The growing importance of exchange-traded funds in the financial markets

Exchange-traded funds (ETFs) are vehicles in the form of investment funds that usually replicate a benchmark index and whose shares are traded on stock exchanges. As such, ETFs differ from traditional open-end investment funds, which are characterised by the fact that fund shares are traded directly with the fund provider. The ETF segment has grown enormously in recent years, making it an increasingly important fixture of the financial markets.

A major driving force behind ETF growth is that investors are given the opportunity to cost-efficiently invest in a diversified portfolio, which also underpins the trend towards passive investment strategies to accumulate assets.

The possible risks involved in making an ETF investment are chiefly the market and credit risk associated with ETFs' underlying assets. In view of their complex structure, however, ETFs can also have specific effects on market liquidity in the financial system. This issue has become the subject of mounting debate between market participants, academics and supervisors, which is why it is one of the focal points of this article.

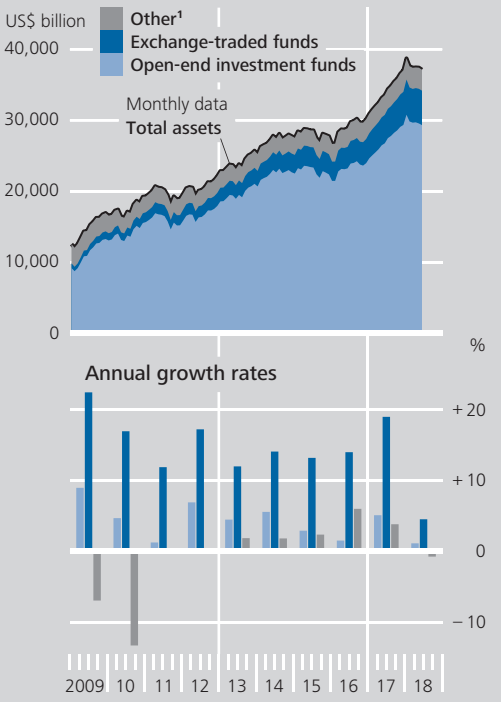
There is a great deal of evidence to suggest that ETFs enhance liquidity conditions in comparatively illiquid asset classes during quiet market phases. What has not been tested up to now, however, is the extent to which this improvement in liquidity generated by ETFs also holds during a protracted period of market stress. It is crucial in this connection that parties known as authorised participants, which play a key role in primary and secondary market ETF trading, function properly. In addition, an analysis of several flash crashes indicates that the way to alleviate possible market disruption depends on how specific market structures are designed.

The evolution of the ETF sector in recent years

Growing importance of ETFs as an investment vehicle

The importance of ETFs as an investment vehicle in the international financial system has grown in recent years. The value of the assets managed worldwide by all types of investment funds stood at US$37.1 trillion at the end of the first half of 2018, of which ETFs accounted for US$5.1 trillion (13.7%) (see the upper panel of the chart below).[1] The biggest of all the investment fund categories remains the traditional open-end investment funds,[2] which hold assets worth US$29.3 trillion. This makes it clear that the ETF sector is still of comparatively negligible significance. However, its growth momentum has been particularly pronounced in recent years. For instance, ETFs accounted for a mere US$0.7 trillion (5.4%) of the assets managed by all types of investment funds back in early 2009. Since then, its share of all fund products has increased significantly, which is attributable to considerably higher growth rates for ETFs compared to those for open-end investment funds (and other investment funds) over the past few years (see the lower panel of the chart on this page). While, for example, the ETF sector expanded by 18.9% in 2017, open-end investment funds and other funds recorded likewise positive but significantly lower growth rates of 5.1% and 3.8% respectively.[3] Despite the high growth rates enjoyed by ETFs, the increase in assets managed by open-end investment funds remains the largest in absolute terms. At US$5.4 trillion in 2017, growth in this segment far surpassed that in the ETF segment, which amounted to US$1.3 trillion in the same period.

Investment fund assets worldwide*



Sources: Morningstar and Bundesbank calculations. * Assets less liabilities (net asset value). 1 Insurance and money market funds.

Deutsche Bundesbank

Stock ETFs: dominant force

Valued at US$3,868 billion, stock ETFs dominated the global ETF sector at the end of the first half of 2018 (see the chart on p. 81). However, bond ETFs have grown in prominence in recent years – holding US$814 billion in assets in the same period, they take second place. With a value of US$129 billion, commodity ETFs make up the third most important segment. All other categories are of secondary importance, each being worth less than US$100 billion.

North America: most important asset region

By far the largest target region for investing via ETFs is North America, which, with 933 ETFs, makes up 57% of ETF assets worldwide (see the lower chart on p. 81). ETFs holding securities that are domiciled in Asia account for 19% of ETF assets worldwide (1,131 ETFs). ETFs with

1 The figures presented here are based on data supplied by the data provider Morningstar and are available from the start of 2009. This means that it is possible to track growth in the wake of the 2008 financial crisis and the associated rise in the importance of ETFs. Data on ETFs can also be found in the Bundesbank's capital market statistics. These cover ETFs established under German law; given the intention to provide a global perspective in this article, these will not be discussed in detail. See Deutsche Bundesbank, Statistical Supplement 2 – Capital market statistics, pp. 73 f.

2 Various definitions can be found in databases and the literature. Strictly speaking, ETFs are also open-end investment funds. However, they are treated here as a sector in their own right – a sector that differs from the "traditional open-end investment fund" sector (hereinafter referred to simply as "open-end investment funds").

3 These developments are not solely attributable to inflows of investor capital. The fund segments' growth dynamics are also affected by price increases. However, the ETF sector's higher growth in relative terms is unlikely to have been chiefly driven by these.

global and European portfolios make up 14% and 9% respectively of ETF assets worldwide (1,414 and 1,181 ETFs).

ETFs: how they work and how they are structured

Intraday ETF trading requires a particular structure

ETFs are investment vehicles that usually track the performance of an index – a stock price index, for example. Unlike open-end investment funds, which are priced and traded only once a day, ETFs can be traded throughout the day on secondary markets (mostly stock exchanges), making them comparable to stocks in this regard. In order to facilitate this intraday trading, ETFs require a structure different to that of open-end investment funds. The latter are designed such that investors trade fund shares directly with the investment company. In line with inflows or outflows, the fund manager then purchases or sells assets (e.g. listed securities) on the stock exchange or in OTC markets. The net asset value (NAV) is the value of all assets in the fund portfolio less its liabilities. The NAV is determined at the end of the trading day and serves as the basis for selling or purchasing fund shares.[4] In the case of both ETFs and open-end investment funds, the securities held in the portfolio constitute a special fund that is protected against direct access by the investment company (or its creditors) in the event of insolvency.

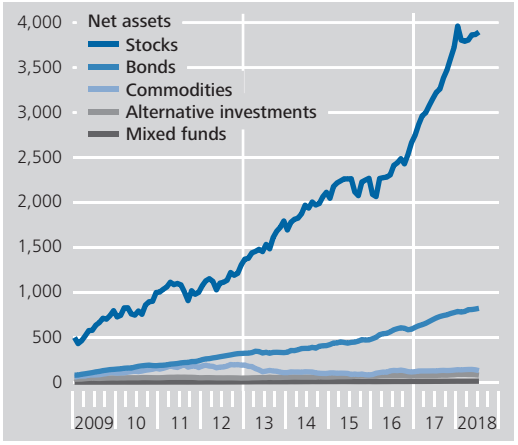
Creation of ETF shares on the primary market

Creation of ETF shares by exchanging securities

ETFs differ from open-end investment funds in that no direct trading takes place between the fund provider and investors. On the primary market, agents known as authorised participants (APs) – typically large financial institutions or specialised market makers – serve as the link between the ETF primary market and the ETF secondary market. In a first step, trading takes place on the primary market, where APs provide a basket of securities[5] (or, in rarer

ETF assets worldwide by investment type

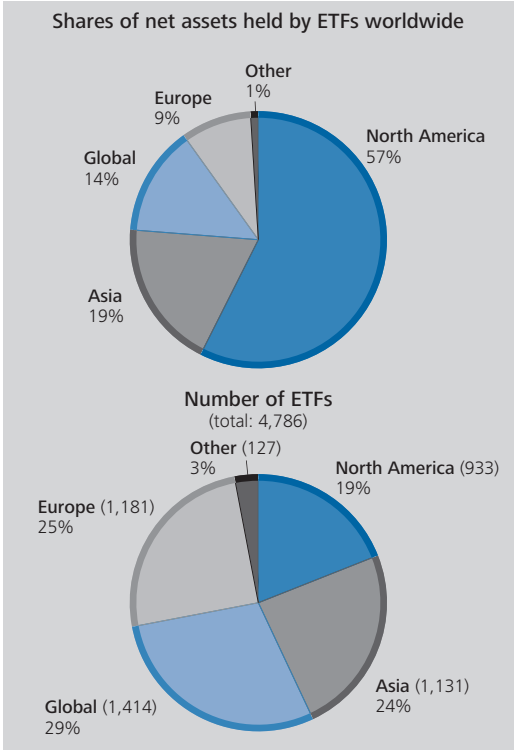
US$ billion, monthly data



Sources: Morningstar and Bundesbank calculations.
Deutsche Bundesbank

Significance of ETFs by asset region

As at July 2018



Source: Morningstar.
Deutsche Bundesbank

4 Some open-end investment funds can also be exchange-traded (on an intraday basis). However, it is difficult to determine a fair price here given that there is no comparison with a benchmark index as there is for ETFs.
5 ETF providers can also hold assets that are not securities. This applies to real estate ETFs, for instance. However, the term "securities" is used consistently throughout this article due to the fact that ETF providers hold securities in their ETF portfolios in the vast majority of cases.

