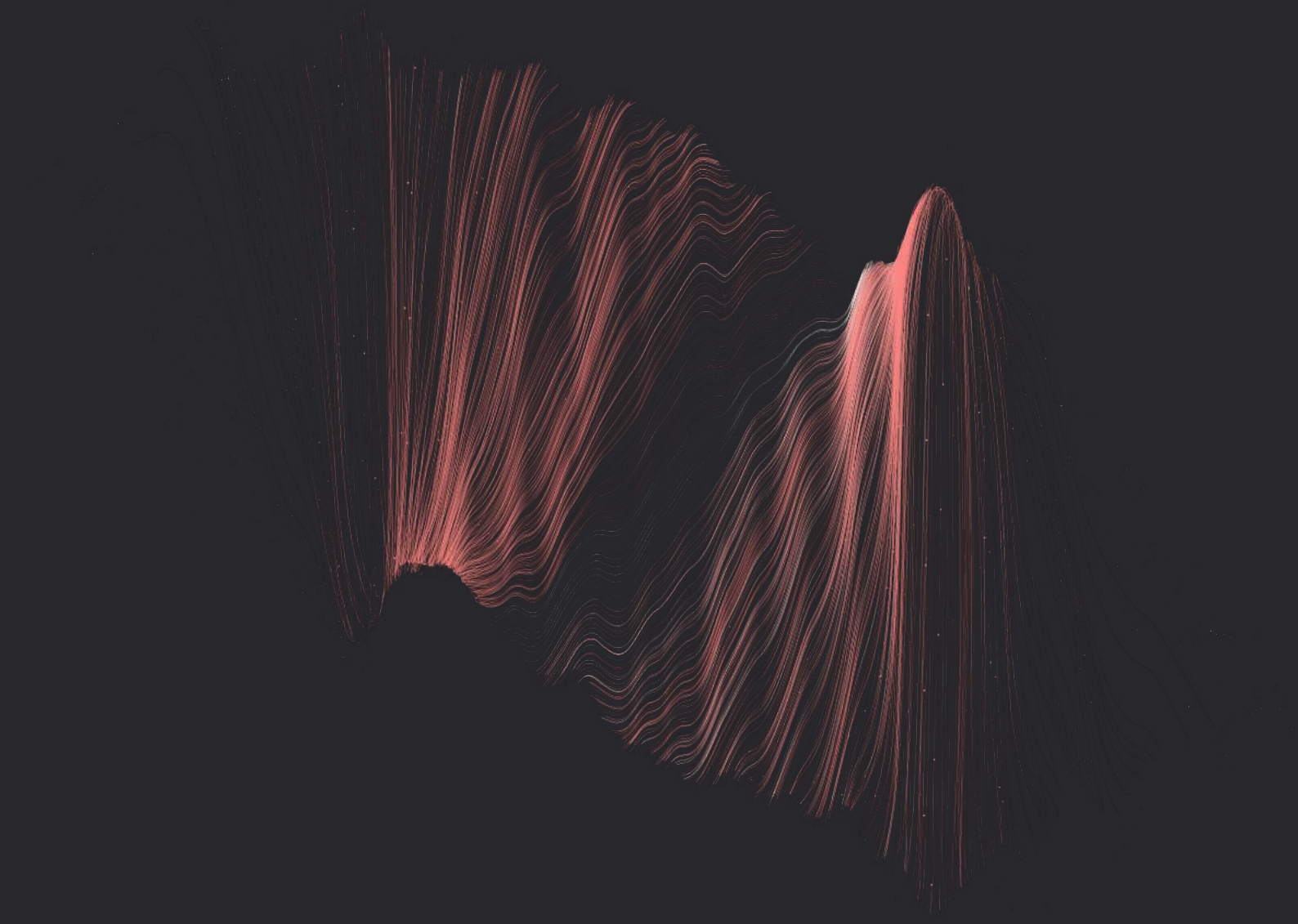
ttmzero
Capital Markets Digitization

Barrier-Hit-Risk Report 2020 – 1st Half Year

DAX Bonus Certificates



01 Highlights

For Bonus Certificates, a barrier hit event has a significant effect on investment performance. In order to aid investors in better quantifying the probability of a barrier breach, TTMzero computes the Barrier-Hit-Risk (BHR) key figures, taking into account the most important factors which are time to maturity, distance to the barrier (buffer) and implied volatility.

TTMzero analyzed the barrier hit events for about 88,000 DAX Bonus Certificates listed at Börse Stuttgart in the 1st half year of 2020.

- For the whole full year of 2019, only 11.6% of DAX Bonus Certificates suffered a barrier hit event.
- In 2020, over 50% of all DAX bonus certificates suffered a barrier breach in Q1. This rate in Q2 reduced substantially to a little less than 13%, thanks to the upturn in the DAX® movement during Q2.
- The BHR key figure is made available to professional market participants in real-time via an API that is maintained by Börse Stuttgart in cooperation with TTMzero.
- Private investors can obtain the current BHR of Bonus Certificates across all categories at https://tools.ttmzero.com/bhr or on the websites of some issuers (ie. https://de.citifirst.com/).

02 Subject of examination

- TTMzero analyzed 87,899 DAX bonus certificates for the first half year of 2020, of which 51,549 were available during Q1 and 51,165 were available during Q2. Only those bonus certificates which had at least one day of intact barrier during the respective quarter were analyzed.
- The considered DAX Bonus certificates are all listed at Börse Stuttgart.

