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STUDY ON DISCOUNT CERTIFICATES IN 2020

STUDY ON DISCOUNT CERTIFICATES IN 2020
CONDUCTED BY TTMZERO AND BÖRSE STUTTGART ON BEHALF
OF THE GERMAN DERIVATIVES ASSOCIATION (DDV)

ttmzero
Capital Markets Digitization

Börse Stuttgart

1 CONTENT

STUDY ON DISCOUNT CERTIFICATES IN 2020

2 SUMMARY

2020 was an eventful and challenging year - in many respects:

The world had to fight a pandemic that had a serious impact on numerous areas of life.

This also had a great impact on the stock markets. The year 2020 began in „pre-Covid19 manner“ with peaks in share prices until the markets collapsed in February. From mid-March onwards, a recovery set in and by the end of the year, stock markets were trading at or even above „pre-Covid19 levels“.

This extreme market development did not go unnoticed by discount certificates, a product category that shows its strengths particularly in sideways-moving or slightly falling markets.

> In the present report, 170,984 discount certificates on 70 underlyings from Europe and the U.S. were examined from 1 January to 31 December, 2020, in order to derive findings on the yield development and relevant key figures.

76.07% of the examined discount certificates achieved a positive return in the given period despite the difficult market environment, 41.10% even achieved a higher return than their underlyings. However, the average yield of the examined discount certificates in 2020 was 1.24% p.a., that of the underlying in the same period 16.97% p.a.

This difference in yields can be explained, among other things, by the fact that many underlyings were able to fully benefit from the recovery phase from mid-March onwards, whereas the discount certificates were limited to a predefined level, the maximum amount, due to their special structure; thus they could only take the recovery up to this cap.

In addition, certificates that matured during the downward phase were generally deeply in the red when they were paid back, which also contributed to the low average yield of the certificates.

The picture is more positive for certificates issued during the low phase in March or shortly thereafter: Due to the increased volatility, higher discounts could be granted for newly issued certificates. The average yield of the certificates issued in the second quarter was 14.52% p.a.

In addition to the yield figures, there are a number of key figures for discount certificates that were examined in this study and should be considered when investing in this product category. One of the most important is the Maximum Yield Probability, i.e., the probability of achieving the maximum yield at maturity.

For example, of the 68,604 certificates maturing in 2020, 28.52% had a Maximum Yield Probability of over 90% on the first observation date. Of those 19,566 certificates, 72.83% achieved their maximum yield at maturity.

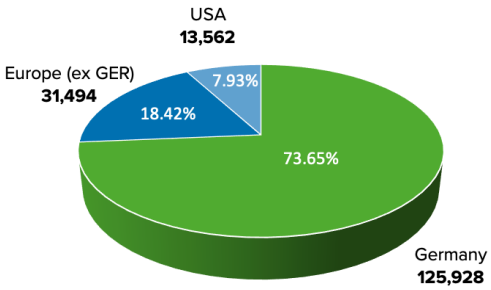
3 INTRODUCTION AND SUBJECT OF EXAMINATION

INTRODUCTION

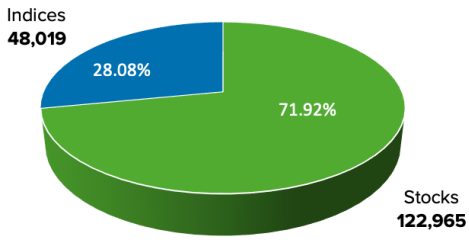
For 25 years, discount certificates have enjoyed great popularity among private investors. This product category - developed in Germany - was one of the first structured investment products on the derivatives market.
Among investment products, discount certificates have a considerable market share, even exceeding that of bonus and index certificates. The reasons for the popularity of these products are their plain structure, the good risk-reward profile and the reduced risk of loss compared to a direct investment in the underlying asset.
The structure of a discount certificate is relatively simple: the investor purchases the certificate on the desired stock or index at a rebate - the discount - i.e. the price of the certificate is lower than the current price of the underlying. In return, the redemption is limited to a preset maximum amount, the cap.
Here, the following applies: the lower the cap, the greater the discount and the lower the risk (as well as the potential return); the higher the cap, the lower the discount, risk and potential returns are higher.
Discount certificates are particularly suitable for defensive investors who are expecting sideways-moving or slightly falling markets and want to be protected against minor price decreases. Offensive investors might also find this product category interesting, as they can control their risk and return opportunities through the choice of the cap.
In cooperation with the Stuttgart Stock Exchange ("Börse Stuttgart"), TTMzero analyzed 170,984 discount certificates for the year 2020. The certificates examined refer to the top 70 underlyings from Europe and the USA.
The objective of this study is to compare investments in discount certificates with direct investments in the corresponding underlying asset in terms of yield attractiveness. The returns realized on certificates and those on underlyings during the period under review were compared for this purpose.
Furthermore, the study describes the large number of discount certificates in the German market and provides investors with a good overview of the opportunities and risks with respect to the discount certificates.
In order to enable a comparison across issuers, the key figures Sideways Yield, Maximum Yield, Implied Volatility, Maximum Yield Probability, Relative Distance to Cap, Relative Discount and Delta were calculated and examined for all discount certificates.

SUBJECT OF EXAMINATION

TTMzero analyzed 170,984 discount certificates, which are based on the 70 most popular underlyings from Germany (Top 40), Europe-ex-Germany (Top 20) and the USA (Top 10).
125,928 certificates were based on underlyings from Germany, 31,494 certificates were based on underlyings from Europe ex-Germany and 13,562 certificates were based on underlyings from the USA.



71.92% of the certificates were based on a stock as underlying and 28.08% of the certificates were based on an index.