cases, cash) in exchange for ETF shares from ETF providers. These bundles of newly created ETF shares are referred to as creation units and are normally issued in large blocks of 50,000 or, in some instances, multiples thereof. Just as APs can create ETF shares, they can also redeem them by returning creation units to the ETF provider in exchange for securities. This process is often referred to as the creation/redemption mechanism (see the right-hand panel of the chart on p. 83). It should be noted here that APs have no legal obligation to either create or redeem ETF shares. The (trading) costs incurred during this process are usually borne by the AP. The charges incurred for investors amount to less than 1 basis point (0.01%) for most ETFs.[6]

Trading ETF shares on the secondary market

Secondary market: ETF shares bought and sold by end investors

In a second step, investors trade the created ETF shares on the secondary market (see the left-hand panel of the chart on p. 83). Trading typically takes place either on the stock exchange or directly with market makers.[7] In this context, APs may assume a dual role, as they often also operate as market makers on the ETF secondary market. In this way, investors are able to trade individual ETF shares without new ETF shares having to be created or redeemed for such transactions. This makes intraday trading on the secondary market possible. New ETF shares are only created, then, if these are purchased by the investor via an AP, but the AP itself no longer has sufficient holdings of ETF shares and cannot procure them via the stock exchange. High demand for ETF shares amongst investors thus tends to result in the creation of new ETF shares on the primary market. If demand for a certain ETF decreases amongst investors, the AP will ultimately take the ETF shares that it has accumulated, and which are no longer needed, and deliver them to the ETF provider in exchange for securities. The process described here basically boils down to changing the form in which securities are held. Either the ETF shares or the underlying securities are traded on the market. From a macroprudential perspective, however, this can also be accompanied by a change in liquidity risk.[8]

ETFs' net asset value and secondary market price

ETFs' net asset value (NAV) and trading price are connected …

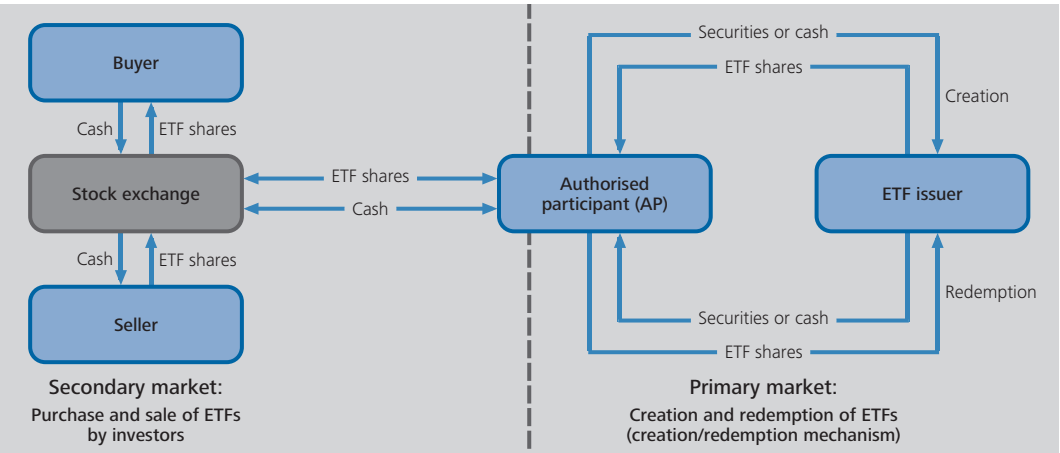
As is the case for open-end investment funds, ETFs generally publish their NAV daily. For ETFs, this is based on an overview of the portfolio of securities held by the ETF provider. It is always generated at the end of the trading day. The daily NAV serves as an important metric for transparent pricing on the stock exchange and facilitates the arbitrage mechanism that underlies the creation/redemption mechanism. The NAV and the price of ETF shares traded on the secondary market may differ from one another over the course of the trading day. As a general rule, the price of ETF shares is derived from the relationship between ETF supply and demand on the stock exchange.

… as a result of arbitrage activities carried out by APs, …

Intraday differences between the prices of securities and ETF shares should tend to be eliminated by APs' arbitrage mechanisms when the NAV is recalculated at the end of the trading day. If, for example, the price of a certain ETF share is below the fair value assumed by the AP, the AP has an incentive to purchase these ETF shares. The AP can hold on to the ETF shares it has purchased until such time as a favourable price emerges at which it can either sell them directly or deliver them to the ETF provider in exchange for securities. However, it is also possible for the NAV and the price of ETF

6 According to I. Ben-David, F. A. Franzoni and R. Moussawi (2017), Exchange-Traded Funds, Annual Review of Financial Economics, Vol. 9, pp. 169-189, the average fee per creation unit created on the primary market is US$1,047, while the median is US$500.
7 The bid and ask prices determined in this connection are risk prices that are executed by the AP immediately without any delay. The market risk assumed by the AP, which is determined by factors such as the liquidity of the underlying securities, is reflected together with additional implicit costs in the bid-ask spreads.
8 This is touched upon in the section entitled "Risks associated with ETFs" on pp. 92 ff.

ETF primary/secondary market mechanism



Deutsche Bundesbank

shares to diverge to a greater extent over the course of several days. This is especially the case for ETFs in less liquid markets, as low liquidity can result in delays in the adjustment of prices of individual securities in the basket of assets and, therefore, of the NAV.[9]

… which serve as key link between primary and secondary markets

The primary/secondary market mechanism presented here is a characteristic that is unique to ETFs. In view of their role as a link between the primary and secondary markets, APs are fundamentally important, with the result that particular attention should be paid to ensuring that they function properly.

Physical versus synthetic ETFs

Physical replication: purchase of securities contained in benchmark index

ETFs can take two different forms – they can replicate a benchmark index physically or synthetically. In the case of physical replication, a distinction is made between full replication and what is known as sampling. Full replication involves the ETF tracking the benchmark index by holding the exact same underlying securities in the ETF provider's basket of assets. This method is suited for stock and bond ETFs that comprise a low number of liquid securities, such as the DAX 30. Using the sampling method, only a selection (or sample) of the securities in the benchmark index are held in the ETF provider's portfolio. This method is an appropriate choice when securities are relatively illiquid and, in particular, the number of securities in the benchmark index is high. In addition to the issue of liquidity – more liquid securities tend to be preferred – the representativeness of the index is also important when making the selection. For example, a US corporate bond ETF would be a good candidate for the sampling method, as this market comprises a total of more than 5,000 different bonds, a vast number of which are relatively illiquid.

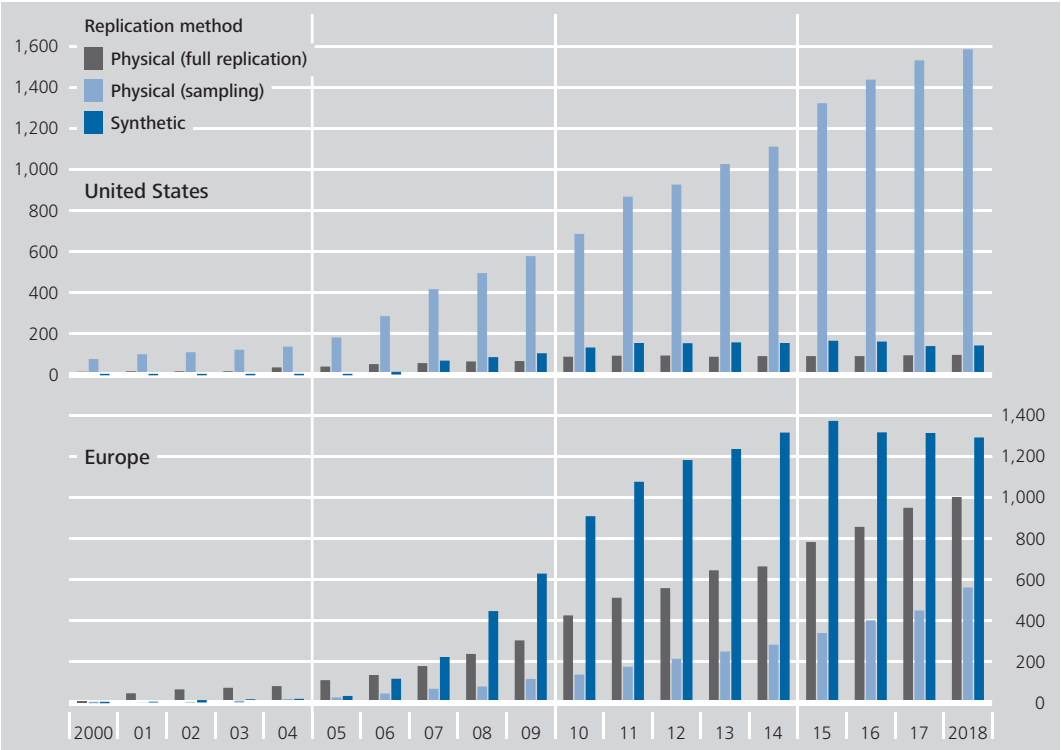
Synthetic replication based on swap transactions

In the case of synthetic ETFs, the index concerned is replicated via derivatives. The ETF provider does not physically hold the basket of securities in this set-up. Instead, the AP receives creation units in exchange for cash. This cash is then exchanged for a basket of securities that does not need to be linked to the index in question. The performance of this basket of securities is then exchanged for the return on the benchmark index by means of a swap contract. This method is chosen if, inter alia, investment restrictions such as trading restrictions or taxation make market access more difficult. However, it is also used for relatively liquid indices

9 See A. Madhavan and A. Sobcyzk (2016), Price Dynamics and Liquidity for Exchange-Traded Funds, Vol. 14, No 2, pp. 1-17.