03 Analysis period and Methodology

For each bonus certificate, the performance of the certificate was compared with the performance of the DAX® index in the respective quarter. The individual observation period for a certificate starts with the first trading day of the certificate in the respective quarter and ends with the last trading day of the certificate in the same quarter. The following assumptions apply:

Assumptions calculating the performance of the certificates

- ✓ The entry price is defined as the first ask price on the first trading day of the certificate in the respective quarter. For certificates issued after 1 January 2020, the first price on the first trading day is defined as the entry price.
- ✓ The last bid price on the last trading day in the respective quarter is defined as the exit price. If the certificate matures during this period, the exit price is the redemption amount.
- ✓ In the case a Bonus Certificate encounters a barrier hit during the analyzed period, its performance continues to be calculated in line with the movement of the DAX®.

Assumptions for calculating the performance of the DAX® in the observation period

- ✓ The performance of the DAX® is calculated from the opening price of the index on the first observation day of the certificate and the closing price of the index on the last observation day of the certificate in the respective quarter.

Calculation of the Barrier Hit Risk

- ✓ The BHR acts as a key figure for the performance of Bonus Certificates. It is being calculated continuously from the first trading day of the certificate until the day it encounters a barrier hit or matures.
- ✓ TTMzero takes into account the most important factors which are time to maturity, distance to the barrier (buffer) and implied volatility to compute the BHR of each Bonus Certificate.

04 2020 – 1st half year in figures

- The number of observed barrier breaches (across all DAX Bonus Certificate categories) has dropped significantly from 25,759 in Q1 to 6,514 in Q2.
- Despite the high number of barrier breaches in Q1, the amount of Bonus Certificates with intact barriers that are available for investors has remained stable (51,549 in Q1 vs. 51,165 in Q2).
- Bonus Reverse and Bonus Reverse Capped made up of roughly 27% the total amount of products in the beginning of Q1. The fraction that these "short products" took as a whole had risen up to over 67% in the beginning of Q2.

Q1 - 2020	**Barrier hit events**	**Issued products in Q1-2020**	**Products matured in Q1-2020***	**Number of products in the beginning of Q1-2020***	**Number of products by the end of Q1-2020***	**Number of products with at least 1 day of intact barrier in Q1-2020***	**Percentage of products with barrier hits in Q1-2020**
Bonus Certificates	**25,759**	**18,741**	**6,806**	**33,280**	**14,876**	**51,549**	**50.04**
Bonus Classic	4,846	2,106	1,335	5,818	1,067	7,859	61.66
Bonus Cap	19,688	12,649	3,905	18,594	4,783	31,074	63.36
Bonus Reverse	173	242	200	1,598	1,398	1,840	9.40
Bonus Reverse Cap	1,087	3,744	1,366	7,270	7,628	10,776	10.09

Q2 - 2020	**Barrier hit events**	**Issued products in Q2-2020**	**Products matured in Q2-2020***	**Number of products in the beginning of Q2-2020***	**Number of products by the end of Q2-2020***	**Number of products with at least 1 day of intact barrier in Q2-2020***	**Percentage of products with barrier hits in Q2-2020**
Bonus Certificates	**6,514**	**29,668**	**5,191**	**22,156**	**39,329**	**51,165**	**12.73**
Bonus Classic	315	5,453	327	1,230	5,793	6,535	4.82
Bonus Cap	704	18,782	2,184	6,112	21,938	24,620	2.86
Bonus Reverse	1,296	652	282	2,465	1,533	3,106	41.73
Bonus Reverse Cap	4,199	4,781	2,398	12,349	10,065	16,904	24.84

**** Without barrier hit***

05 DAX® Equity Market Performance during 1st half year – 2020

- The chart below demonstrates the DAX® movement for the period from 3/JAN to 30/JUN. *TTMzero Evaluated Real-Time Prices* for DAX® is constantly computed and available on FIS Market Map.

TTMzero estimate for INDEXDB: DAX / **TTMzero DE30**

- On 19/FEB, the market achieved its All-Time-High at 13,789 points.
- In less than a month, DAX® reached its lowest at 8,441 points on 18/MAR. This plunge accounts for 37% in evaporation of the equity market value on DAX®.
- In the week between 9/MAR and 16/MAR alone, the market lost 17.7%.
- Since its low on 18/MAR, the DAX® had experienced an impressive bounce back of 45% to 12,310 points on 30/JUN/2020.

- As a result of the dramatic crashes in late February into March, a great number of Bonus Certificates suffered. Of those that encountered a barrier hit, 100% were "long products" (i.e. Bonus Classic and Bonus Capped).