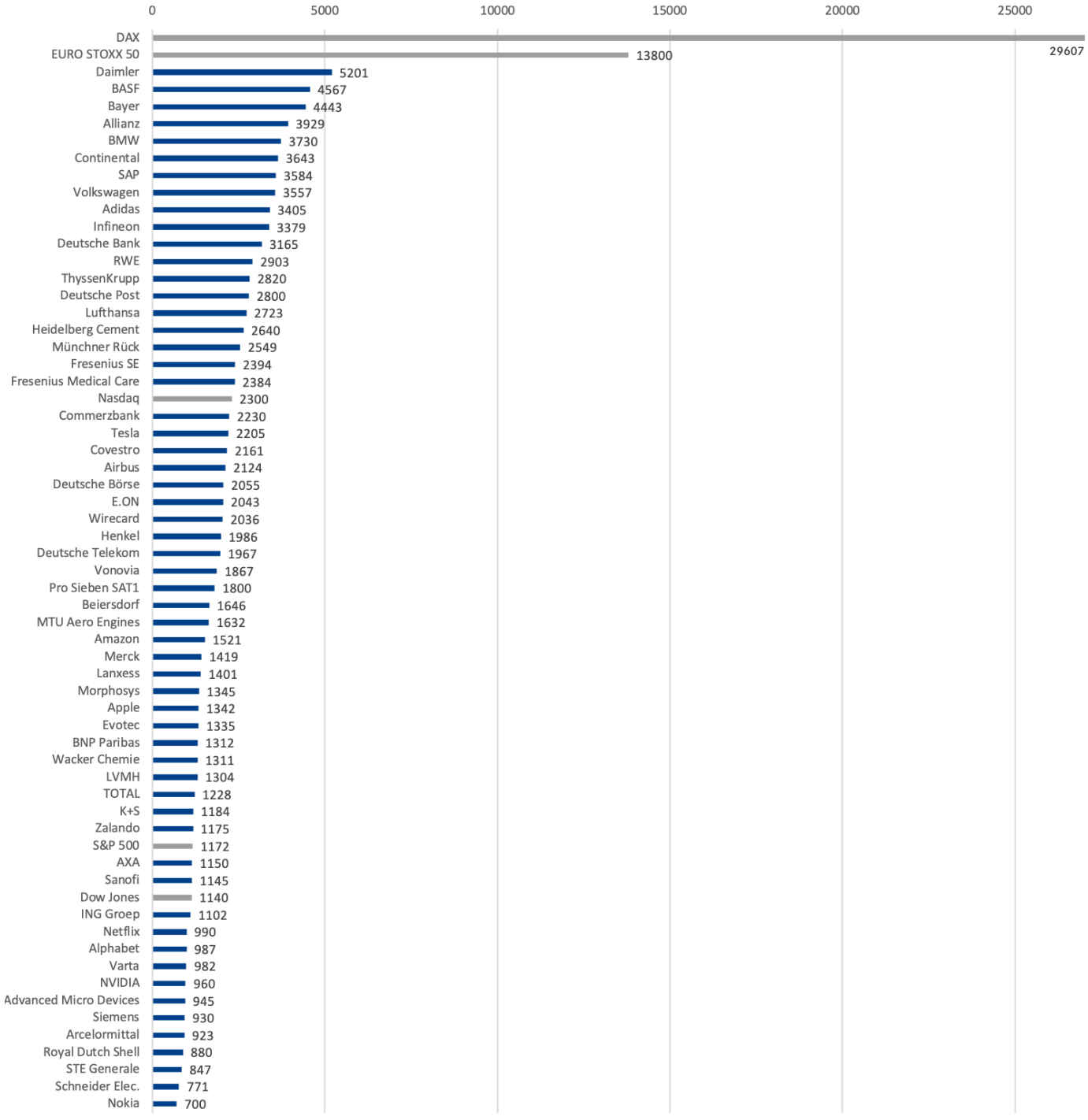


SUBJECT OF EXAMINATION

The top 40 underlyings from Germany consist of 39 shares and the DAX® index. The top 20 underlyings from the rest of Europe consist of 19 equities and the EURO STOXX 50® Index. The American top 10 underlyings include seven equities and the three indices NASDAQ 100®, S&P 500®, and Dow Jones Industrial Average®.

The underlyings are listed in the following overview.

Chart 1: Underlying assets and number of discount certificates examined based on these underlying assets



4 ANALYSIS PERIOD AND METHODOLOGY

ANALYSIS PERIOD

For each discount certificate, the certificate yield was compared with the underlying yield in the respective observation period. The individual observation period for a certificate starts with the first trading day of the certificate in 2020 and ends with the last trading day of the certificate in 2020. The following assumptions apply:

Assumptions calculating the certificate yield

The entry price is defined as the first ask price on the first trading day of the certificate. 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 2020 is defined as the exit price. If the certificate matures during the year 2020, the exit price is the redemption amount.

Assumptions for calculating the underlying yield in the observation period

The yield of the underlying asset is calculated from the opening price of the underlying asset on the first observation day of the certificate and the closing price of the underlying asset on the last observation day of the certificate in 2020.

When calculating the yield of the underlying instrument, prices are adjusted for corporate actions (dividends, stock splits, etc.).

For underlyings not denominated in Euro, the performance was adjusted for the exchange rates valid on the specific day.

Calculation of key figures

The certificate key figures (sideways yield, maximum yield, implied volatility, delta, relative discount, relative distance to cap and maximum yield probability) are calculated on the first trading day of the discount certificate in 2020.

As a rule, the first ask price of the day was used to calculate the key figures. The mid-price between the first bid and ask price was used to calculate the delta and the implied volatility.

5 RESULTS

1 Comparison of Yields: Discount Certificates vs. Underlyings

Overall, 76.07% of the discount certificates achieved a positive performance. For the respective underlyings, 64.92% achieved a positive performance.

14.30% of the discount certificates achieved a positive yield during the period under review, while the underlying asset performed negatively during the same period.

Of the discount certificates maturing in 2020, 61.56% achieved their maximum yield with an average maximum yield of 10.89% p.a. The average yield of all discount certificates maturing in 2020 was -17.72 p.a.