ETF replication methods*

Number of funds per replication method



Sources: Morningstar and Bundesbank calculations. * Ways in which benchmark index performance is replicated.
Deutsche Bundesbank

such as the DAX 30 and EURO STOXX 50 on cost grounds.

Physical replication is the most common replication method for ETFs in both Europe and the United States. However, while sampling is clearly the replication method of choice for all ETFs currently available in the United States, the picture in Europe is more mixed (see the chart above). While full physical replication and sampling together remain the most common replication method for ETFs here, analysing the three replication forms individually shows that synthetic replication is (still) the most widely adopted method in Europe at this time. The decline in the number of synthetic ETFs in Europe since 2016 appears to be driven by the demand side. Going by market participants' perceptions, the higher degree of complexity, the risks associated with swap transactions and the lack of transparency relating to the securities held in portfolios clearly play an important role.

Available range of investments

Wide range of products available

ETFs typically aim to track the performance of a particular index (passive ETFs). While the first ETFs merely tracked the performance of stock market indices,[10] they are now available for a very wide variety of indices and encompass, inter alia, bond indices, sector indices such as sustainability or electric mobility, and volatility measures such as the VIX.

Smart beta and active ETFs based on specific investment strategies

Smart beta ETFs and active ETFs represent a more recent development and are based on selecting and/or weighting individual securities (following a specific strategy).[11] Their objective is to outperform a benchmark index. Examples of this are pursuing either a value-oriented

10 The first ETF, named SPDR, was set up by State Street in 1993. It tracks the performance of the US stock market index S&P 500 and is now the largest ETF in the world, with market capitalisation of US$289 billion as at September 2018.
11 This makes it clear that ETFs cannot be thought of solely as passive investment strategies.

strategy based on certain metrics such as the price-to-book ratio or following a growth-oriented strategy. Some smart beta ETFs also focus on selecting high-dividend stocks. Additionally, smart beta ETFs can combine various factors. The idea behind this is to leverage diversification and correlation effects.

ETPs are debt securities with a risk profile differing from that of ETFs

In addition to ETFs, there are also exchange-traded products (ETPs). ETPs are debt securities that can be further broken down into exchange-traded commodities (ETCs) and exchange-traded notes (ETNs).[12] While ETCs focus exclusively on tracking the performance of commodities, or on tracking commodities futures or commodities indices, ETNs are debt securities that track the performance of an underlying benchmark index outside the commodities sector. As ETPs are (secured but also often unsecured) debt securities and do not have special fund status, the investor is exposed to the issuer's credit risk when trading in these products. This gives rise to particular risks for the investor that are not comparable to those associated with ETFs.[13]

Leveraged and inverse ETFs available

Also available are ETFs and ETPs that either provide leveraged exposure to the underlying benchmark indices (i.e. they amplify their returns) or track declines in the value of the benchmark indices. These leveraged and/or inverse ETFs and ETPs have a higher value at risk with respect to index performance (for more information, see the box on pp. 86 f.).

Driving forces behind exchange-traded fund growth

The strong growth observed in the ETF sector in recent years reflects its great popularity amongst investors and is attributable to various factors. In terms of growth drivers, it is possible to distinguish between product features, type of usage and structural trends (see the adjacent table), which are detailed below.

ETF growth drivers

Product features	Usage	Structural trends
Intraday trading	Asset allocation (e.g. into asset classes or regions)	ETFs as core investment
Diversification	Simplification of investment processes (e.g. in terms of index weighting, market access)	Search for yield throws spotlight on cost of financial investment in low interest rate environment
Transparent pricing		Regulatory changes
Secondary market trading and additional market liquidity		Shift in distribution
Cost efficiency		

Deutsche Bundesbank

Product features

Intraday trading and diversification are important product features

One major product feature of ETFs is that they combine the advantages of open-end investment funds and stocks. ETFs facilitate investment in diversified portfolios (as for open-end investment funds) and intraday trading on stock exchanges (as for stocks). In addition to greater flexibility with respect to buying and selling, this also enables transparent pricing on account of comparability with the benchmark index in the case of passive ETFs.

Secondary market trading of ETFs and additional liquidity

ETFs often have lower bid-ask spreads than their underlying securities

Additional liquidity generated through secondary market trading is frequently attributed to ETFs. Investors can trade ETF shares without affecting the benchmark index's underlying individual securities. In fact, ETFs are often more liquid than the average of their underlying indi-

12 There is a lack of clarity in the literature with respect to how ETPs are defined. Some of the literature uses the definition outlined here and defines ETPs as a separate investment vehicle that exists alongside ETFs. Other literature describes ETPs as an umbrella term that includes ETFs as one of various subcategories.
13 See A. Madhavan (2016), Exchange-Traded Funds and the New Dynamics of Investing, Oxford University Press, New York.

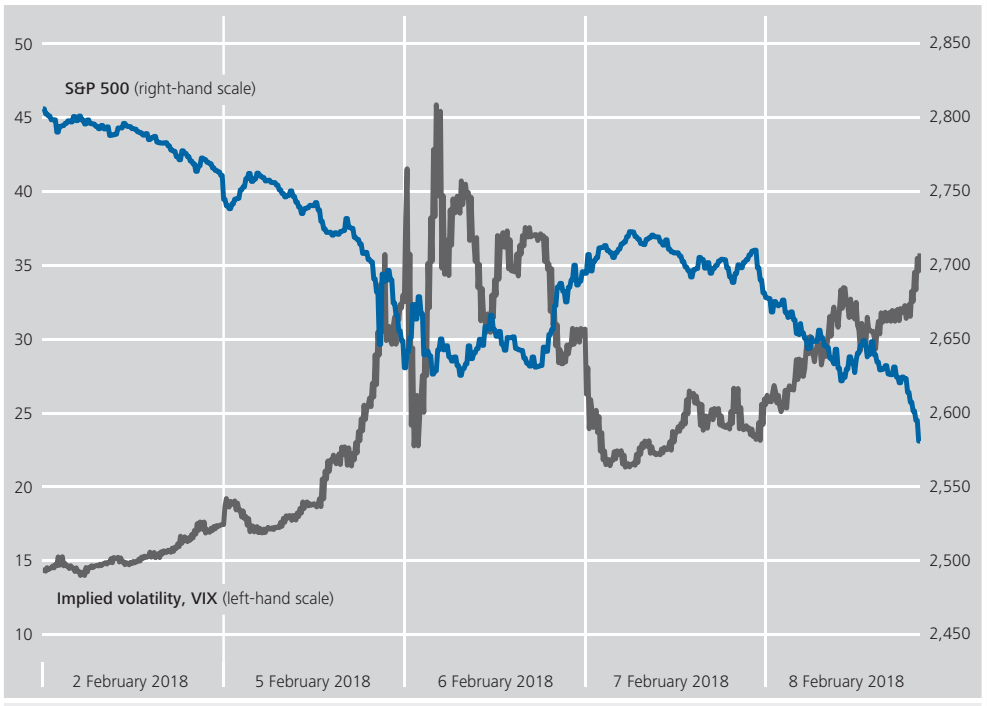
Exchange-traded funds for inverse volatility during the flash crash[1] of 5 February 2018

Through ETFs, investors can participate in the movements of certain volatility measures. There are also products available that are designed to track the inverse performance of a particular volatility index. Owing to the historically low (implied) volatility on the financial markets and the associated positive stock price movements, these products were enjoying growing popularity amongst investors in the lead-up to the flash crash of 5 February 2018. This box looks at a specific ETF offering inverse performance to the VIX volatility index. The commentary is therefore of an illustrative nature and is intended to provide an insight into the highly diverse risks associated with ETFs with respect to price movements.

On Monday, 5 February 2018, the US financial markets were rocked by heavy turbulence late in the trading day. The S&P 500 stock market index closed having fallen around 4% that day. Against the backdrop of this market development, there was a marked rise in implied volatility. Implied volatility reflects current expectations regarding the price swings for a given underlying instrument, so when implied volatility is on a strong upward trajectory, this is often interpreted by market participants as a rise in the "fear barometer". The VIX, which is a measure of implied volatility for the US stock market index S&P 500, rose temporarily over the course of 5 February

1 A flash crash is a rapid, deep and volatile decline in security prices. Automated trading algorithms and high-frequency trading generally play a part in such events, which are also characterised by swift price recovery. See D. Bozdog (2011), Rare Events Analysis of High-Frequency Equity Data, Wilmott Journal, pp. 74-81.

S&P 500 and implied volatility from 2 to 8 February 2018



Source: Bloomberg.
Deutsche Bundesbank

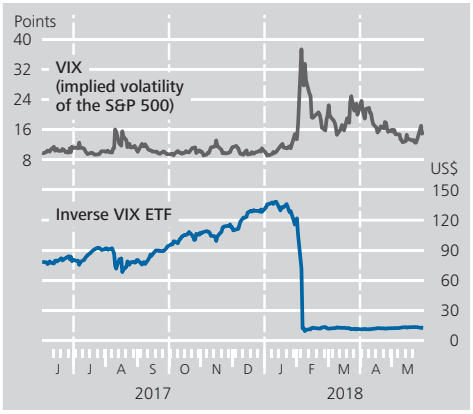
2018 from 17.31 points to 37.32 points – a 116% increase (see the chart on p. 86).