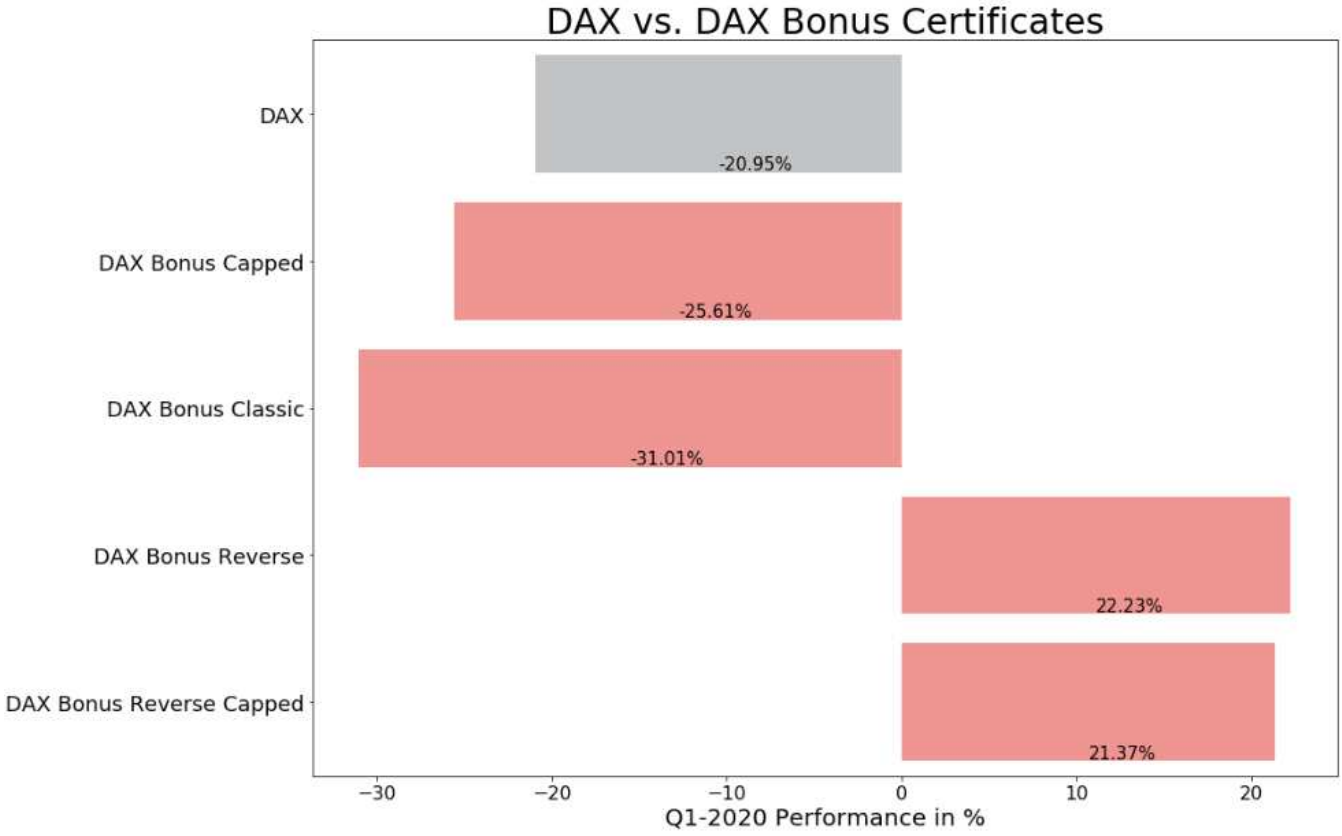
knock_out_date	No. of products with barrier breaches	% of Bonus Classic / Bonus Capped
12-Mar-2020	7,797	100
9-Mar-2020	5,358	100
16-Mar-2020	3,518	100

- As the DAX® gradually climbed back up throughout Q2, the amount of barrier hit events reduced significantly compared to Q1.
- Furthermore, in contrast to the bear market, during the bull market, "short products" (ie. Bonus Reverse and Bonus Reverse Capped) are more likely to run into a barrier breach compared to "long products". In fact, 100% of products that hit the barriers on the 3 days with the most barrier hits in Q2 were short products.

knock_out_date	No. of products with barrier breaches	% of Bonus Reverse / Bonus Reverse Capped
3-Jun-2020	941	100
5-Jun-2020	859	100
30-Apr-2020	479	100

06 Q1-2020: Performance of DAX® vs. Bonus Certificates

- On average the short products were able to overcompensate the losses that the DAX® generated in Q1. The strongest products were the Bonus Reverse product category. They achieved an average performance of 22.23% (compared to -20.95% performance in the DAX®).