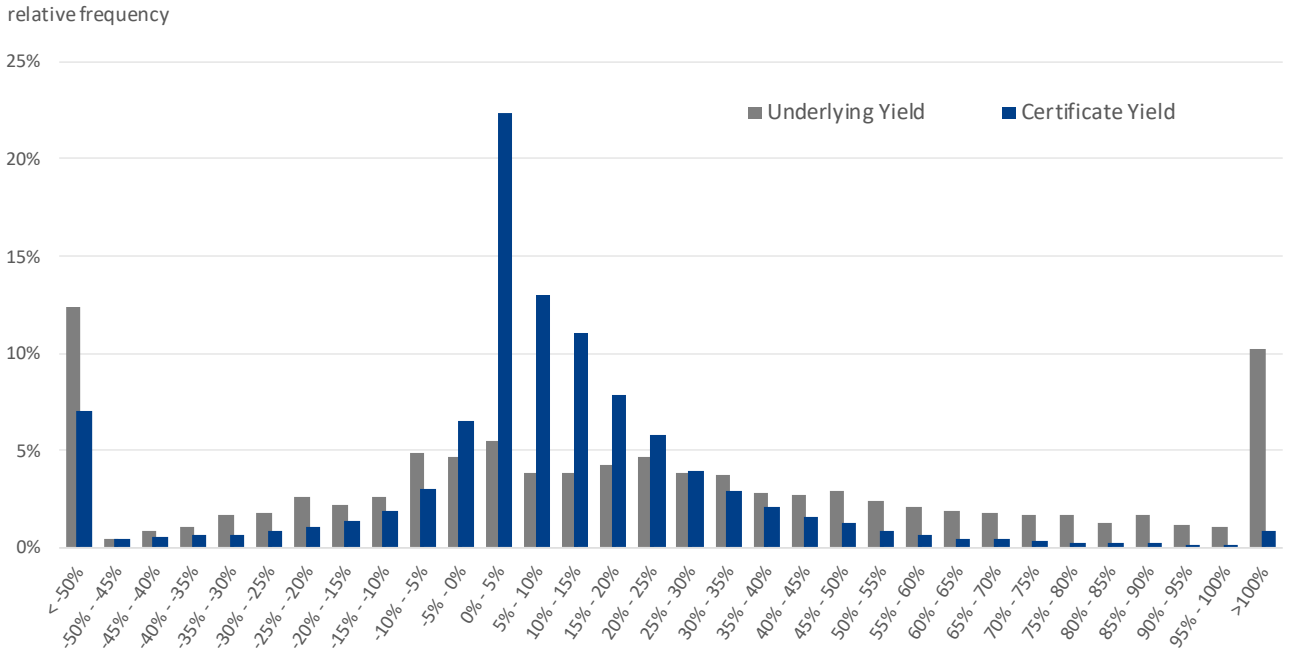
41.10% of the discount certificates generated a higher yield than a direct investment in the respective underlying asset would have generated in the same period.
The average yield of the underlyings in the period under review was 16.97% p.a., whereas that of discount certificates was 1.24% p.a.

Certificate yields in detail:

- **22.32%** of discount certificates generated yields between **0%** and **5%** p.a.
- **12.95%** between **5%** and **10%** p.a.
- **11.00%** of the discount certificates had yields between **10% and 15%** p.a.
- **7.79%** of the certificates generated yields between **15%** and **20%** p.a.
- **5.83%** between **20%** and **25%** p.a.
- **16.17%** of the certificates generated yields of more than **25%** p.a.
- **23.93%** generated negative yields

Explanations on the yield figures can be found at the end of the document.

Chart 2: Comparison of the distribution of yields of discount certificates and underlyings



RESULTS

2 Distributions and Averages of Certificate Key Figures

The following certificate key figures were calculated on the first trading day of each discount certificate.

2.1 Maturity

The discount certificates under review had an average remaining term of 328 days.
68,604 certificates matured in 2020.

2.2 Relative Distance to Cap

The relative distance to the cap shows how far the price of the underlying asset is from the cap on the first observation day and whether it is above or below it, i.e. whether it is negative or positive.

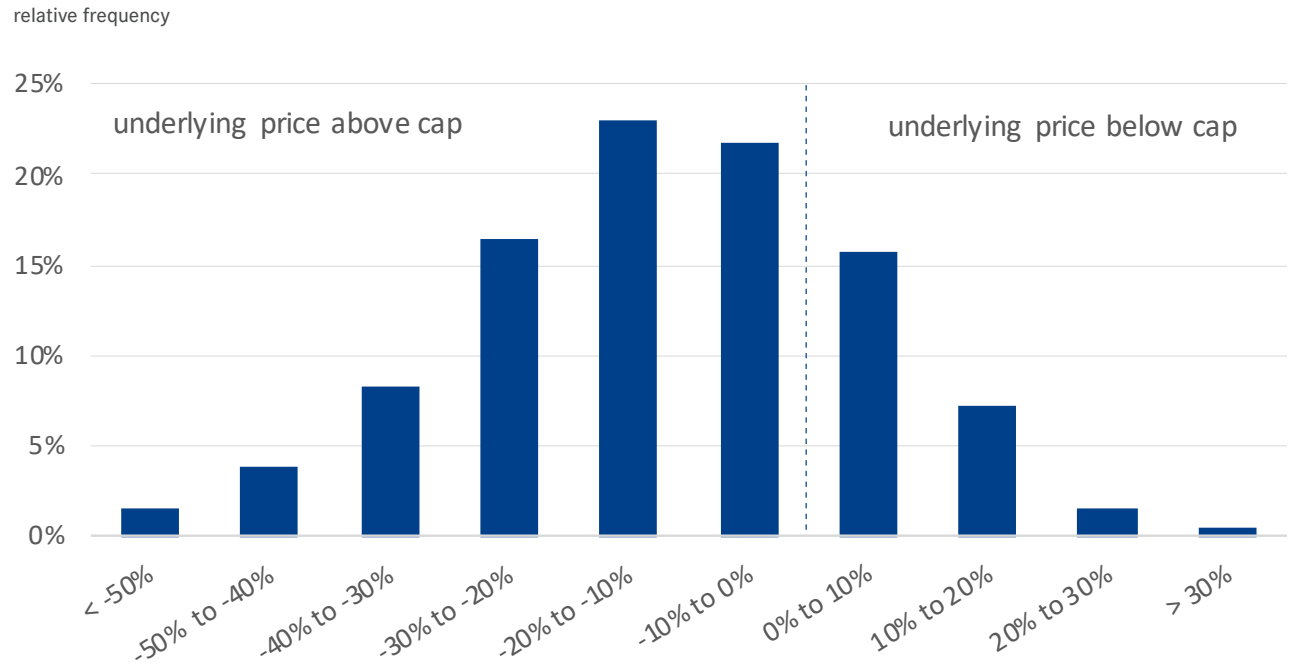
74.88% of the discount certificates had a negative distance to the cap on the first observation day, i.e. the price of the underlying instrument was above the cap.

In 25.12% of the cases, the price of the underlying instrument was below the cap on the first observation day. The distance to the cap was therefore positive.

37.64% of the certificates had a distance to the cap between -10% and +10%.

The average distance to the cap was -11.77%.

Chart 3: Distribution of the relative distance to the cap on the first trading day of each certificate



RESULTS

2.3 Relative Discount

The relative discount corresponds to the percentage discount of the certificate‘s price compared to a direct investment in the underlying instrument.