As implied volatility climbed from 5 February 2018, ETFs designed to track the inverse performance of the VIX saw prices tumble. The ProShares Short VIX Short-Term Futures ETF (SVXY) serves here as an example. At the time of the flash crash, it was tracking the daily percentage changes of a synthetic 30-day VIX future,[2] the performance of which is closely linked to the VIX, with a leverage factor of -1.0. In other words, if the 30-day VIX future index rose by 5% on a single trading day, the SVXY would have fallen by 5%. The sharp VIX increase from 5 February 2018 (and the associated upward movement of the synthetic 30-day VIX future) led the SVXY to fall by 91% in the space of four days (see the chart above).[3] It is important to point out here that the ETF provider made explicit reference to this risk in its prospectus and the ETF functioned exactly as described.

The example of the SVXY shows that some ETFs carry a very high profit and loss potential. Whilst an investment in the S&P 500 via an ETF would have resulted in only temporary, manageable losses,[4] investors in the inverse VIX ETF had heavy losses to bear. The case examined here makes plain that the various types of products that exist in the ETF/ETP universe can vary hugely in terms of the level of risk entailed. Furthermore, in periods of stress, these kinds of products may have an impact on the underlying securities or derivatives markets.[5]

VIX and inverse VIX ETF

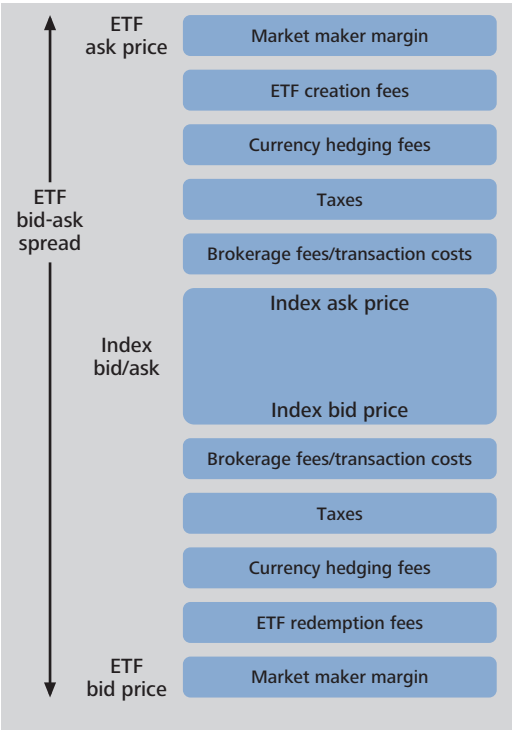
Daily data



Source: Bloomberg.
Deutsche Bundesbank

2 The synthetic 30-day VIX future is a weighted basket of VIX futures with 20 and 50-day maturities.
3 A new factor of -0.5 was introduced on 28 February 2018, and this has contributed to the SVXY's smaller percentage price swings since then. In addition, following the significant price declines in February 2018 and owing to the lower basis, the percentage changes are leading to less pronounced fluctuations in absolute terms.
4 ETFs tracking the development of the S&P 500 (such as the SPDR) only fell by around 6.5% between 5 and 8 February 2018, and on 26 February 2018 had already surpassed 2 February 2018 levels again.
5 For more on the behaviour of ETFs in periods of market stress, see the box on pp. 97 ff.

ETF costs contained in the bid-ask spread



Deutsche Bundesbank

vidual securities (see the box on pp. 89 ff.). However, this liquidity advantage is probably largely at play during periods of low volatility on the financial markets. By contrast, the secondary market liquidity generated by ETFs can potentially dry up quickly, particularly during periods of pronounced market stress.[14]

Cost efficiency

Whilst ETFs have cost advantages over open-end investment funds, …

Another product feature of ETFs is their high cost efficiency, especially in comparison with traditional investment funds, some of which currently charge considerable fees for active management. On the one hand, actively managed open-end investment funds sometimes incur higher charges which do not apply to ETFs (such as transfer agent fees). As ETF trades on the secondary market are not performed with the fund provider directly, front-end loads are either lower or non-existent. On the other hand, awareness of price competition and cost sensitivity in relation to open-end investment funds do not appear to have been particularly pronounced amongst investors in the past.[15] However, the differences in cost between various investment vehicles are likely to have become more important to many investors recently, as the percentage of the expected total return accounted for by costs is higher in many asset classes in the low interest rate environment. A further reason behind the higher cost efficiency of ETFs lies in their structure. For example, the costs arising during the creation process on the ETF primary market, such as the bid-ask spread of the underlying securities, broker fees, taxes, exchange charges and AP fees (see the adjacent chart) are only incurred once and, over time, are spread across the different investors who trade in ETF shares on the ETF secondary market.

… it is unclear whether open-end investment funds systematically generate higher returns than ETFs

If active fund managers are not able to outperform the market as a whole (benchmark index), investors would not be compensated for the higher costs of actively managed funds by excess returns. Based on the assumption that the asset markets are informationally efficient and no costs are incurred when procuring and processing information, securities reflect all the information available at any given time, meaning that excess future returns cannot be predicted.[16] Actively managed funds would be crowded out of the market under such conditions.

14 The problems associated with this "illusion of liquidity" are discussed in greater detail in the section entitled "Risks associated with ETFs" on pp. 92 ff.
15 A study published in 2017 by the Financial Conduct Authority (FCA), which is responsible for the regulation of the financial market and its infrastructure in the United Kingdom, found that price competition among British active fund managers is weak, and that retail investors are barely aware of the significance of management fees. For more information, see Financial Conduct Authority (2017), Asset Management Market Study – Final Report.
16 See B. B. Jonathan and R. C. Green (2004), Mutual Fund Flows and Performance in Rational Markets, Journal of Political Economy, Vol. 112, No 6, pp. 1269-1295. It should also be noted that investors may possess differing amounts of information and that the process of procuring information can incur charges. See S. J. Grossman and J. E. Stiglitz (1980), On the Impossibility of Informationally Efficient Markets, The American Economic Review, Vol. 70, No 3, pp. 393-408.

Liquidity analysis of exchange-traded funds

The bid-ask spread can be used as a simple measure of market liquidity. This metric is used here to gauge whether ETFs are more liquid than their underlying basket of securities or the relevant benchmark index. Various trading venues (Germany: Frankfurt, Xetra; United States: New York, NYSE; Europe: respective national trading venues) and asset classes (stocks and bonds) are considered.

To analyse stock index ETFs, the normalised bid-ask spreads – defined as the bid-ask spread as a percentage of the closing price – are compared, on a weekly basis, with the weighted average bid-ask spreads of the stocks included in the relevant benchmark index for the period from January 2013 to December 2017. The three ETFs analysed here consistently have a lower normalised bid-ask spread than their underlying benchmark indices. In the period under review, the iShares Core DAX UCITS ETF (DE) (DAXEX) has a bid-ask spread of 3.9 basis points. The volume-weighted average of the individual securities in the benchmark index (DAX 30) comes to 4.5 basis points, which is 0.6 basis point higher than the ETF (see the adjacent chart).

Similar results can be seen for the S&P 500 index and FTSE Europe. In both cases, the bid-ask spreads of the ETFs are again lower than the average of the volume-weighted individual securities (see the table on p. 90). However, it should be noted that, for each of the three regions and benchmark indices, the ETF with the highest total net assets was chosen. This is likely to result in higher than average "liquidity advantages" compared with other ETFs for the same benchmark indices.

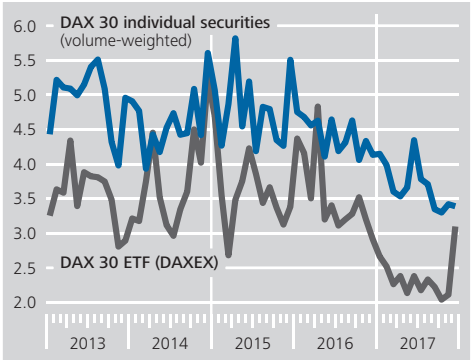
There are discernible differences not just between ETFs and benchmark indices, but also between the various trading venues. In the United States, both the ETF and the benchmark index tend to have lower bid-ask spreads than the corresponding metrics in Europe and Germany, though the spreads for the FTSE Europe ETF are lower than those for the DAX 30 ETF. This reflects the higher average trading volume of the S&P 500 and an overall higher level of net assets in the US market compared with Europe and Germany.

The situation is similar in the bond segment. Owing to the large number of assets in the underlying benchmark indices, a different method is used to analyse bond ETFs. The bid-ask spread is measured as at a specific reporting date (12 July 2018) and the benchmark index is based on self-generated baskets of securities based on the respective ETFs (see the chart on p. 90).

As with stock ETFs, ETFs in the emerging market and corporate bond segments are shown to have greater liquidity than their

DAX liquidity: ETF versus individual securities*

Basis points



Source: Bloomberg. * Liquidity measured on the basis of the normalised bid-ask spread.
Deutsche Bundesbank

Bid-ask spread of ETFs and the underlying benchmark indices (normalised bid-ask spread in basis points)*

Region	Index	Index spread	ETF	ETF spread	Difference between index spread and ETF spread
Germany	DAX 30	4.5	DAXEX	3.9	0.6
United States	S&P 500	2.5	SPY	0.5	2.0
Europe	FTSE Europe	4.5	VGK	1.9	2.6

Sources: Bloomberg and Bundesbank calculations. * The normalised bid-ask spread is defined as the bid-ask spreads as a percentage of the (daily) closing price. All figures are based on weekly values for the period from 1 January 2013 to 29 December 2017. For all three regions and benchmark indices, the most important ETFs – measured by total net assets – were chosen. This is the iShares Core DAX UCITS ETF (DE) (DAXEX) for the DAX 30, the SPDR 500 ETF (SPY) for the S&P 500, and the FTSE Europe All Cap Net Tax (VGK) for the FTSE Europe.

