13,10%	12,65%	8,43%	8,22%	20,02%	21,02%	13,75%	13,00%	15,33%	6,96%
2008	31,37%	14,26%	16,91%	14,38%	12,30%	17,06%	32,59%	11,24%	32,00%	47,38%	40,59%	17,98%
2009	19,55%	17,15%	14,09%	24,50%	12,54%	13,39%	20,31%	13,66%	11,01%	12,33%	10,00%	18,00%
2010	6,68%	15,92%	14,94%	5,43%	13,99%	8,61%	13,06%	5,44%	11,06%	10,92%	12,27%	9,75%
2011	12,54%	9,61%	12,23%	8,71%	15,04%	7,75%	10,22%	29,22%	14,54%	8,63%	16,68%	9,67%
2012	18,69%	8,23%	7,24%	7,39%	11,70%	15,04%	7,81%	6,49%	3,70%	10,76%	5,01%	8,14%
2013	10,35%	7,39%	9,35%	5,45%	10,05%	17,30%	10,30%	19,17%	21,68%	9,01%	9,98%	24,61%
2014	13,51%	8,33%	15,20%	7,03%	7,50%	5,77%	10,91%	8,42%	11,89%	11,75%	12,85%	10,36%
2015	8,08%	8,52%	10,48%	7,57%	8,44%	12,30%	9,02%	14,49%	7,23%	9,81%	12,74%	12,39%
2016	7,73%	9,48%	10,42%	7,48%	11,89%	7,30%	17,61%	7,05%	5,75%	4,98%	7,23%	9,16%
2017	14,62%	4,17%	4,40%	8,18%	6,23%	4,19%	8,51%	5,33%	9,36%	11,02%	13,40%	12,36%
2018	9,38%	7,46%	5,02%	11,29%	8,87%	9,21%	14,33%	16,64%	10,34%	13,64%	7,04%	8,39%
2019	21,20%	4,52%	17,02%	8,00%	14,98%	7,60%	8,19%	8,30%	9,40%	13,18%	10,71%	8,07%
2020	12,45%	24,68%	38,04%	16,43%	8,83%	9,98%	7,57%	16,02%	7,73%	11,61%	20,93%	15,28%
2021	10,53%	9,18%	26,52%	10,44%	5,22%	8,68%	4,35%	5,75%	7,92%	11,16%	22,98%	39,42%
2022	12,77%	12,80%	15,34%	14,88%	8,84%	13,39%	9,94%	23,02%	21,87%	25,65%	25,11%	18,07%

