



# The Future of Equity Market Structures

Report by



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## The future of computer generated trading (CGT) in Financial Markets

This paper has been commissioned as part of the UK Government's  
Foresight Project on The Future of Computer Trading in Financial Markets.  
The views expressed are not those of the UK Government and do not represent its policies

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# I Executive summary

## Background, context and approach

The Foresight Committee, under the auspices of the Department for Business, Innovation and Skills (“BIS”) has been analysing the impact of computer generated trading (“CGT”) on financial markets from a structural and market stability and quality perspective.<sup>1</sup> This has been informed by reviews of the evolution of CGT and expected trends for the future. The Foresight Committee has engaged a number of academics, industry participants and consulting firms to undertake studies and produce reports to inform their thinking. As part of this assessment, and to inform the current regulatory and policy debate on CGT’s role in the equity markets, BIS have commissioned PwC to write a report which analyses and documents the drivers of change that have impacted the equity markets’ structure as well as map out what the market looks like – from a historical perspective, in its current form and how it might appear in the future. This report has been compiled with the following objectives:

- Understanding how the market has evolved over the last 5 years, focusing on changes in market structure and its underlying characteristics;
- Review the current market structure for trading, highlighting the role of different market players and interactions; and
- Outlining expectations of how the market might evolve in the next 5 to 10 years.

The scope of this report is restricted to equity markets, however, we also make some references to developments and implications across other asset classes to the extent they are relevant and encompassed under computer based trading and its different forms.

In terms of our approach to this report, the research was conducted over a short timeframe (approximately six weeks) and used the following data collection techniques:

- Existing research available from the Foresight Group and internal research, knowledge and resources from PwC’s global network;
- An industry workshop that has allowed us to engage with a wide range of actors and stakeholders in the market to develop a deep understanding of drivers and interactions that are relevant in shaping the current and future markets, as well as the depiction of the current market structure; and
- One-on-one interviews with some of the key players in the market to test our thinking and impression of the market.

As such, the industry workshop on “Drivers of Equity Market Structure” forms a core part of our overall assessment and functions as a key source of evidence for our depiction of market structures and trends that have and will shape them in the future.

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<sup>1</sup> For a more detailed overview of the aims of the Foresight Group, visit < <http://www.bis.gov.uk/foresight/our-work/projects>>.

To substantiate changes in market structure and understand drivers that shape the underlying trends, we have set out a conceptual view of the market structure to channel discussion, debate and analysis. Whilst there will be differing views on the precise depiction of markets and their core components as well as how participants are categorised (for example certain participants can fall into multiple categories), for the purpose of this report our view of the market is comprised of three main groups of participants: investors, intermediaries and infrastructure providers, with issuers being a supplementary group (important but not considered central as the focus of this report is on secondary, not primary markets). Within the market structure we have distinguished participants from external influencers and other stakeholders, of which national governments and regulators are two such examples.

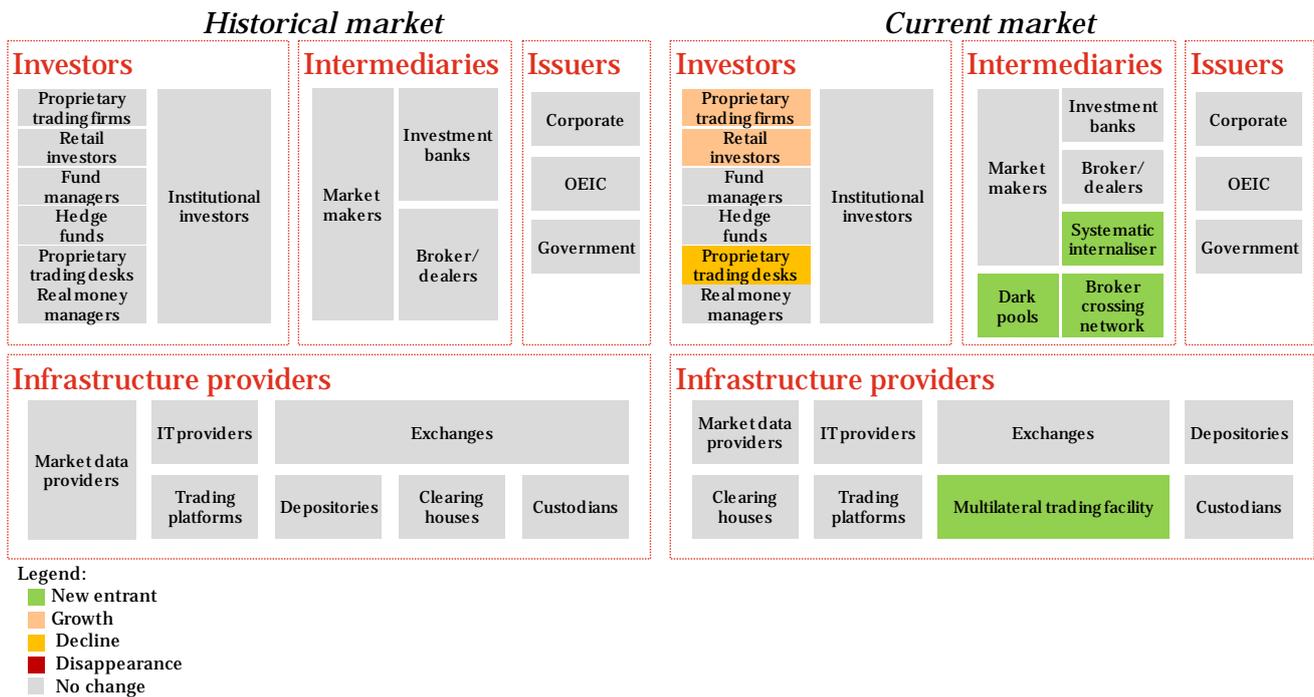
## **Evolution of historical market structure and characteristics**