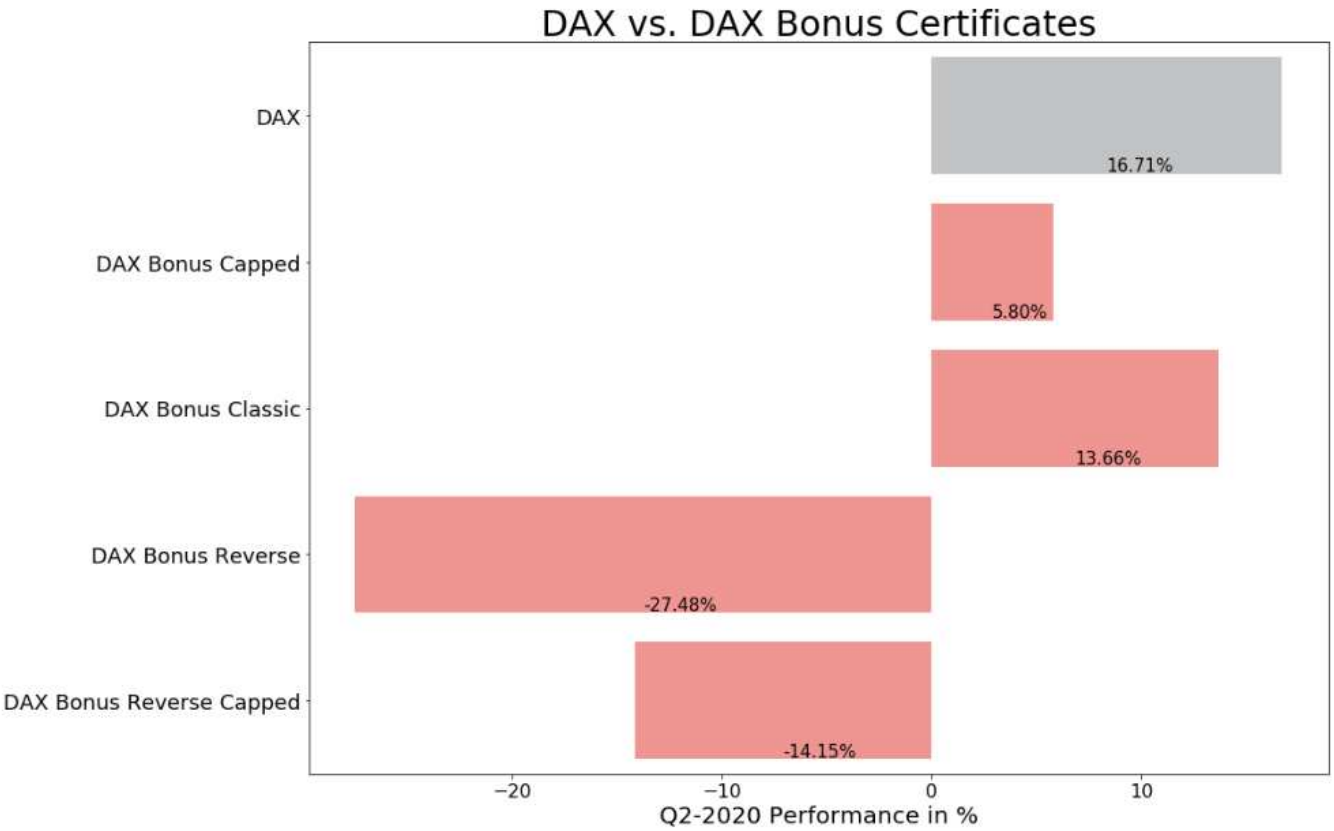


	Number of Bonus Certificates that outperformed the DAX®	in %
DAX Bonus Capped	10,602	35.82
DAX Bonus Classic	2,297	31.58
DAX Bonus Reverse	2,992	99.04
DAX Bonus Reverse Capped	15,508	99.23

- Of the long products, only 31.58% of Bonus Classic and 35.82% of Bonus Capped Certificates were able to outperform the DAX® during Q1.
- Meanwhile, more than 99% of the short products outperformed the DAX® in Q1.

07 Q2-2020: Performance of DAX® vs. Bonus Certificates

- The DAX® impressively rallied back up during Q2 with a performance of 16.71% by the end of JUNE/2020. On average the DAX® outperformed the long and short Bonus Certificates during Q2.



	Number of Bonus Certificates that outperformed the DAX®	in %
DAX Bonus Capped	2,136	8.75
DAX Bonus Classic	2,606	41.40
DAX Bonus Reverse	62	1.95
DAX Bonus Reverse Capped	515	3.02

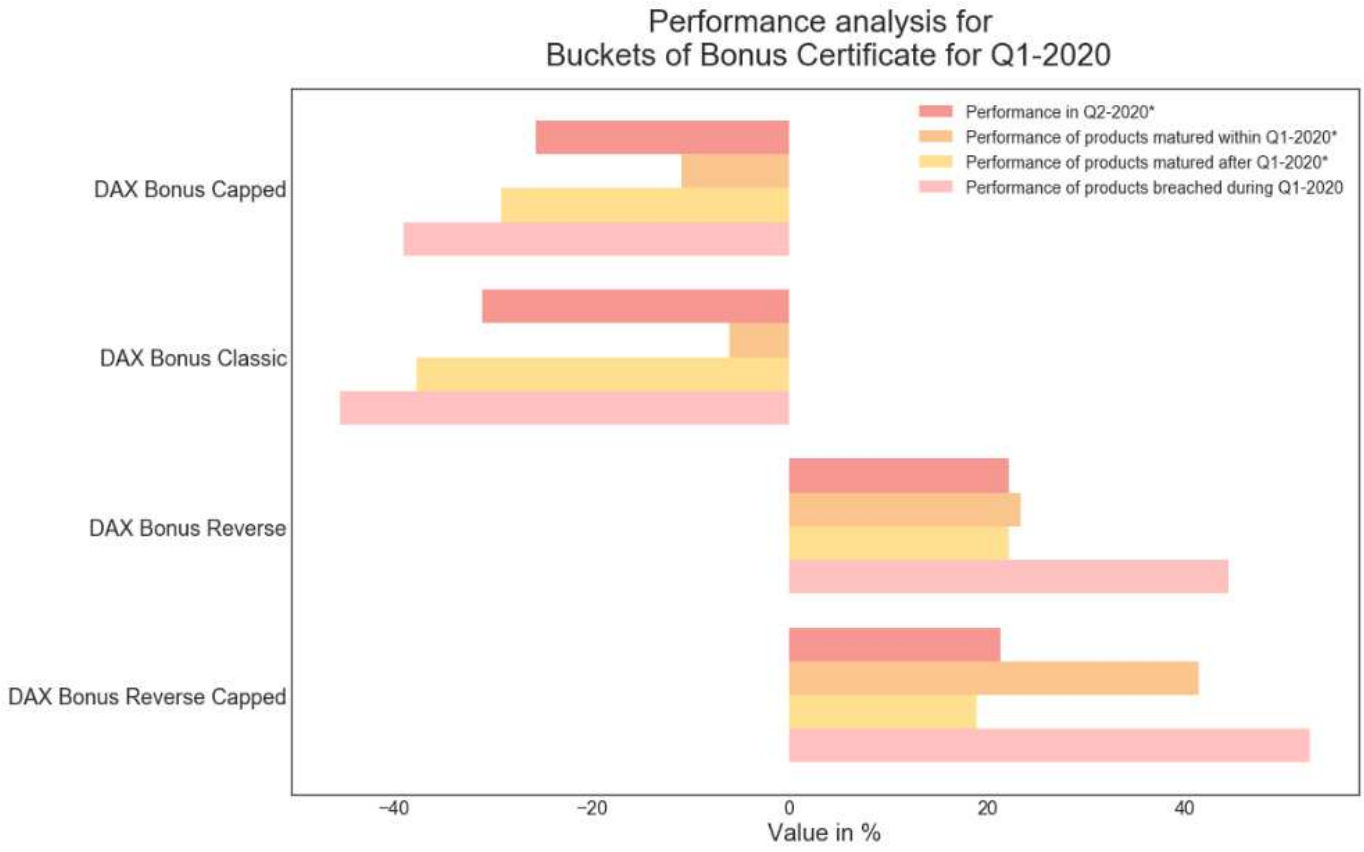
- Interestingly, 41.40% of Bonus Classic Certificates were still able to achieve an outperformance during Q2.