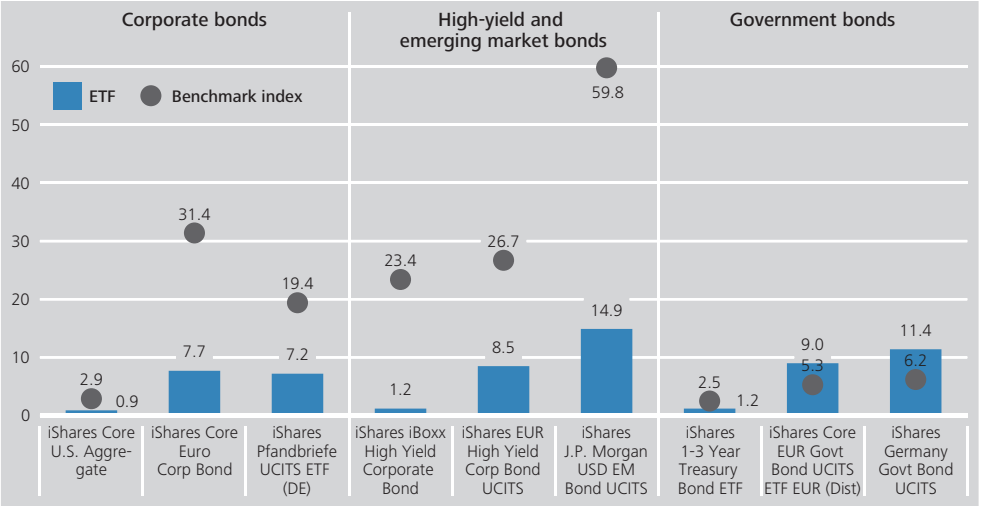
Deutsche Bundesbank

underlying reference assets. In the government bond segment, however, there are no notable differences between the liquidity of ETFs and the corresponding basket of bonds. The bid-ask spread of the ETF tracking US Treasuries, for example, is only slightly lower than that of its basket of securities, while the spreads of European and German government bond ETFs are somewhat higher than those of their underlying baskets.

With regard to the liquidity effects of ETFs on their underlying basket of securities, no definitive conclusion has been reached. On the one hand, ETFs could cause liquidity to increase, as authorised participants (APs) can reduce or eliminate price differences

Liquidity of bond ETFs and their benchmark indices*

Normalised bid-ask spread (in basis points)



Source: Bloomberg. * The normalised bid-ask spreads for the benchmark indices were calculated on a volume-weighted basis for 12 July 2018. In the case of the iShares Pfandbriefe UCITS, the iShares J.P. Morgan USD EM Bond ETF, the iShares 1-3 Year Treasury Bond ETF, the iShares Core EUR Govt Bond UCITS and the iShares Germany Govt Bond UCITS, all individual securities were included in the calculation of the volume-weighted, normalised bid-ask spread. In the case of the following ETFs, the calculation included individual securities from their baskets of securities: the iShares EUR High Yield Corp Bond UCITS (180 individual securities; 47% of assets under management (AUM)), the iShares iBoxx High Yield Corporate Bond (180 individual securities; 38% of AUM), the iShares Core Euro Corp Bond (90 individual securities; 10% of AUM) and the iShares Core U.S. Aggregate (90 individual securities; 35% of AUM). If all securities in the ETFs had been included in the calculation for the benchmark indices – i.e. 100% of AUM – the result would probably have been higher bid-ask spreads, as the securities not included tend to have comparatively low liquidity (and therefore comparatively higher bid-ask spreads on an individual basis). As such, it is likely that the difference between the benchmark index and the ETF actually tends to be underestimated for this group.

Deutsche Bundesbank

between ETF shares and the basket of securities via arbitrage.[1] On the other hand, trading in ETF products could give rise to a crowding-out effect, whereby market participants who would otherwise have traded individual securities directly may now invest indirectly via ETFs and thus divert liquidity away from the market for individual securities. This transmission mechanism could gain further significance given sustained growth in the ETF sector.

The analysis presented here shows that ETFs – at least those with high investment volumes in calm market phases – have lower (normalised) bid-ask spreads than the average of their underlying individual securities. However, this "liquidity advantage" may dissipate in times of market stress and could even be reversed in extreme cases.[2]

1 An analysis of the French CAC40 index reveals that the bid-ask spread narrows in the short and long term after the launch of an ETF. See R. De Winne, C. Gresse and I. Platten (2009), How Does the Introduction of an ETF Market with Liquidity Providers Impact the Liquidity of the Underlying Stocks?, Working Paper.
2 For an analysis of ETFs in periods of market stress, see the box on pp. 97 ff.

Even if the assumption of informationally efficient markets charging no transaction costs does not hold, a passive investment strategy (using ETFs) can be optimal. To the extent that potential outperformance represents a zero-sum game – the excess return over the benchmark index achieved by some active fund managers must be offset by other active fund managers' excess losses compared with the benchmark index – the average return generated by active management (excluding costs) would correspond to the return on the benchmark index, which can be replicated by an ETF.[17] Taking management fees into account, then, the achievable average return would be lower for active investors than for passive investors.[18]

It is, however, conceivable that informed active fund managers systematically generate higher returns than other uninformed active investors.[19] Furthermore, the zero-sum game argument only applies to static portfolios. Be that as it may, passive fund managers must also adapt their portfolios in practice – when index adjustments are made, for example. This results in predictable trading patterns and creates particular profit opportunities for active managers. In summary, it can be concluded that there is limited opportunity, if indeed any, for active fund managers to systematically outperform the benchmark index. Even where this is possible, the resulting profit would have to cover the management fees charged by active investment funds.

17 An exception to this would be if non-investment fund investors systematically underperformed investors in open-end investment funds.
18 For a discussion of potential outperformance by active investment funds, see also V. Sushko and G. Turner, The implications of passive investing for securities markets, BIS Quarterly Review, March 2018, pp. 116-117.
19 See L. Barras, O. Scaillet and R. Wermers (2010), False Discoveries in Mutual Fund Performance: Measuring Luck in Estimated Alphas, The Journal of Finance, Vol. 65, No 1, pp. 179-216.

Usage

Passive fund management but active allocation decisions on the part of investors

With regard to the use of ETFs, their great significance for the allocation of capital must be stressed. ETFs are by no means a purely passive investment vehicle. Investors pursue an investment policy and must decide, for example, which region (e.g. Europe versus the United States) their ETF portfolio should be invested in, as well as choosing the level of specialisation (broad diversification versus niche investment) and an asset class (e.g. bonds or stocks). These decisions are usually made on the basis of the risk exposure and expected return on an investor's portfolio.[20] The passive element of an ETF is that the fund manager makes no active decisions as to whether certain securities in an index should be overweighted at a certain point in time. The asset managers track the performance of the relevant index as precisely as possible in a purely passive manner. The combination of actively selecting a specific investment policy and passive fund management is also called a semi-active strategy.

Investment processes facilitated by easier market access, inter alia

Overall, ETFs can simplify investment processes. For example, it is far simpler to purchase an ETF for the DAX 30 than the 30 underlying index components. Even in the event of index adjustments (for example, new weightings or risers/fallers), investors do not have to become active. Furthermore, ETFs can facilitate market access. Via ETFs investors can invest in otherwise less liquid investment segments such as corporate bonds. Constraints and barriers in certain countries, such as trading restrictions on securities or taxes, can also be overcome by means of synthetic replication by ETFs. Simplified investment processes via ETFs are also useful to small-scale investors or savers accumulating assets (to bolster pension provisions), as they can encourage a more balanced mix of investments.

Structural trends

ETFs increasingly the focus of core investment strategies

The structural trends identifiable in asset management over the past few years represent a further driver of ETF growth. Passive asset allocation is increasingly becoming the preferred focus of the overall investment strategy (core investment). In addition, the low interest rate environment is shifting investors' focus to the cost of investing. In the wake of the financial crisis, furthermore, adjustments were made to the regulatory framework (as part of Basel III, Solvency II and MiFID II, for example), and this may have changed the investment behaviour of market participants. In this vein, some market participants have since found investment in asset classes such as a direct investment in derivatives to be a less attractive prospect, and ETFs may have profited from this. This could create an incentive to construct a similar risk/return profile using specific ETFs without directly investing in the relevant asset class. The new sales channels established in the past few years, such as online banking and the emergence of digital asset managers which use "robo advisors",[21] for instance, are likely to have contributed to the strong growth of ETFs.

Risks associated with ETFs

Risk of underlying assets in the benchmark index highly significant for ETF risk

The risks associated with investing in ETFs should not be primarily assessed based on whether or not an investor could potentially suffer a financial loss. Individual securities and open-end investment funds are subject to considerable price volatility which can give them

20 It can be demonstrated that up to 90% of a portfolio's return is dependent on the investment policy. See G. P. Brinson, J. J. Diermeier and G. G. Schlarbaum (1986), A Composite Portfolio Benchmark for Pension Plans, Financial Analysts Journal, Vol. 42, No 2, pp. 15-24 as well as G. P. Brinson, B. D. Singer and G. L. Beebower (1991), Determinants of Portfolio Performance II: An Update, Financial Analysts Journal, Vol. 47, No 3, pp. 40-48.
21 Robo advisors are products offered by FinTech firms which digitalise and automate financial services. Investment decisions are made based on the investor's previously established risk appetite using rule-based models which control the creation, monitoring and adjustment of the portfolio.

profit and loss potential, and the same applies to ETFs. For instance, the market risk associated with an ETF investment cannot be regarded as a risk exclusive to ETFs. Rather, it is important to distinguish whether ETFs pose a particular additional risk compared with other asset classes – especially the individual securities in the benchmark index – and whether certain risks have simply been insufficiently addressed. Against this backdrop, this article will examine liquidity risk, counterparty risk and risks related to price formation, including in the form of potential procyclical developments in the financial markets. The phenomenon of common ownership structures will also be touched upon in the context of ETFs.