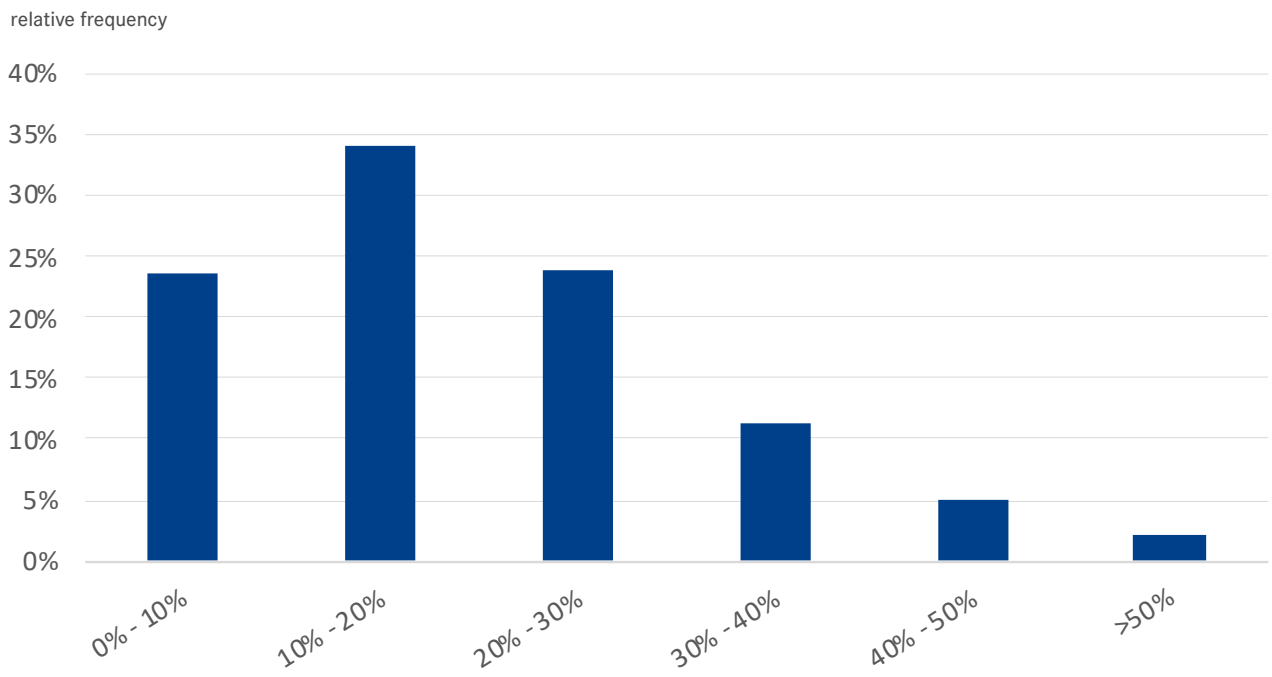
The discount certificates under review had an average discount of 19.71% on the first observation day.

In total, 23.64% of the certificates had a discount below 10%, 34.15% had a discount between 10% and 20% and 23.93% of the certificates had a discount between 20% and 30%.

18.27% of the certificates had a discount of over 30%.

The exact distribution is as follows:

Chart 4: Distribution of the relative discount *)



*) 0.13% of the certificates under review had a negative relative discount

RESULTS

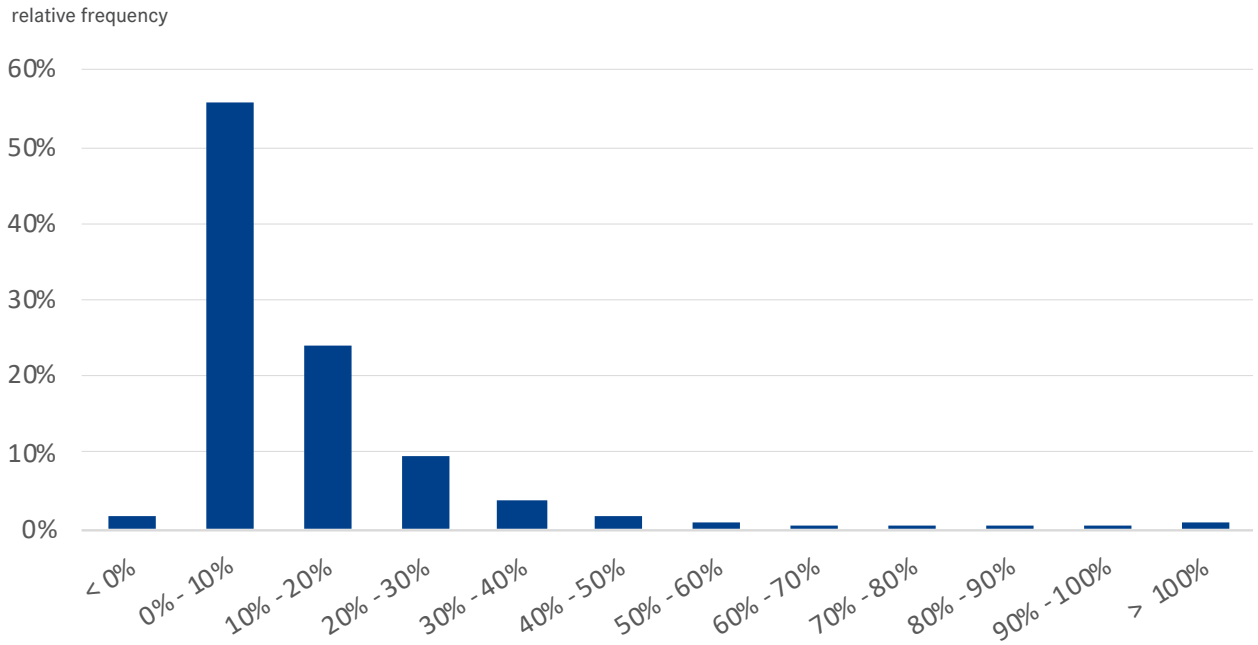
2.4 Maximum Yield p.a.

The maximum yield corresponds to the maximum possible yield of a discount certificate until maturity. By annualizing those yields, the maximum yield p.a. is obtained.

Looking at the possible maximum yield p.a. on the first observation day, the following picture emerges:

- 55.87% of the discount certificates had the chance of a maximum yield of 0% to 10% p.a.
- 24.17% of the certificates had a chance of a possible maximum yield of 10% to 20% p.a.
- 18.23% of the certificates had the chance of a maximum annual yield of more than 20% p.a., thereof 2.08% of more than 60% p.a.
- 1.73% of the certificates had a negative possible maximum yield p.a.
- The average maximum yield on the first observation day was 13.30% p.a.

Chart 5: Distribution of maximum yields p.a.



For comparison:

61.56% of the certificates maturing in 2020 achieved their possible maximum yield. For those, the average maximum yield was 10.89% p.a.