08 Performance of DAX Bonus Certificates

- In both Quarters, the DAX Bonus Certificates that matured within the Quarter generally performed better than the average performance across all categories.
- Products that matured after the analyzed Quarter tend to have a comparable level of performance when compared to the average performance of each category.

	Performance in Q1-2020* (%)	Performance of products matured within Q1-2020* (%)	Performance of products matured after Q1-2020* (%)	Performance of products breached during Q1-2020 (%)
DAX Bonus Capped	-25.61	-10.88	-29.12	-38.95
DAX Bonus Classic	-31.01	-6	-37.68	-45.4
DAX Bonus Reverse	22.23	23.35	22.13	44.33
DAX Bonus Reverse Capped	21.37	41.36	18.97	52.56

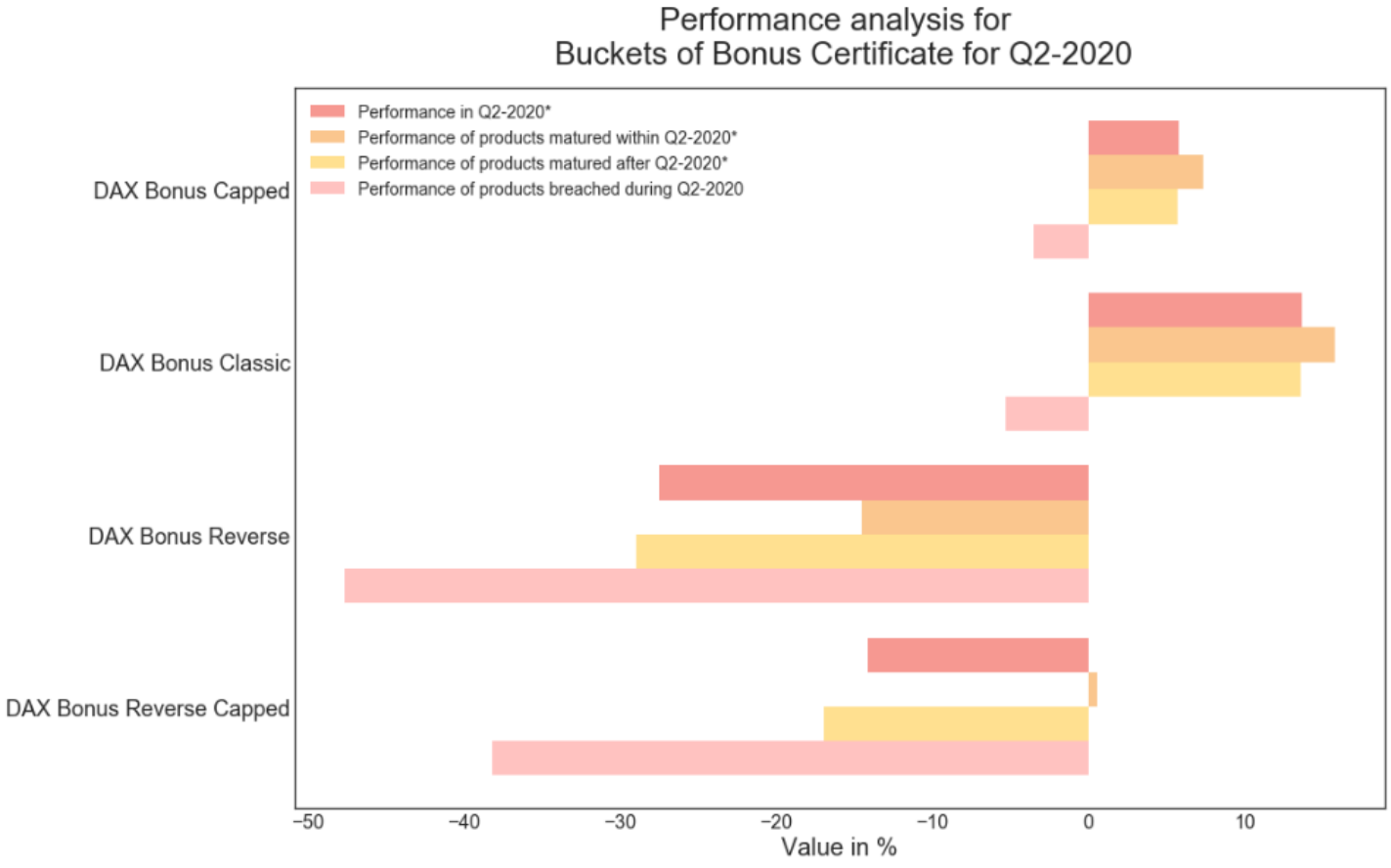
**** Without barrier hit***



- The DAX Bonus Certificates that got breached during a Quarter typically performed worse Compared to the average performance, with the exception of the short product types in Q1.
- Short products which got breached during Q1 performed significantly better than the average performance of the corresponding categories. This is due to the remarkable crash occurred in Q1.