Liquidity risk

Secondary market liquidity generated by ETFs can dry up quickly in phases of market stress, …

Due to the particular structure of ETFs, with their primary/secondary market mechanism, risks resulting from potential imbalances between the liquidity of the ETF and that of the underlying securities can arise. ETF providers may be obligated to buy back ETF shares on request at short notice. The risk here is that in the event of a price drop, the providers may be unable to liquidate the securities held in their portfolios in a timely manner. In a higher illiquidity scenario such as this, the trading price of ETF shares could fall below the value of the underlying portfolio (NAV). This is particularly problematic when investors take market conditions in calm periods to draw conclusions about conditions amidst adverse market trends (known as the liquidity illusion). The liquidity transformation of relatively illiquid securities from an index into more liquid ETF shares, which is carried out when the market is calm, could quickly be reversed in periods of stress, should investors sell ETF shares on a large scale.

… with ETFs for less liquid asset classes in particular appearing susceptible

Problems can occur particularly with ETFs with less liquid underlying baskets of securities (e.g. corporate bond ETFs or emerging market ETFs). Here, there can be strong pressure to sell in times of market stress (for more on the behaviour of ETFs in periods of market stress, see the box on pp. 97 ff.). Whilst investors in open-end investment funds can generally redeem their shares at the NAV, in the case of ETFs discrepancies can arise between the NAV and the ETF's trading price, which is the price relevant to the investor. If investors expect the ETF price on the stock exchange to fall below that of the underlying basket of securities, it would be rational for them to offload ETF shares as quickly as possible (first-mover advantage[22]), amplifying negative price effects. This may result in the entire redemption process being brought forward, thereby exacerbating liquidity problems or even creating such problems in the first place. Any pressure to sell could also be amplified due to a lack of dampening mechanisms in the ETF sector such as lock-up periods for hedge funds or minimum holding periods and redemption notice periods for real estate funds.[23]

The significance of authorised participants in times of market stress

Potential disruptions to the functioning of APs during periods of stress …

In times of high market stress, falling prices and high volatility, there is a risk that APs will no longer fulfil their intended role as a link between the ETF secondary and primary markets. This is particularly important if APs assume a dual role, operating simultaneously as market makers on the secondary market. A lack of reliable price information about the underlying securities or balance sheet restrictions may be responsible for this.[24] It is also important to note that risks can be transferred from the ETF provider to the AP when performing cash

22 For more on the relationship between price formation and the first-mover advantage in the case of ETFs, see also International Monetary Fund, Navigating Monetary Policy Challenges and Managing Risks, Global Financial Stability Report, April 2015, Chapter 3, pp. 101-103.
23 See Deutsche Bundesbank, Financial Stability Review 2011, p. 31.
24 Aside from this, APs could feel induced, under certain conditions, to utilise the ETF creation and redemption process to manage portfolio risk, rather than attempting to offset mispricing in the markets. For more information, see K. Pan and Y. Zeng (2017), ETF arbitrage under liquidity mismatch, European Systemic Risk Board Working Paper, No 59.

transactions on the primary market. The ETF provider initially assumes the price risks associated with trading the securities, for which it charges the AP a fee. Moreover, ETF providers often ask the AP to provide cash collateral, for example if trading in the underlying securities markets has closed due to time zone differences. In order to mitigate risk further still, some providers ultimately make contractual arrangements reserving the right to switch from payment in cash to payment in kind (in exchange for securities).[25] In this set-up, the securities, and thus the price risk associated with the sale, pass completely from the ETF provider to the AP.

… can lead to discrepancies between the ETF price and its NAV

To account for this heightened risk, APs might respond by widening the bid-ask spread and/or trading ETF shares at a considerable discount to the NAV. (Temporarily) suspending redemption of ETF shares would be another possible reaction. As a result, the ETF's NAV and the market price of the ETF shares could diverge further.[26] In addition, many APs trade with several ETFs, meaning that different funds could be affected by market tensions. Due to the critical significance of APs, it would therefore be preferable for ETF providers to be affiliated with a large number of APs so that a possible withdrawal of an individual market player could be compensated for more easily.[27] However, this possibility could be severely limited for some market segments as precise knowledge of the specific market is needed for less liquid and/or complex benchmark indices, which is expertise that potentially only a few APs possess.

Number of APs per ETF varies

Due to the limited nature of disclosure requirements applying in this area, information available as to the number of APs that ETF providers are contractually linked with is by no means comprehensive. These data gaps make it hard to conduct a detailed analysis of such links. Where it is possible to obtain lists of ETF providers, these mostly constitute overviews of all of the APs with which an ETF company works for all of its ETF products and do not normally contain breakdowns showing which individual ETFs are linked to which APs. Information from studies and reported anecdotally by market participants indicates that there is significant variation in terms of the number of APs per ETF. While large ETFs will often have contractual links with more than 30 APs, smaller niche ETFs (such as those for emerging markets) may have far fewer.[28] But a simple statement of the number of APs contractually linked to an ETF does not reveal a great deal as to the actual activity levels of those APs. The number of active APs is often fewer than five, and even less in the case of niche products.[29] Adverse market developments, in particular, could see the number of APs which are actually active reduce still further – and even fall to zero in extreme cases. Given the major importance of APs as a link between the primary and secondary markets, it would be wise to work towards greater transparency in terms of the (contracted) number of (active) APs per ETF.[30]

Safeguards in the event of disruption to the primary/secondary market mechanism

While a total breakdown of AP activities seems unlikely, it cannot be entirely ruled out in an extreme stress scenario triggered by a systemic

---

25 Furthermore, some ETF providers can limit the daily redemption volume per AP or overall, or extend the repayment deadline. This means that the provider has a longer period to sell securities, but leads to a delayed inflow of liquidity for the AP.

26 Some trading platforms employ protective measures when faced with strong price fluctuations. For example, the trading platform Xetra has "circuit breakers" which interrupt continuous trading as soon as potential execution prices exceed predetermined price ranges. These are defined on the basis of historical volatility.

27 See Deutsche Bundesbank, Financial Stability Review 2013, pp. 42-43.

28 Regarding US ETFs, see M. Lettau and A. Madhavan (2018), Exchange-Traded Funds 101 for Economists, Journal of Economic Perspectives, Vol. 32, No 1, pp. 135-154; and R. Antoniewicz and J. Heinrichs (2015), The Role and Activities of Authorized Participants of Exchange-Traded Funds, Investment Company Institute, Washington, DC.

29 See G. Turner and V. Sushko, What risks do exchange-traded funds pose, Banque de France, Financial Stability Review, No 22, April 2018.

30 The importance of transparency in relation to APs has also been stressed by the Central Bank of Ireland in a consultation paper on ETFs. See Central Bank of Ireland, Feedback Statement on DP6 – Exchange Traded Funds, September 2018.

ETF providers obligated to buy back shares as a way of protecting investors

event, for instance. In a case such as that, the only option left to ETF investors would be to return shares to the ETF provider directly. This process is governed by guidelines issued by the European Securities and Markets Authority (ESMA).[31] In their prospectuses and market communications, ETF providers should first draw attention to the fact that the purchase and sale of ETF shares usually takes place on the secondary market with the assistance of an intermediary, meaning that there can be discrepancies between the NAV and ETF share prices. Where the value of the ETF shares varies significantly from the NAV – such as in the case of market disruption in the absence of a market maker – the investor should be allowed to sell them back directly to the ETF provider. In situations such as this, the ETF provider would be obligated to inform its investors that they can opt to redeem their shares directly with the provider. The exact process and the costs involved (which must not be excessive) should be disclosed in the ETF provider's prospectus.

Legal provisions are complex

The option to return ETF shares directly to the ETF provider is an important feature for protecting private investors. Given this role, it is significant that the ESMA guidelines leave ETF providers with scope in terms of the precise implementation. When exactly is the stock exchange value of the ETF shares classified as varying significantly from the NAV? When exactly does the ETF provider inform its customers about the direct redemption option in the event of market disruption? What are the costs involved? These may be crucial aspects, for example. Furthermore, there are doubts as to whether private investors in particular are able to fully appreciate the sometimes complex interrelationships involved and evaluate them appropriately.

Halts to trading aid market stabilisation in periods of stress

Trading halts are another form of safeguard. As the analysis of various flash crashes shows, they can help to stabilise the market when volatility increases during periods of stress (see the box on pp. 97 ff.).