RESULTS

2.5 Sideways Yield p.a.

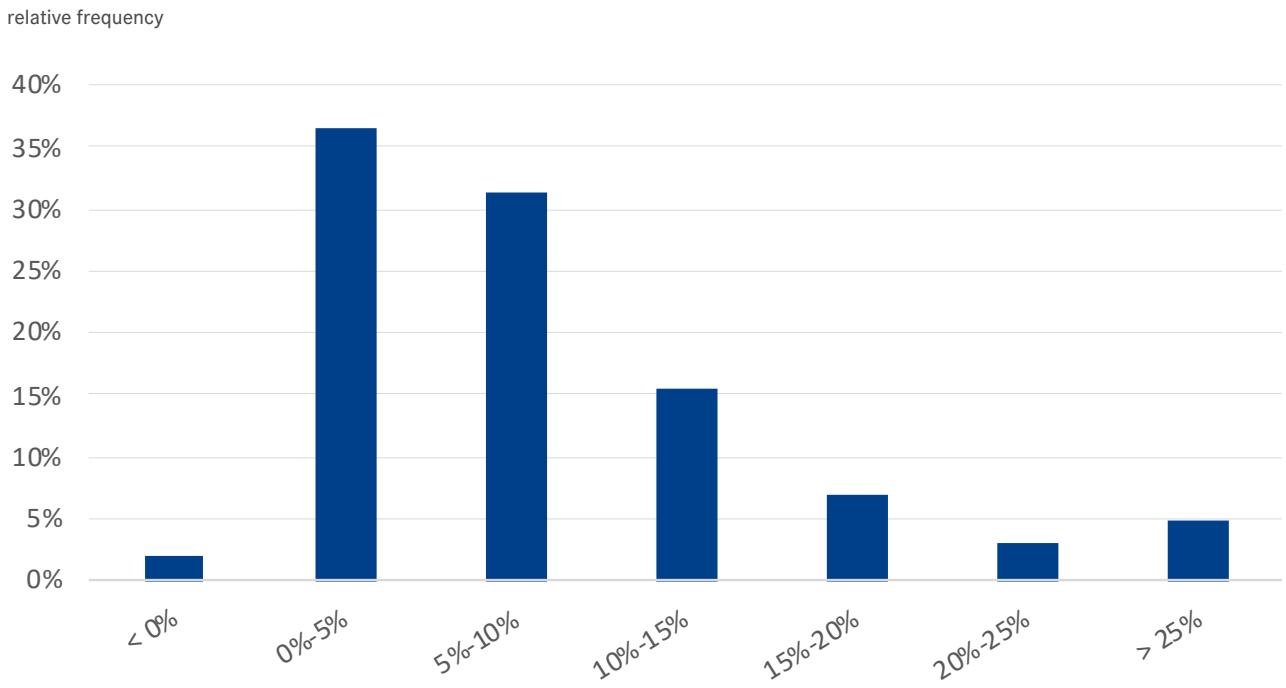
The sideways yield indicates the yield achieved by the discount certificate if the underlying asset is quoted at the same level at maturity as the level on the first observation day.

In our analysis, 36.41% of the discount certificates under review had a sideways yield of 0% to 5% p.a., 31.43% had a yield between 5% and 10% p.a., 15.48% between 10% and 15% p.a. and 14.82% had a sideways yield of more than 15% p.a.

1.86% of certificates showed a negative sideways yield.

The average sideways yield was 8.85% p.a.

Chart 6: Distribution of annualized sideways yields



RESULTS

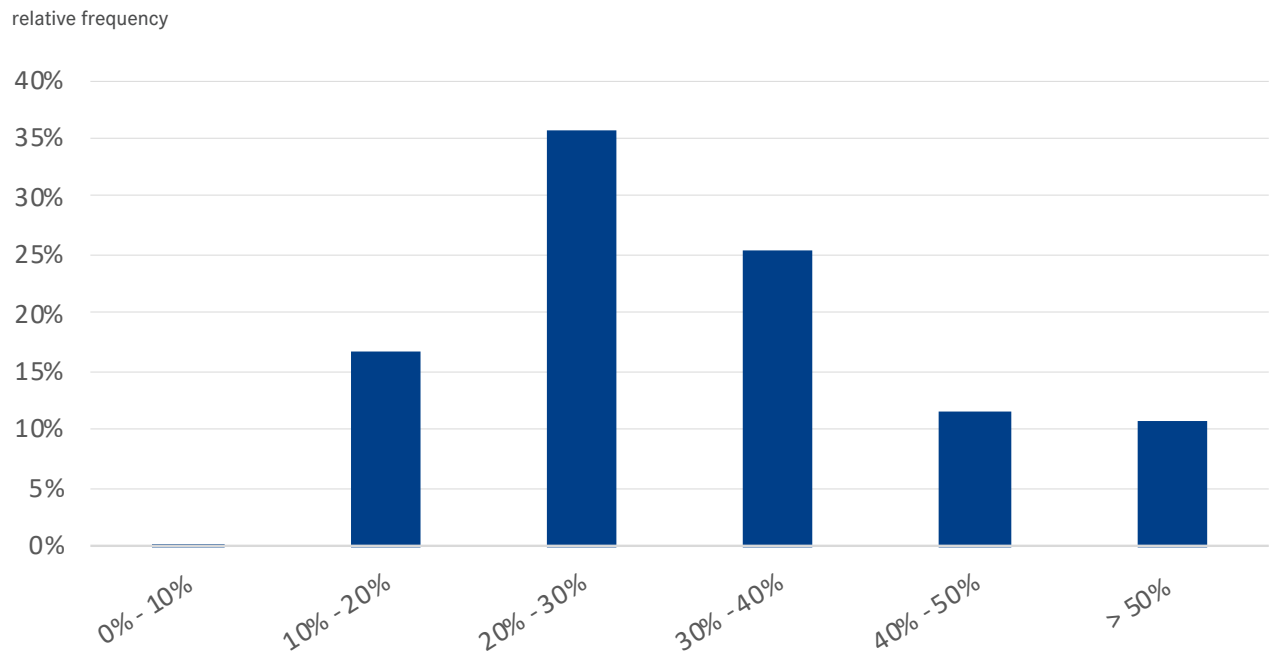
2.6 Implied Volatility

The implied volatility provides information about the expected fluctuations of the underlying. The higher this value is, the higher the price markdown for discount certificates.

Among the discount certificates examined, 0.15% of the discount certificates had an implied volatility of 0% to 10%, 16.79% from 10% to 20%, 35.65% between 20% and 30%, 25.30% from 30% to 40% and 11.48% from 40% to 50%. For 10.63% of the certificates the implied volatility was greater than 50%.

The average implied volatility was 32.78%.