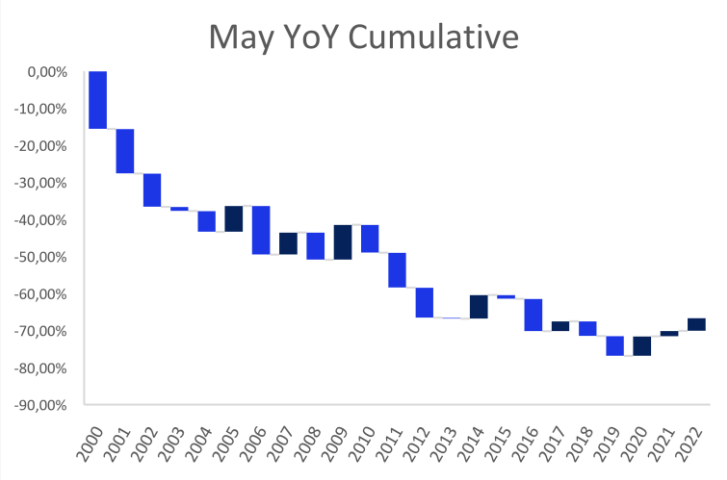
2000-2022 Monthly Cumulative Returns

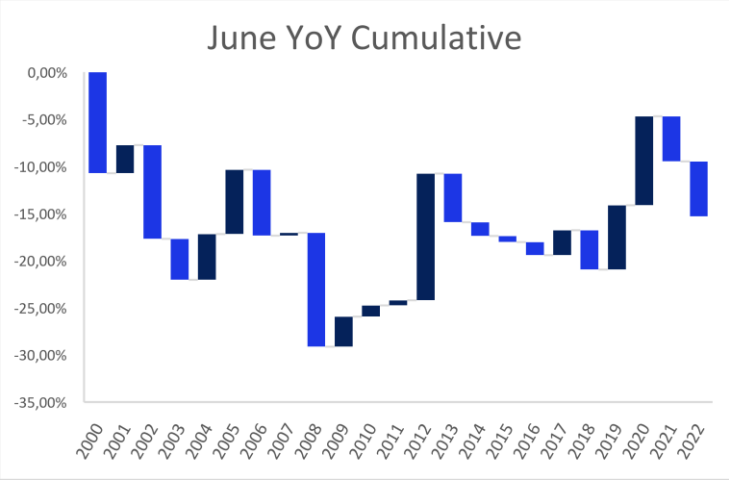


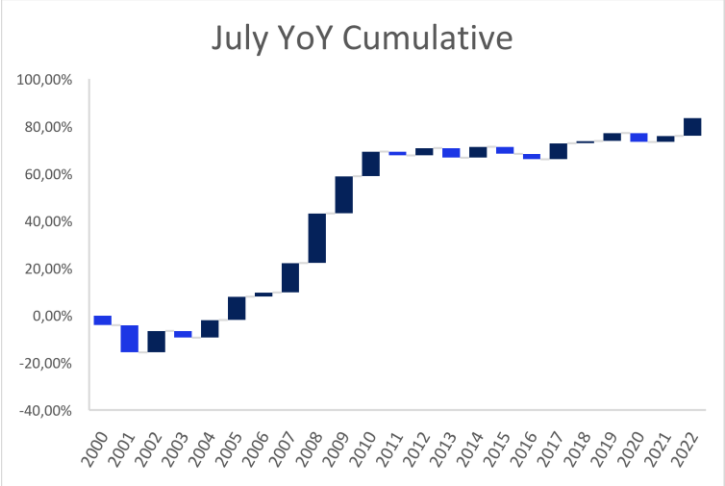


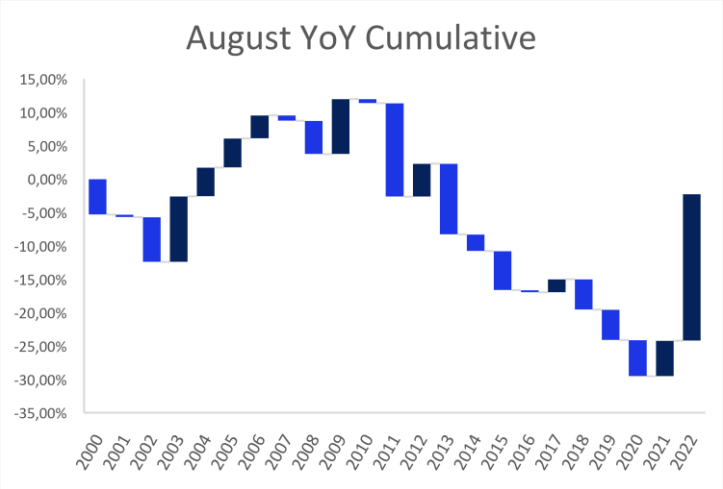


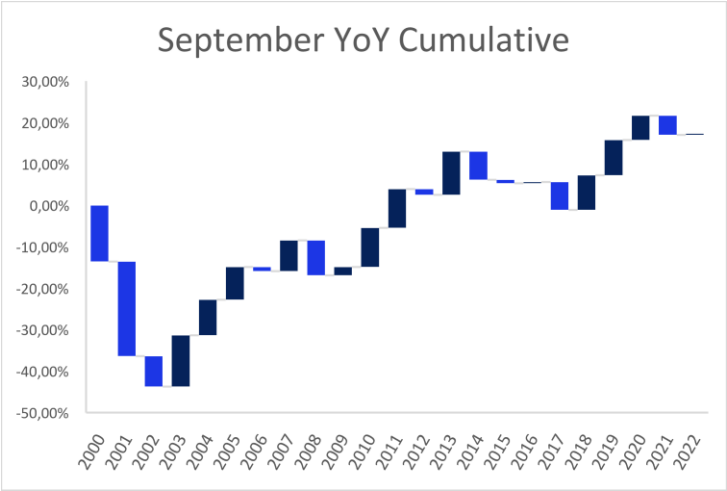


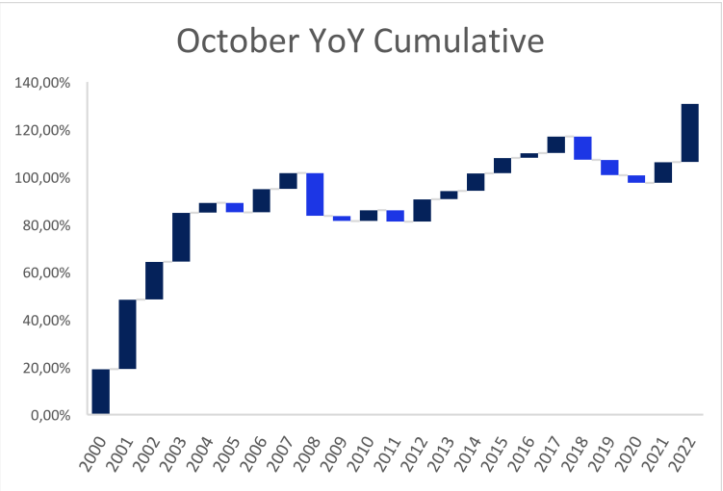


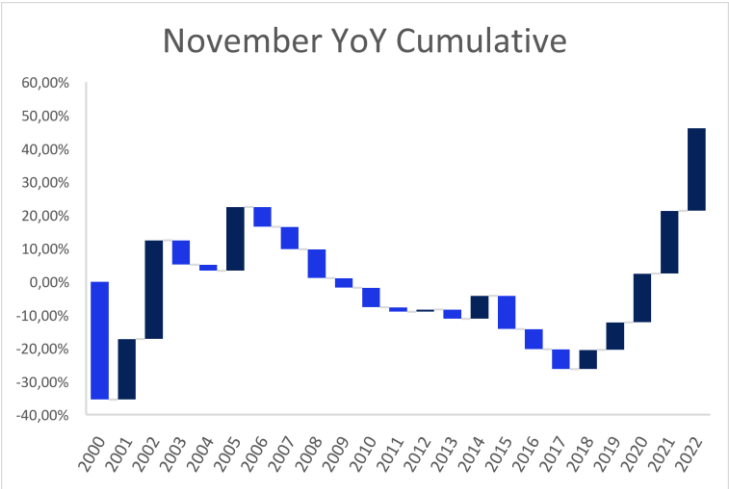


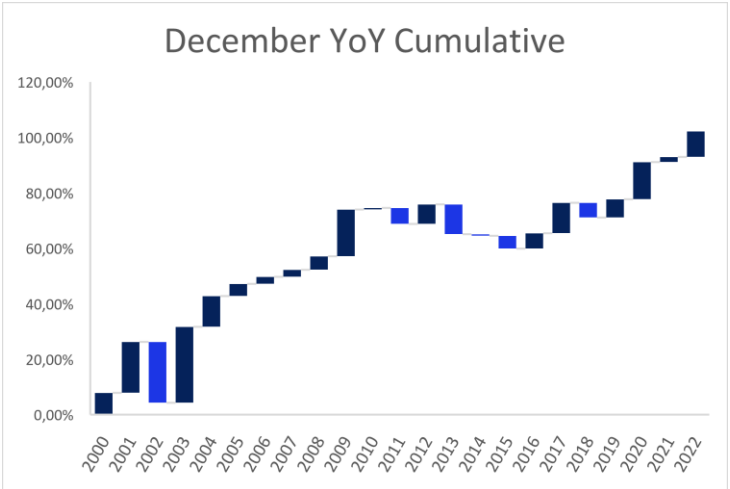

July YoY Cumulative
100,00%
80,00%
60,00%
40,00%
20,00%
0,00%
-20,00%
-40,00%
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022


August YoY Cumulative
15,00%
10,00%
5,00%
0,00%
-5,00%
-10,00%
-15,00%
-20,00%
-25,00%
-30,00%
-35,00%
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022


September YoY Cumulative
30,00%
20,00%
10,00%
0,00%
-10,00%
-20,00%
-30,00%
-40,00%
-50,00%
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022


October YoY Cumulative
140,00%
120,00%
100,00%
80,00%
60,00%
40,00%
20,00%
0,00%
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022


November YoY Cumulative
60,00%
50,00%
40,00%
30,00%
20,00%
10,00%
0,00%
-10,00%
-20,00%
-30,00%
-40,00%
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022


December YoY Cumulative
120,00%
100,00%
80,00%
60,00%
40,00%
20,00%
0,00%
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022

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