Counterparty risk

While counterparty risk in the case of physical ETFs derives from securities lending, …

ETFs are exposed to counterparty risk, that is to say the risk that a counterparty may default. There is a distinction to be drawn between the risks in the case of physical ETFs and those associated with the synthetic breed. With physical ETFs, the counterparty risk stems from the securities lending transactions routinely involved. These transactions are common practice in financial markets and feature in open-end investment fund activity and derivatives trading, too. The ETF provider lends stocks or bonds from the portfolio to another market player for a set period of time. In exchange for the securities it has lent, the ETF provider receives a fee as well as other securities as collateral. According to industry data, profit made through securities lending typically accounts for around one-third of an ETF provider's total revenue.[32]

If the counterparty then defaults, the borrowed security does not get returned to the ETF provider. In this case, the ETF provider is left with the securities that it received as collateral, which at the time of transaction are worth more than the lent securities on account of the standard practice of over-collateralisation. While this practice provides additional protection against falling prices, adverse market developments can potentially entail such steep price drops that the over-collateralisation proves insufficient and the ETF provider incurs losses through its securities lending operations.[33] Via the primary/secondary market

31 See Guidelines for competent authorities and UCITS management companies, ESMA/2014/937EN of 1 August 2014, in particular Section IX entitled "Treatment of secondary market investors of UCITS ETFs" on p. 7 at https://www.esma.europa.eu/system/files_force/library/2015/11/esma-2014-0011-01-00_en_0.pdf

32 See Deutsche Bank, In the ETF labyrinth, where does the thread begin?, 7 July 2011, p. 23.

33 Additional protection is provided by the Securities Financing Transactions Regulation (SFTR), the guidelines issued by the European Securities and Markets Authority (ESMA) and the EU provisions relating to mutual funds (UCITS). These provide for rules on diversification, counterparty limits, transparency rules (primarily concerning securities lending) and minimum requirements for the quality of collateral posted.

mechanism, these losses in the ETF portfolio would end up being transferred to the ETF shares. In extreme scenarios, this could trigger general pressure to sell across the ETF sector, which would accelerate the price decline still further.[34]

… it stems from swap transactions in the case of synthetic ETFs

The counterparty risk in the case of synthetic ETFs results from swap transactions. As in the case of physical ETFs, there is also the possibility that the collateral will turn out to be insufficient to offset losses in the event of counterparty default, meaning that negative price dynamics could be triggered or catalysed with this type of ETF, too.

Furthermore, with synthetic ETFs there is the danger that the ETF provider may become unable to replicate the performance of the relevant benchmark index in the event of a swap counterparty defaulting. If no new swap with a different market participant can be agreed, the ETF provider would have to sell the securities in its portfolio and, in turn, buy the securities of the benchmark index in order to achieve physical replication – so far as the possibility is even afforded given any barriers to entry or other market obstacles that might exist. This sort of process could lead to a loss of confidence – especially if several ETFs are affected at the same time – and thus, in a first step, trigger pressure to sell in the synthetic ETF segment. In a second step, the physical ETF segment could be hit by contagion effects if similar strategies are being pursued or as herd behaviour comes into play.

Additional risk is created when AP, swap counterparty and ETF provider are linked

There are additional risks if the AP, swap counterparty and/or ETF provider are heavily interconnected. The swap counterparty and the AP could belong to the same banking group, for instance. While this may make for greater cost efficiency when it comes to collateral management and refinancing,[35] this kind of market structure can produce perverse incentives. For example, there is the risk that some banks might use illiquid securities to refinance themselves through swaps. Since related party transactions are prohibited in the United States, this is a risk primarily for the European ETF market.[36] It must be said, however, that the number of ETF products offering synthetic replication has been waning in Europe in past years, which ought to significantly reduce the associated counterparty risk (see the upper panel of the chart on p. 84).

Influence on price formation

Mechanical index investment may compromise the informative function of prices

Results are inconclusive as to the impact of ETFs on price formation. First, it is possible that ETF-based mechanical index investment may stifle important price signals, which can lead to misallocation of capital. In the event of weak company performance, investors or fund managers become unable to easily offload shares because they have to follow a prescribed weighting. This could compromise the informative function of prices. It should be stressed in this context, however, that passivity in purchase decisions does not necessarily have to mean passivity on the part of ETF companies as regards managerial control. ETF companies influence corporate decisions by exercising voting rights in shareholders' meetings.

It remains to be seen what size the ETF sector needs to reach before it starts having the potential to impair the informative function of prices. But if the robust growth seen in the past few years persists, the importance of this issue looks set to grow.

---

34 From a financial stability perspective, there could also end up being a shortage of collateral in the financial system if a large number of ETF providers (and other market participants, too – those involved in derivatives transactions, for instance) were to simultaneously stop extending their securities lending transactions. See Financial Stability Board, Potential financial stability issues arising from recent trends in Exchange-Traded Funds (ETFs), 12 April 2011.

35 For a detailed discussion of this point, see S. Ramaswamy (2001), Market structures and systemic risk of exchange-traded funds, BIS Working Papers No 343, Bank for International Settlements.

36 See G. Turner and S. Sushko, What risks do exchange-traded funds pose, Banque de France, Financial Stability Review, No 22, April 2018, pp. 133-144.

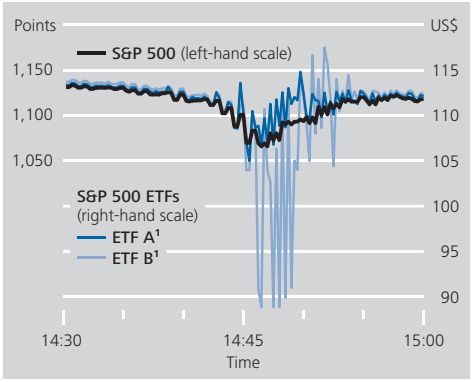
Exchange-traded funds in periods of market stress

On 6 May 2010 – amid, amongst other things, concerns about the ongoing sovereign debt crisis in Greece – the prices of US stocks (as measured by the S&P 500) plummeted by around 5% within a very short space of time, having already fallen by around 4% over the course of the day. This meant a peak loss of 9% on the previous day's closing prices (see the chart below). Prices recovered in minutes, with the index recording a daily loss of just over 3% as the markets closed. Against the backdrop of a weak market environment, the price collapse was very probably due to the automated placing of sell orders for futures contracts, which then triggered corresponding stop-loss orders. Amplified by high-frequency traders, these developments spilled over into the ETF markets.

The large number of sell orders caused bid-ask spreads to widen significantly. Market makers' pricing models are important in this connection. The models they used here were partly responsible for significant differences between the prices determined by market makers and the indicative net asset value (iNAV) of the ETFs concerned.[1] As a result, market makers and APs withdrew from the market, liquidity dried up and some orders could no longer be executed.[2] While ETFs were hit harder by the "flash crash" than other asset classes, it does not appear that they were the cause of it. In response to this event, a raft of regulations were introduced and existing regulations tightened in the United States. These include, in particular, "circuit breakers" that temporarily halt trading when prices hit predefined "tripwires".[3]

On the morning of 24 August 2015, there was another flash crash just as the markets opened. With a slump in prices on the Asian stock markets having caused futures prices to fall in Europe and the United States (the Chinese SSE Composite Index had tumbled by 8.5%), the S&P 500 in the United States opened 5.2% down on the previous day's closing prices and temporarily plunged by 7.8% in the space of five minutes. Most of these losses had been recouped by the

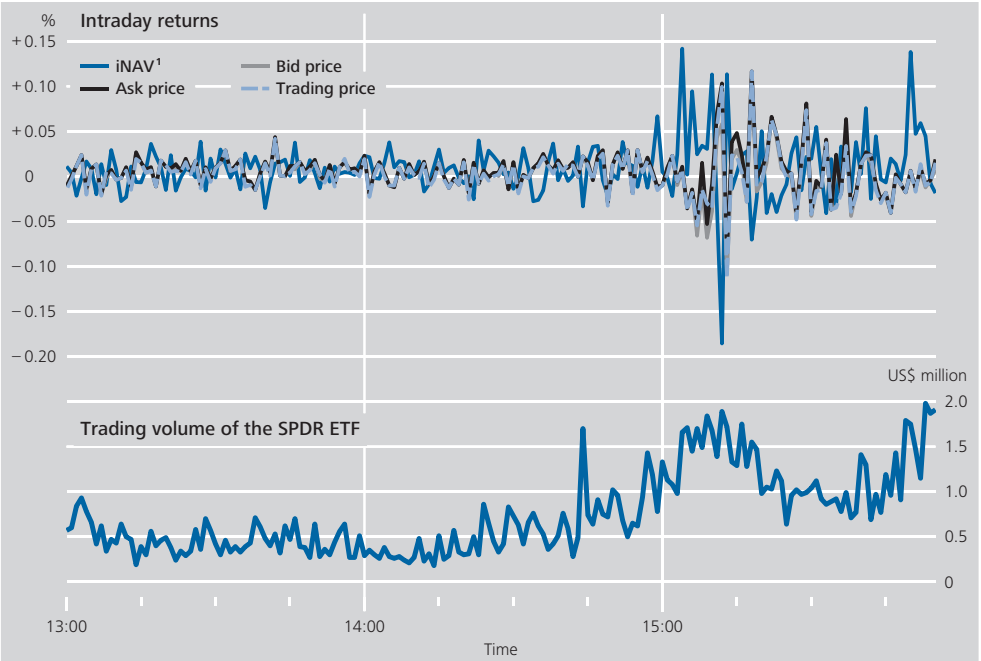
Intraday price movements of the S&P 500 and selected ETFs on 6 May 2010



Source: Bloomberg. **1** ETFs anonymised.
Deutsche Bundesbank

1 Some market makers determine their ETF prices based on supply and demand only, without any regard for the underlying index values, while others take into account the value of the replicated basket of securities. However, the latter need time to evaluate information and price changes. If individual market makers withdraw from the market, it can result in reduced liquidity and larger price swings. For more information, see United States Security and Exchange Commission (SEC), US Commodity Futures Trading Commission: Findings Regarding the Market Events of May 6, 2010, 30 September 2010.
2 Some 70% of the transactions that were subsequently cancelled were also ETF transactions. For more information, see M. Borkovec, I. Domowitz, V. Serbin, H. Yegerman, Liquidity and Price Discovery in Exchange-Traded Funds: One of Several Possible Lessons from the Flash Crash, Investment Technology Group, May 2010, p. 1.
3 These were introduced by the SEC and the US Commodity Futures Trading Commission (CFTC) in several stages. In addition to tightening the trading halt rules put into effect in 1987, they also set out requirements for risk management and rules on automated trading.