Chart 7: Distribution of implied volatilities



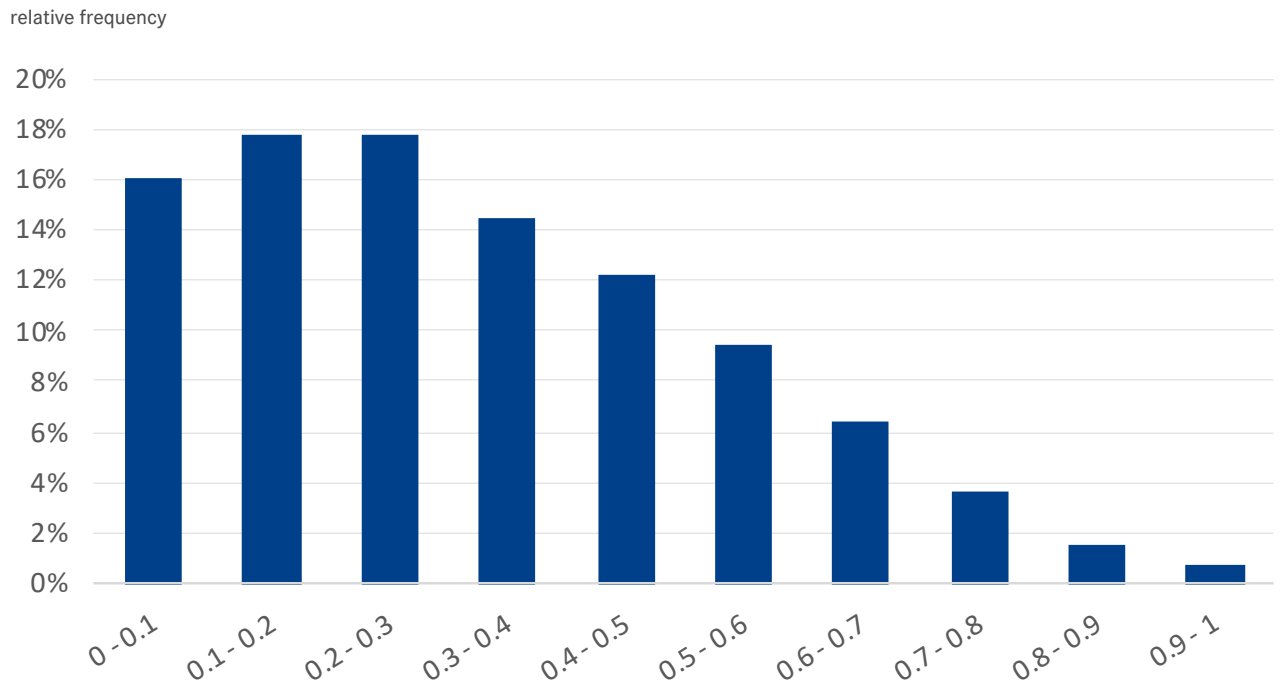
RESULTS

2.7 Delta

The delta indicates how the price of the discount certificate changes if the price of the underlying increases by one unit. For better understanding, the study adjusted the delta for certificates based on underlyings in foreign currencies by the exchange rates (pure delta).

- 16.07% of the discount certificates under review had a delta of less than 0.1 on the first observation day.
- 62.14% had a delta between 0.1 and 0.5.
- 21.79% of the certificates had a delta between 0.5 and 1.
- The average delta was 0.32.

Chart 8: Distribution of the delta



RESULTS

2.8 Maximum Yield Probability

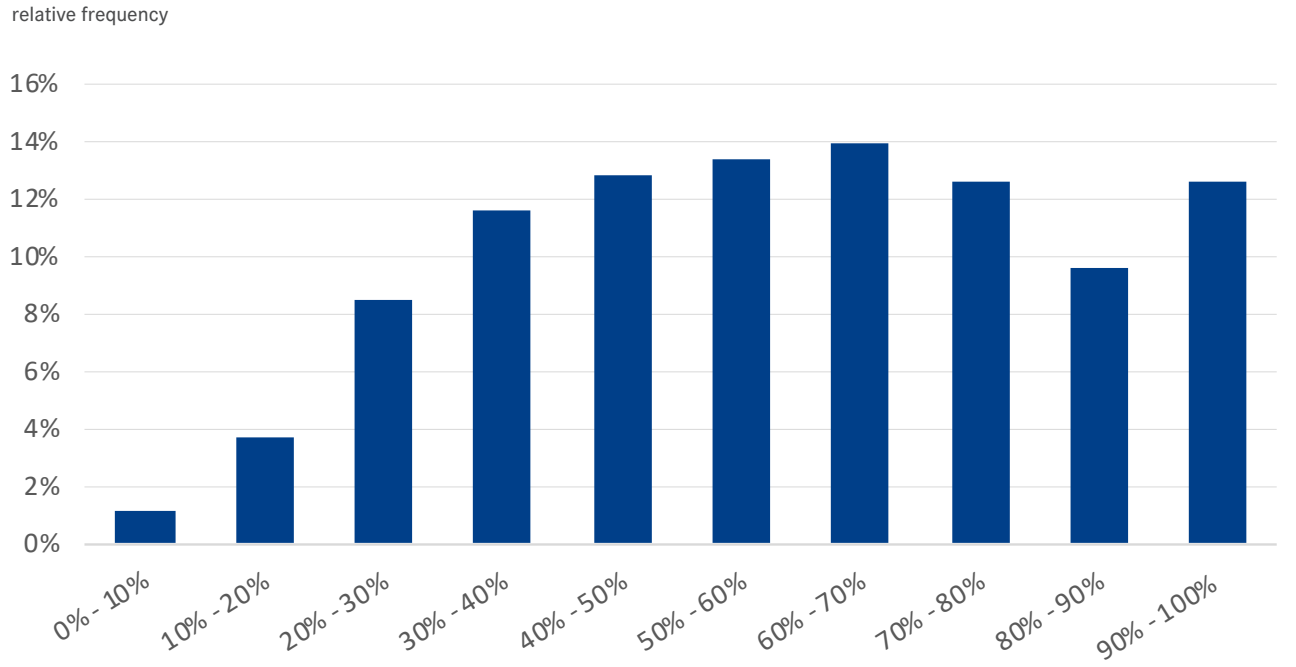
One of the most important indicators for discount certificates is the Maximum Yield Probability.

It provides information about the probability of a discount certificate to achieve the maximum yield at maturity. In other words: The Maximum Yield Probability gives information about the probability that the price of the underlying asset will be at or above the cap on the valuation day of the discount certificate.