	Performance in Q2-2020* (%)	Performance of products matured within Q2-2020* (%)	Performance of products matured after Q2-2020* (%)	Performance of products breached during Q2-2020 (%)
DAX Bonus Capped	5.80	7.33	5.66	-3.51
DAX Bonus Classic	13.66	15.76	13.55	-5.29
DAX Bonus Reverse	-27.48	-14.56	-28.94	-47.65
DAX Bonus Reverse Capped	-14.15	0.52	-16.95	-38.15

**** Without barrier hit***



09 Barrier-Hit-Risk as an early indicator

- The Barrier-Hit-Risk (BHR) is a key figure that continuously quantifies the probability of a barrier breach that a certain Bonus Certificate encounters. It is not static, but a dynamic ratio that is constantly changing.

- TTMzero computes the BHR taking into account the most important impacting factors which are time to maturity, distance to the barrier (buffer) and implied volatility.

  - ✔ Expiry of the bonus certificate or Time to Maturity – generally speaking, **decreasing time to maturity reduces the BHR level**.
  - ✔ Distance between the underlying price and the barrier – **the higher the distance, the lower the BHR.**
  - ✔ Volatility – principally **declining volatility goes hand in hand with decreasing BHR.**

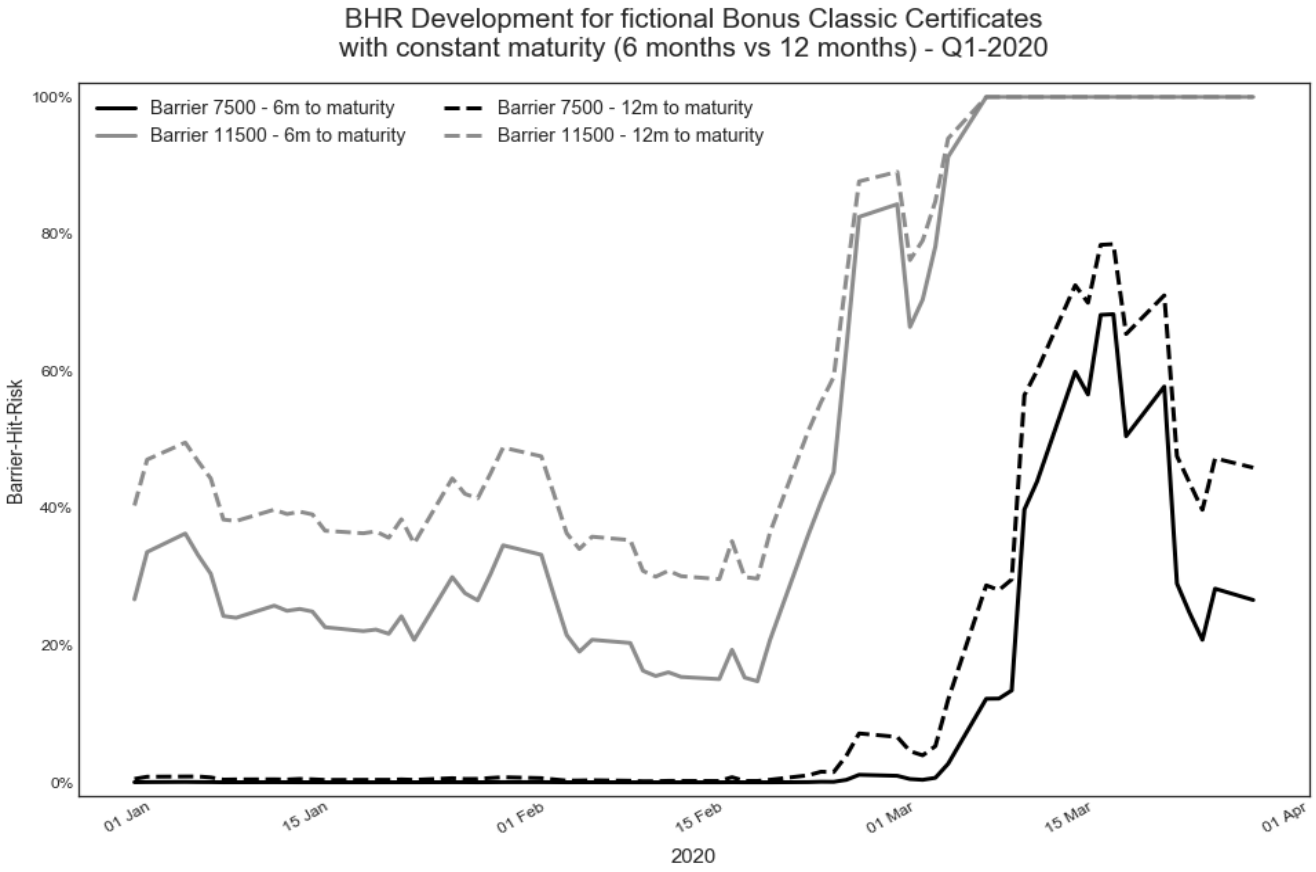
- These correlations will provide a good picture of how significant the BHR key figure is as an early indicator for investors when looking into this product type.