The figure below shows the structure and key participants of historical and current European equity markets – as such the participants identified do not represent the entire universe of market players that function within the value chain, instead we focus on the main market players that underlie some of the major interactions. It is important to note that some of the market participants operate in many different capacities and in different participant groupings of the market structure. A case in point are certain financial institutions that have proprietary trading functions (investors), facilitate transactions through acting as agents (intermediaries) and offer services as custodians (infrastructure).

There is also an overlap in terms of services offered by participants within different segments of the market structure. This is particularly true for intermediaries, who primarily support market intermediation and facilitate interaction. For example, market making is a service which can be offered by specialist market makers or by a subsection of the brokers-dealer community. In defining market participants in the intermediary grouping, we have considered this in the context of services provided by market participants, such as credit intermediation (broker-dealers), trading interaction (crossing networks) and timing intermediation (market makers), as opposed to explicitly considering a category of participants, since in principle, a broad range of services can be offered by individual intermediaries.

Figure 1 describes the current depiction of equity market structures and highlights the key changes that have occurred over the last 5 years.

Figure 1: Evolution of historical market structure



Source: Drivers of equity market structure workshop and PwC analysis

It can be immediately observed from the diagrams above that there have been significant changes in most parts of the market structure including investors, intermediaries and infrastructure providers. Starting in the investor space over the last 5 years, hedge funds have increased in prominence and there is a greater divergence in terms of statistical and algorithmic trading strategies, driven again partly by the growing availability of sophisticated technology and accessibility of different platforms for trading. There has also been a noticeable increase in investment from the retail sector, although the patterns of this vary across Europe with typically a more active retail equity trading environment in continental Europe and more funds based retail investments in the UK. The composition of fund managers has also changed significantly, with ownership structures becoming more diverse, and the development of several ‘fund-of-funds’.

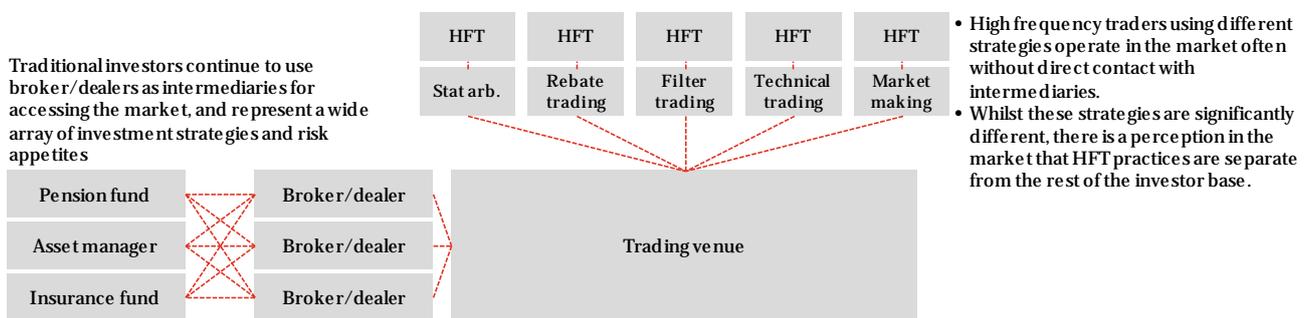
A significant shift has been the growth in specialised proprietary trading firms (both regulated and unregulated), which has been the result of two key drivers: technology in the form of a significant increase in computer generated trading (CGT); and secondly regulator and market pressures on the regulated banks and broker-dealers to close or spin out their proprietary trading activities. These two points are discussed further below.