Intraday returns of the SPDR ETF relative to the S&P 500 and its trading volume on 5 February 2018



Source: Bloomberg. **1** Indicative net asset value.
Deutsche Bundesbank

afternoon. Price swings in excess of predefined price changes triggered a total of 1,278 trading halts – 1,058 of which were in the ETF and ETP sectors. These served to stabilise the markets.

Yet another flash crash took place on 5 February 2018 (for more information, see the box on pp. 86 f.). Suffering heavy intraday losses (-4%), S&P 500 prices dipped by 2.1% in a matter of minutes just after 15:00 local time, only to pick up again to pre-dip levels a short time later (see the chart on p. 86). The flash crash appears to have been sparked by high volumes of accumulated VIX short positions combined with long positions in the S&P 500 stock market index, which, following a slow start to the trading day, reached their liquidation trigger thresholds, provoking massive ETF sell orders in the process.[4] Some of the long positions were in ETF portfolios, which could explain the downward pressure in this market segment. To the extent that it is possible to comment without inspecting the order books, it appears that, measured by volume, the volatility of price movements during and after this event was relatively moderate (see the chart above). This could be an effect of the rules that were introduced and tightened in the wake of the flash crash of 6 May 2010.

Although the circumstances surrounding each of the flash crashes presented here are different, one commonality is the massive surge of automated sell orders that were activated. It seems that, while the market for ETFs played a major role in these devel-

4 According to investment management company BlackRock's figures, the trading volume of ETFs in the week of trading from 5 to 9 February 2018 was worth US$1,000 billion. The SPDR S&P 500 ETF recorded weekly outflows of US$23.6 billion, which equates to around 8% of its market volume at that time. See Blackrock, Case Study: ETF Trading in a High-Velocity Market, Viewpoint, March 2018.

opments, it did not trigger them. The market structure – in particular, the ability to trade high-pressure asset classes at all times in conjunction with unstable market depth in the context of market-making activities – has proved to be a weakness. It can lead to differences between the price at which an ETF is exchange-traded and its iNAV, and cause the affected ETFs or their underlying securities to become increasingly volatile. The halts to trading existing on the European trading markets even prior to the flash crashes and the tougher circuit breakers subsequently put in place on US stock markets to curb significant price drops therefore constitute an important safeguard against the rapid spread of distortions on the financial markets.

In addition to the "illusion of liquidity" – the problem of ETFs that are liquid during normal times merely appearing to remain liquid during periods of market stress – there are further risks. For example, there could be asymmetries in information processing between the ETF provider, the AP and/or the end investor. It cannot be ruled out that, in times of stress, APs may be unable or unwilling to absorb high order volumes in a short space of time. This could ultimately also result in APs demanding higher bid-ask spreads. ETFs with relatively illiquid assets (e.g. investments in emerging market economies or corporate bonds) are likely to be hit especially hard by this.

Additional liquidity improves price formation processes – risks due to potential propagation of price shocks

ETFs appear to have a positive impact on price formation due to the additional secondary market liquidity: market makers and APs carry over information available at the ETF level to the underlying securities, which can – in particular – speed up the price formation process, it seems. However, the structure of ETFs also allows non-fundamental liquidity shocks on the secondary market to be propagated to the individual underlying securities. Moreover, owing to their low-cost nature, ETFs lend themselves to speculative purposes. Investors can bet on price trends over short horizons. This can produce non-fundamental price shocks which then propagate via the primary/secondary market mechanism to the individual securities that make up an index.[37]

Possible amplification effects through ETFs

towards reinforcement of existing trends. In relation to ETFs, there is the potential danger that price developments in the financial markets could be amplified. For example, a fall in the price of individual securities belonging to the relevant benchmark index would, by definition, lead to a drop in price for that index. Valuation shifts in the benchmark index caused by the passive investment process can then call for adjustments to the ETF portfolio, which, under certain circumstances, may mean that the ETF provider needs to offload individual securities from the basket within a short space of time. The resulting procyclical developments could foster the build-up of potential risks in the financial system, which could then spread throughout the system in times of stress.

Procyclical developments as a specific form of price formation risk

In the context of securities markets, the term procyclicality refers, in general, to a tendency

37 For a detailed discussion on pricing, see I. Ben-David, F. A. Franzoni und R. Moussawi (2017), Exchange-Traded Funds, Annual Review of Financial Economics, Vol. 9, pp. 169-189.

Common ownership

ETFs can encourage common ownership structures, …

ETFs are a cost-effective means of diversification. It has been shown that cost-effective options for diversification can be associated with a rise in common ownership structures.[38] The term "common ownership structure" describes a situation where the shares of several enterprises belonging to the same sector are held by one asset manager. This set-up could lead to insufficient incentives for competition. When one enterprise acquires a greater market share by pursuing an aggressive competitive policy this leads to a reduced market share for another enterprise from the same sector. A common owner – one who possesses (the same) shares in both enterprises – therefore does not benefit from an aggressive competitive policy of this kind. If common owners supplant individual owners as the most powerful shareholders there are no longer any incentives to compete. Negative consequences might include higher prices for consumers and a narrower range of products on offer. It is important to note here that there does not necessarily need to be any price collusion or cartel for these effects to arise.

… which can lessen the incentive to compete and lead to higher prices for consumers

Empirical studies indicate that, in certain sectors, an increasing market concentration due to common ownership structures has led to climbing consumer prices.[39] It must be said that there are also those (in particular, major asset managers) who take a contrary view and adopt a critical stance towards the literature dealing with common ownership structures.[40]

Conclusion

Cost-efficient investment in a diversified portfolio

ETFs are enjoying increasing popularity with investors as reflected in high growth rates, including in comparison to open-end investment funds. Despite their growing importance, ETFs make up just under 14% of fund assets worldwide, meaning that their role still ranks as lower-level. There appear to be a range of factors driving the fast-paced expansion of the ETF sector, chief among them – at this point in time – being the fact that they represent a cost-efficient means of investing in a diversified portfolio. They thus also open up access to market segments which are difficult to reach through other investment instruments. This may also have a bearing in terms of pension-related asset accumulation.

ETFs' credit and market risks determined by the benchmark index selected

The prime factors determining the potential for profit, loss and risk of any given ETF are the underlying assets. Investing in ETFs can come with significant risks attached – for instance, if the selected benchmark index tracks a very high-risk asset class. Furthermore, some ETFs have particular features built in such as leveraged exposure or a structure offering inverse performance tracking of the benchmark index. When assessing the risks specific to ETFs as a product class, however, the underlying credit or market risk of the reference assets are less relevant. The most pressing issue here is whether ETFs may be a source of additional risks when compared with other asset classes, such as open-end investment funds or individual securities.

Specific risks due to complex structure – liquidity risk particularly significant

Overall – and partly because the sector is still relatively small – the specific risks for the financial system associated with ETFs appear limited for now. However, analysis of various flash crashes suggests that there is the potential for episodes of pronounced financial market tension to be amplified in the short term. The complex structure of ETFs, including the primary/secondary market mechanism, makes the task of risk assessment harder and may harbour liquidity risk. In that regard, APs occupy a key position in the system. Disruption to the proper

38 See J. J. Rotemberg (1984), Financial transaction costs and industrial performance, Working Paper, Massachusetts Institute of Technology.
39 See J. Azar, M. C. Schmalz und I. Tecu (2018), Anticompetitive Effects of Common Ownership, The Journal of Finance, Vol. 73, No 4, pp. 1513-1565; and J. Azar, S. Raina and M. C. Schmalz (2016), Ultimate Ownership and Bank Competition, Working paper, IESE/University of Alberta/University of Michigan.
40 See, for example, BlackRock, Index Investing and Common Ownership Theories, March 2017.

functioning of APs may result in the ETF and the benchmark index drifting apart in price terms. In the past, such disturbances have been limited to just a few minutes. However, it cannot be ruled out that – particularly in the case of systemic stress events – longer-lasting periods of dwindling market liquidity or sustained negative price dynamics, including an increase in volatility extending beyond the short term, may occur. It should be borne in mind that the strong growth of ETFs did not set in until after the financial crisis of 2008; the sector, with its new-found significance, has yet to be exposed to more sustained market disruption.

Safeguard mechanisms enhance resilience in times of stress

A number of mechanisms already exist to keep ETFs working smoothly. In the event of a volatility spike in stress periods, halts to trading seem to be able to help stabilise the market. In addition, a large number of active APs per ETF appears to be important for ensuring that the primary/secondary market mechanism remains able to function when adverse market developments occur. It would be good to see more transparency on the part of ETF providers here, especially concerning the links between ETF providers and APs as well as the detailed arrangements applying to the option for ETF shares to be returned to the ETF provider as laid down in the ESMA guidelines.

In addition to liquidity risk, ETFs also involve counterparty risk stemming from securities lending or swap transactions. Risks related to price formation can emerge in particular if ETFs used for speculative purposes propagate liquidity shocks on the secondary market to the individual underlying securities. Lastly, ETFs appear to foster common ownership structures, which could dampen incentives for competition in corporate sectors.