10 BHR and Time to Maturity – Q1

- *Background:*

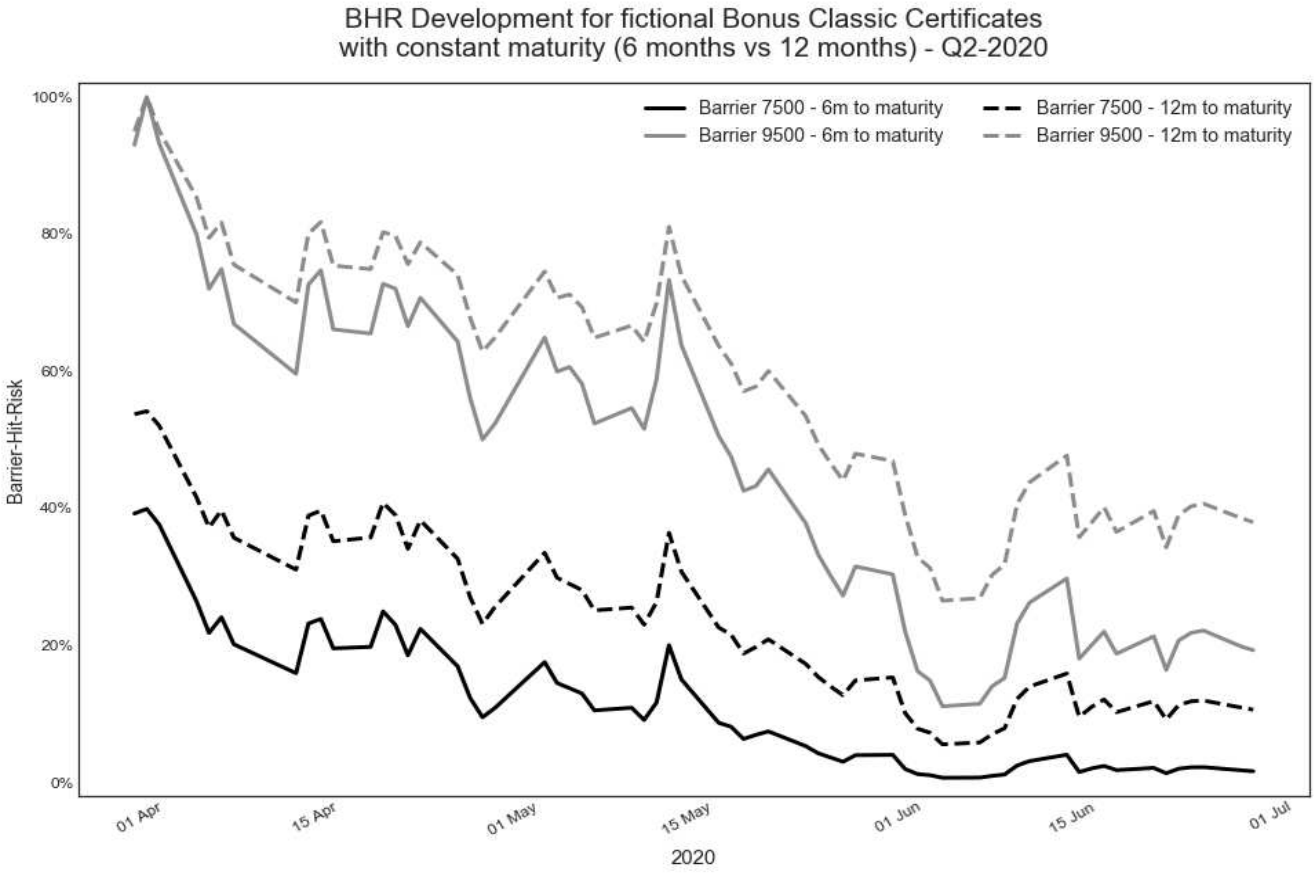
  The two charts below show the BHR development for four fictional Bonus Classic Certificates. The Time to Maturity is fixed to either 6 months or 12 months from the end of each Quarter.

- The first chart displays the behaviour of the fictional Bonus Classic Certificates with absolute barrier levels of 7,500 (in black) and 11,500 (in grey) respectively on every observation date of Q1.



11 BHR and Time to Maturity – Q2

- Due to the fact that products with barrier level of 10,000 and above were breached during Q1, the upper barrier of 9,500 points are looked at for the BHR development in Q2.
- Therefore, the second chart displays the behaviour of the fictional Bonus Classic Certificates with absolute barrier levels of 7,500 (in black) and 9,500 (in grey) respectively on every observation date of Q2.



KEY TAKEAWAYS

- The higher the Time To Maturity, the higher the BHR.
- The smaller the difference between Spot Price and Barrier, the higher the BHR.
- The smaller the difference between Spot Price and Barrier, the heavier the reaction of the BHR to changing market conditions.

12 BHR and Distance to Barrier

- This table demonstrates the translation of Barrier-Hit-Risk into the buffer in DAX® points for Bonus Classic Certificates with ***1 year*** remaining maturity.
- The Spot prices on 18/MAR when the DAX® was at all-time low (below 8,500) and at the end of Q2 when the DAX® has bounced back up to above 12,000 were taken for calculation.