Technology has aided development of sophisticated trading models and techniques which, along with high frequency trading (“HFT”) capabilities, has created new revenue opportunities and as such has grown significantly to become a core part of the market’s ecosystem with some estimates suggesting it represents 40 – 50% of overall trading activity on regulated trading venues. Indeed, the financial crisis and associated volatility in financial markets added to increased activity by HFT and algorithmic trading firms, as many such algorithms work particularly effectively in terms of generating superior returns in such trading environments.

An observation from some industry participants drew on the large volume of HFT trades in the market, citing the potential homogeneity of HFT activity in comparison to historical trading patterns. Whilst HFT operators vary to a considerable degree in terms of their strategies and approaches, there is a perception that some of the bigger HFT players are largely similar in nature from a liquidity perspective, even though the specifics of the underlying strategies might

be different. Whilst the nuances of trading strategy may make them quite distinct in reality, their relatively obscure operational methods ensure that this perception remains. It is perhaps useful, therefore, to contrast strategic variance within the HFT space with historical investment patterns. Traditionally, a wide range of players such as asset managers and pension funds would come to market with different views on asset value due to a wider range of investment considerations; including length of investment, geographical and political considerations, and tailoring to the investment strategies of their clients. Operators that form part of the perceived ‘natural’ market such as the aforementioned are seen to be ‘normal’ participants that are trading based on differing views of asset values. A counter observation was that even if this was the case, HFT was probably not harming the market, but was merely introducing additional volume, liquidity and efficiency.

**Figure 2: HFT interactions within the market**



Source: Drivers of equity market structure workshop and PwC analysis.

The financial crisis has had a secondary effect in terms of the reduction in the participation by the regulated firms in the market as proprietary risk takers. This is a result of regulatory concerns emanating from the perceived role of proprietary trading by the banks in the financial crisis through excessive risk taking, thus making the recovery or resolution of banks particularly difficult and with systemic implications. As such the regulatory reaction has been to propose intervention through structural changes as well as enhanced capital, liquidity and leverage requirements (e.g. Volcker rule and increasing scrutiny of capital requirements under Basel 2.5/3). In addition, there has been increased shareholder scrutiny of bank management and their ability to generate returns on the capital employed in the business at an acceptable level of risk.

A further observation related to increased capital requirements was that other regulatory proposals such as the change to move OTC derivatives to central counterparty clearing (“CCP”) may exacerbate the issue. Whilst this is likely to have a greater effect on the market structure for fixed income securities and other equity derivatives, there is a risk that it will ‘suck’ capital from other asset classes such as equities given that it is a scarce resource.

Another critical dimension in this context is the economic environment, which is impacting the market in terms of the provision of proprietary capital and investor appetite to commit funds. The banks are deleveraging both as a result of the regulatory environment, but also as an impact of a challenging economic situation and to meet their investors’ demands to reduce the risk profile of the balance sheet and focus on improving return on equity. This is particularly acute in Europe with significant disruption from the Euro-zone crisis. The net result is an equities market that is facing lower volumes and reduced capital commitment. In addition, it is evident that equities have declined in popularity as an asset class over the past five years. Industry participants reflected a growing concern that tabled transparency requirements in the equity space could

merely result in investors moving into synthetic instruments, or indeed to other asset classes – thereby exacerbating this decline.

Turning to the intermediaries, the capital challenge highlighted above is also impacting on the level and type of intermediation that is taking place in the market. A traditional view of the role of intermediaries suggest that they facilitate bringing savers and investors together;<sup>2</sup> this may be through seeking out buyers for sellers and vice versa or providing liquidity to allow for timing differences between buy and sell orders by holding an inventory of assets – this requires capital to be used by the intermediary to buy and hold inventory. On the first role of intermediaries – helping buyers and sellers to meet - it has been argued automation has increased the opportunity for buyers and sellers to be found for an asset by increasing connectivity across the market and by increasing the speed at which this can occur. However the suggestion of a number of workshop participants was that the second type of intermediation (capital for timing intermediation) is becomingly increasingly strained, primarily due to increased capital holding requirements for banks and intermediaries leaving less available capital for facilitating client activities.