The following picture emerges for the discount certificates examined:

- For 62.20%of the certificates, on the first observation day the probability of reaching the maximum yield was above 50%.
- For 12.66% of the certificates, the probability of reaching the maximum yield was over 90%.
- The average maximum yield probability of the analyzed certificates was 58.91%.

Chart 9: Distribution of Maximum Yield Probability



RESULTS

Insights on Maximum Yield Probability

Usually, the underlying price of discount certificates with a high Maximum Yield Probability is either near or above the cap. Hence, yields to be achieved are generally lower than those for certificates with a lower Maximum Yield Probability.

A low Maximum Yield Probability in general goes along with an underlying price far below the cap, i.e. the chance for the underlying to reach the cap (=maximum yield), is smaller, which then in general results in higher maximum yields.

At the beginning of 2020 from 1 January to 15 February, i.e. before Covid 19 and before the deep plunge in the markets, the average Maximum Yield Probability on the first observation day of a certificate was at 67.20% due to the favorable market environment and the relatively high price level of the underlying instruments. However, this changed in the course of the year and the probability for newly issued certificates to reach maximum yield went down to an average of 52.50% in Q2, 49.91% in Q3 and 50.32% in Q4.

The following table illustrates the Maximum Yield Probability for discount certificates in 2020 and the respective average yields that were achieved on the last observation day of the certificate.

Maximum Yield Probability	Average Certificate Yield p.a.
20% to 30%	14.74%
30% to 40%	14.26%
40% to 50%	9.55%
50% to 60%	5.89%
60% to 70%	2.70%
70% to 80%	-1.23%
80% to 90%	-7.78%

Key Takeaways for Maximum Yield Probability in 2020

For an investor, opting for a high Maximum Yield Probability in 2020 in general resulted in low or even negative average certificate yields on the last observation day due to the sharp drop in the markets in March and the special overall market environment.

Investors who took a greater risk and selected a certificate with a lower Maximum Yield Probability, i.e. a higher distance of the underlying to the cap were in general rewarded with a higher yield.

RESULTS

3 Key Messages

Further statements can be derived from the results of our investigation:

- For certificates with a positive distance to the cap on the first observation day – i.e. the underlying price was below the cap – the average yield was 6.52% p.a.. This applied to 25.12% of all discount certificates under review.

- 74.88% of the certificates had a negative distance to the cap on the first observation day, i.e. the underlying price was above the cap; of those, the number of certificates with a positive yield on the last observation day was 76.28% ; however, the average yield achieved was at -0.54% p.a.

- For 82.38% of the certificates under review, of which the price of the underlying asset was above the cap on the first observation day, i.e. those with a negative distance to the cap, the underlying price was also above the cap on the last observation day.

- For certificates with a relative discount of at least 10%, the average yield was 3.83% p.a. This was the case for 76.36% of the certificates.

- With a relative discount of less than 10% on the first observation day – this applied to 23.64% of the certificates – the average yield was -7.15% p.a.

- With an implied volatility of at least 30% on the first observation day, the average yield was 8.04% p.a. This was the case for 47.41% of the certificates.

- 80.29% of the certificates with a maximum yield below 10% p.a. on the first observation date retained their maximum yield also on the last observation date, i.e. the underlying was above the cap.

- Of the 32,508 certificates issued in the second quarter, 90.28% maintained their maximum yield on the last observation date, i.e. the underlying was above the cap.

RESULTS

4 Explanations on the Certificate and Underlying Yields

As shown in the study, the average yield of all discount certificates in 2020 of 1.24% p.a. differs significantly from the average yield of maturing certificates in 2020 (-17.72% p.a.).

One of the reasons for this difference is that many certificates issued in 2020 did not mature in the same year but were still active on the last observation day when the certificate yield was calculated. This applied to 89,616 certificates. Thus the favorable market environment at year end contributed positively to the average yield of those certificates that were still running at the turn of the year.

Obviously, this positive effect is not or only to some extent included in the certificates maturing in 2020. Of these, many certificates matured in February, March and April 2020 (15,283) when the markets were significantly down; here, the average certificate yield was at -80.48% p.a. which contributed to the poor average yield of all certificates maturing in the course of the year.

The difference between the average certificate yield of 1.24% p.a. and the average underlying yield of 16.97% p.a. in the difficult market environment in 2020 is partly due to the fact that during the upward moving markets after the year low in March, many underlyings were able to realize a spectacular rebound with a performance of 50% or more, while the yield of discount certificates was limited to the cap.

This is well illustrated by the performance of certificates issued in the second quarter 2020 (32,508 certificates) after the deep plunge in the market: 90.28% of certificates issued from April to June maintained their maximum yield on the last observation day, i.e. the underlying instrument was above the cap.

In detail, the following picture emerges for certificates issued in 2020 and their underlying instruments:

Time of issue	Average Yield of the Certificate p.a.	Average Yield of the Underlying p.a.
Q1	5.66%	30.83%
Q2	14.52%	49.29%
Q3	17.54%	43.77%
Q4	20.97%	56.93%

6 DESCRIPTION OF THE MARKET AND LICENSE INFORMATION

DESCRIPTION OF THE MARKET

In Germany, the volume invested in structured products amounted to around 70.2 billion euros at the end of 2020. Discount certificates accounted for approximately 4.9% of this total. (Source: DDV).

At the Stuttgart and Frankfurt stock exchanges, the volume traded in investment products amounted to 11.31 billion euros in 2020. Discount certificates accounted for 5.17 billion euros of this total. This corresponds to a share of more than 45%.

A total of 416,242 investment products were listed in Stuttgart as of 31 December 2020, of which 154,182 were discount certificates.

The relatively high share of discount certificates in the total investment products reflects the high attractiveness of this product category in Germany, even in highly volatile markets like we saw in 2020.

LICENSE INFORMATION

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S&P 500® is a registered trademark of Standard & Poor's Financial Services LLC.

Dow Jones Industrial Average® is a service mark of Dow Jones & Company Inc.