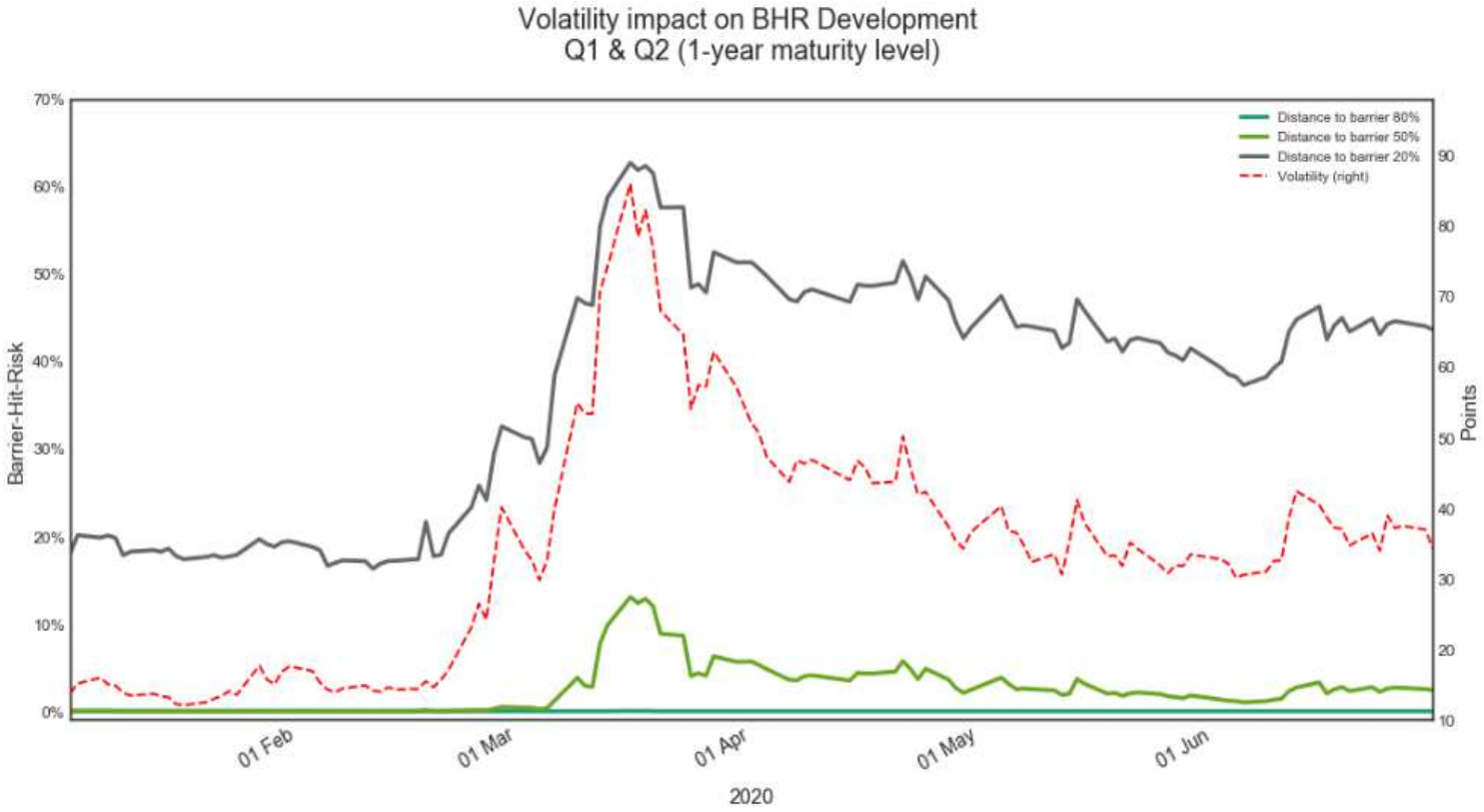
BHR in %	Buffer in DAX® points as spotted on 18/MAR	Relative distance in %	Buffer in DAX® points at the end of Q2-2020	Relative distance in %
10	3,358	39.65	3,399	27.73
20	2,756	32.54	2,711	22.12
30	2,291	27.06	2,208	18.01
40	1,903	22.47	1,805	14.73
50	1,541	18.20	1,439	11.74
60	1,204	14.21	1,108	9.04
70	868	10.25	785	6.40
80	524	6.18	462	3.77
90	157	1.85	125	1.02

KEY TAKEAWAYS

- Changes in the volatility regime have dramatic effects on the relative distance between Spot and Barrier that investors would have to choose to maintain a stable BHR.
- During Q1, investors needed to select products with relative difference of 32.54% between spot and barrier to maintain a Barrier Hit Risk of 20%. At the end of Q2 a relative difference of 22.12% was sufficient to maintain the same level of BHR.

13 BHR and Volatility

- The chart below describes the impact of the DAX® volatility on DAX Bonus Classic Certificates for different levels of distance to barrier (as a percentage of spot levels: 20%,50%,80%).
- All products considered for the demonstrated distance to barrier levels during the observed time between Jan2020-Jun2020 have a fixed maturity of *1 year*, which correspond to Jan2021-Jun2021.



KEY TAKEAWAYS

- For products with relative differences of 80% or more between spot and barrier the BHR remained below 5% during 1st half year of 2020, despite the high range of volatilities that were observed.
- For products with smaller differences between spot and barrier, we observed heavy reactions of the BHR with respect to the changes in volatility.