In terms of other regulatory specific impacts on the intermediaries, one of the most overarching and impactful changes for the market over the past five years has been the enactment of the Markets in Financial Instruments Directive (“MiFID”). MiFID was tabled, legislated and enacted in order to encourage transparency and liquidity, enhance client protection, to develop a pan European securities market and to harmonise the regulatory environment across European markets. It is evident from the observations of workshop participants and other industry experts we engaged that whilst MiFID was in many ways a viable framework, it has not achieved everything it set out to do. Views expressed on the effectiveness of MiFID were largely split between specific observations about discrete effects it has had on market structure, and more general observations about a perceived failure to ameliorate the issues it sought to address.

The impact of these regulatory changes has been far reaching and profound. One of the resulting developments has been the proliferation of dark pools provided by a range of intermediaries such as investment banks. These venues offer investors (operating at a large scale) liquidity in large trade sizes, as it is possible to execute block trades and fill the order sizes at reasonable prices and within the appropriate timeframe compared to many of the ‘lit’ trading venue such as exchanges, as well as an opportunity to remain anonymous when executing such trades. The rise of dark pools has also been complemented by current transparency requirements that allow delayed reporting of block trades in the process allowing investors and their risk takers to trade at levels that will have less immediate market impact. It is apparent that elements of conflict have developed over the past five years between the principles of dark pools and the principles of regulation. Brokers and other intermediaries that provide unlit sources of liquidity would argue that such methods help protect investor interests, and ensure that market liquidity is maintained without regard to large movements in the market. Indeed, recent market developments have included HFT market makers starting to provide liquidity in dark pools as well as regulated venues, thus supplementing overall liquidity levels in the market. Whilst HFT practitioners see such outcomes as making a case for the continued existence of the market in its current form, regulators are seeking to homogenise and increase transparency across all forms of intermediation. The tension between these two forces, and the potential for disruption of the natural development of the market, are some of the key focus points that have developed over the past five years.

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<sup>2</sup>B. Scholtens & D. Wensveen, ‘The theory of financial intermediation’, SUERF – The European Money and Finance Forum, 2003, p. 9, <<http://www.suerf.org/download/studies/study20031.pdf>>.

Investment firms and intermediaries that offer dark pools typically provide such services using what is referred to generally as a broker crossing network (“BCN”), which has both discriminatory client access and execution rules which given their multilateral client characteristics might otherwise require them to operate as a regulated MTF. In the last couple of years in particular, we have also seen many specialised proprietary trading firms and market makers starting to interact with dark pools, especially those that use computer generated trading strategies. In response to the growth in the retail investor market, some intermediaries have developed specialised offerings for retail investors. Similarly, many new participants have entered the retail service provider (“RSP”) market in the belief that trading as principal against this retail flow they can make a margin by “beating” the prices on the primary markets and other regulated venues (e.g. MTFs) whilst managing the market risks that arise. Again many of these RSPs use algorithmic trading strategies.

There has also been an increase in firms operating as systematic internalisers (“SI”). However, the increase has been somewhat muted as many firms have structured their activities to avoid the burdensome regulation this places on them and their clients. This has also been made possible because the current regulations are not particularly prescriptive in determining which activities might fall with the definition of an SI. Nonetheless, it is debated amongst participants on both the buy-side and sell-side whether this lack of firms appearing within the SI category has had any significant impact on investors or transparency.

On the infrastructure side, one of the most significant changes has been the creation of multilateral trading facilities (“MTF”), for which new EU regulation implemented through MiFID in 2007 created the necessary regulatory structure for these trading platforms to develop. MTFs represent regulated trading venues which bring together multilateral buying and selling interest similarly to that of an exchange but with some ability to have differing levels of pre-trade price transparency. They typically have lower transaction costs compared to other exchanges. Additionally, the prohibition on the concentration rule (i.e. a particular jurisdiction forcing all trading of a security listed on that venue to be traded solely on that venue) has allowed MTFs to offer trading facilities in pan-European securities, as such there are around 147 regulated MTFs operating in Europe covering a range of asset classes.

One of the concerns raised by investors in relation to the various forms of venue was a lack of trust in those venues where proprietary or HFT firms were thought to be present – predominately the ‘lit’ venues. This was reflected in the way they traded as well as their preference of intermediary or their usage of dark pools. It should be noted that there are other factors at play such as the ability to move large trades at reduced costs, but the question of trust is a factor for further consideration by regulators and the industry.