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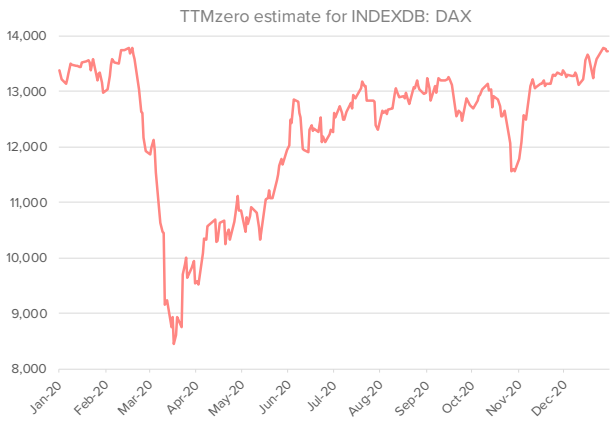
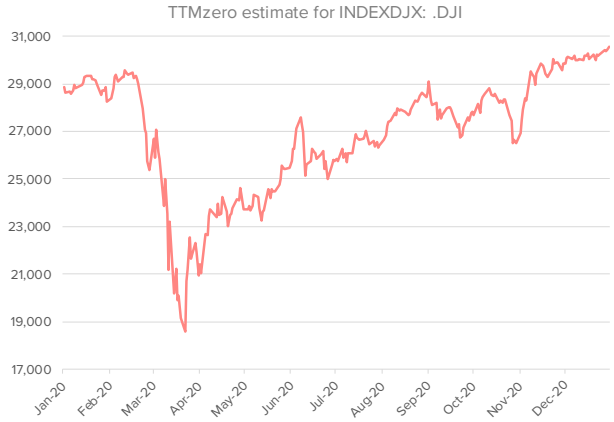
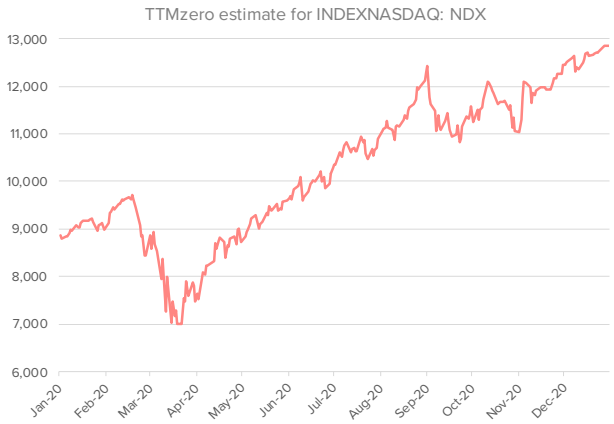
7 PERFORMANCE OF THE 5 INDICES

PERFORMANCE OF THE 5 INDICES

The 5 indices that are part of the examined underlyings all show a similar performance for 2020.







The charts are based on real-time estimates calculated by TTMzero.

TTMzero provides real-time prices for a large number of financial instruments such as all major indices, stocks, currencies, crypto currencies, futures and commodities.

8 TTMZERO, BÖRSE STUTTGART AND ABOUT DDV

The study was conducted by TTMzero together with the Stuttgart Stock Exchange on behalf of the German Derivatives Association (DDV).

TTMzero

TTMzero, part of United Fintech since 2021, is a technology company from Berlin-Brandenburg, which offers products and solutions in the area of RegTech and Capital Markets Tech for the financial sector.

The company's expertise lies in the independent valuation of financial instruments and the calculation of risk indicators. In addition, the product range includes a variety of real-time data products such as key figures for structured products and Software-as-a-Service (SaaS) solutions. These products support financial institutions and capital markets participants in the automation of pre- and post-trade processes and the optimization of valuation data.

TTMzero calculates the key figures presented in the study in real-time for all discount certificates. Investors can view these, as well as the real-time prices calculated by TTMzero for the underlying instruments, on relevant finance portals. From December 2021, key figures for certificates will also be available on the website of the Stuttgart Stock Exchange.

The Stuttgart Stock Exchange (Börse Stuttgart)

The Stuttgart Stock Exchange (Börse Stuttgart) is the private investor exchange and the leading floor trading place in Germany. Private investors can trade shares, securitized derivatives, bonds, ETFs, funds and participation certificates in Stuttgart.

Stuttgart is the market leader in Germany for exchange trading in corporate bonds and the European market leader in securitized derivatives. In the hybrid market model of the Stuttgart Stock Exchange, trading experts ensure reliable and fast order execution. All regulatory and control mechanisms of a public stock exchange are in place to ensure investor protection and transparency.

With a trading volume of around 111.3 billion euros in all asset classes in 2020, the Stuttgart Stock Exchange ranks eighth in Europe.

ABOUT DDV

The Deutscher Derivate Verband (DDV, German Derivatives Association) is the industry body which represents the 15 leading issuers of structured securities in Germany. The members are amongst the most important issuers of certificates in Germany. They represent a domestic market share of more than 90 percent. The work of the association is supported by 17 sponsoring members, which include the Stuttgart and Frankfurt Exchanges, Baader Bank, the direct banks comdirect bank, Consorsbank, flatexDEGIRO, ING-DiBa, maxblue and S Broker, as well as finance portals and other service providers.

DDV's aim is to improve the general political and regulatory conditions for structured products in Germany and at European level, and to encourage increasing numbers of private investors to choose certificates and warrants. The objectives of DDV therefore include making the products more understandable and transparent. To this end, DDV provides a wide range of training and educational opportunities. This includes regular publications such as this „Discount Study". The intention is to provide private investors - professionals and those who want to become professionals - with useful facts in order to make well-informed and self-responsible investment decisions. It is therefore targeted to self-decision-makers as well as investors who seek advice.

The Discount Study is commissioned by DDV for the second time this year.

9 IMPORTANT NOTES & YOUR WAY TO US

IMPORTANT NOTES

This document is a promotional brochure.

For the above information, the sources available and considered reliable have been used. Statements based on these sources represent a non-binding estimate at the time this document was prepared.

The authors of the study make no representations or warranties with regard to the results. In no way are the securities discussed in the study recommended or advertised. The information contained herein does not constitute investment advice. The complete information as well as the risks relating to the discount certificates examined can be found in the respective base prospectus and any supplements thereto, as well as in the respective Final Terms.

The investment products considered in this document are not suitable for every investor, as they may also result in substantial losses. Individual clarification by an investment advisor is recommended.

YOUR WAY TO US

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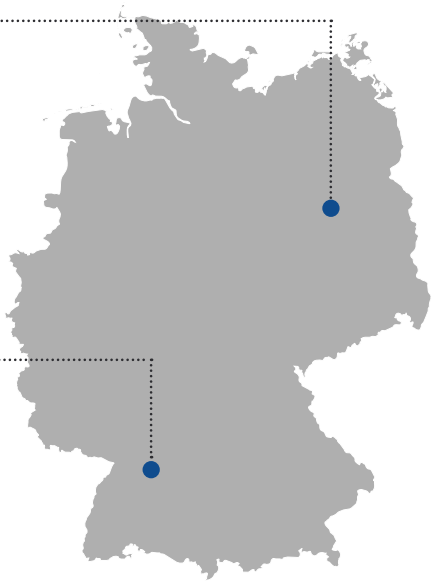

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