In terms of summarising the market ‘picture’ and how it has developed over the past five years, the report identifies the following changes to market characteristics:

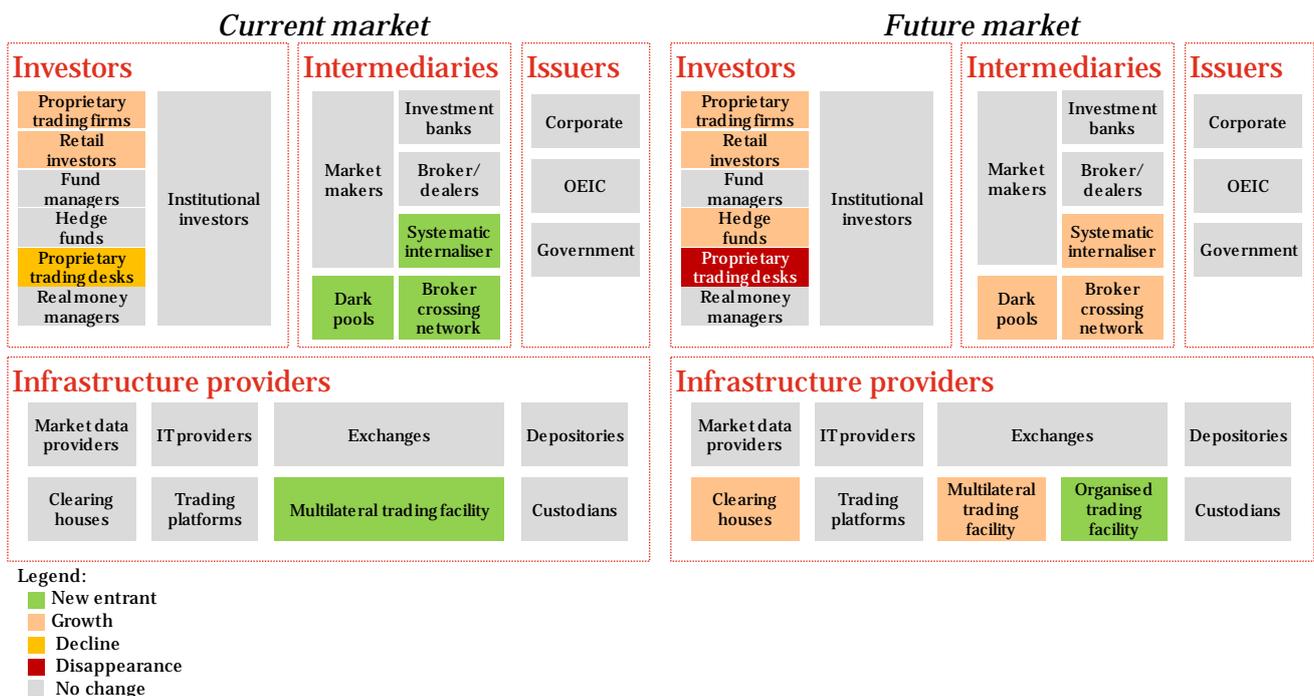
- The European equity market of today is more fragmented than it was five years ago, and has more types of infrastructure provider and intermediaries;
- Exchange ownership is less diverse, and has become more consolidated over the time period;
- The investor base is also more diverse than it was five years ago, with traditional institutional investors adopting new strategies and with more hedge funds and retail investors;
- The overall level of automation in the market is higher than it was five years ago. In terms of technology, sophisticated trading algorithms are more common, and latency times are lower; and

- Overall volumes traded in the market are lower than they were five years ago, although this is largely attributable to the loss of confidence following the global financial crises and subsequent economic downturns.

### Expected evolution of current market structure

Determining a complete picture of the expected market structure in the future is clearly difficult to predict and this is complicated by the role of regulation given the prominent part it plays in shaping market structure and associated characteristics, as well as the unprecedented volume of regulatory change under proposal at the moment. However, it is possible to identify the direction of market structure changes, key drivers that are likely to influence this movement and comment on the resulting market characteristics that might describe such a future market structure. The figure below represents the combined views of our workshop participants on expectations of the structure and key players of the future set alongside the current market for comparison. Similar to figure 1 above, the players identified do not represent the entire universe of market players that function within the value chain; instead we focus on market players and associated services (in the intermediary space) that underlie some of the major interactions.

Figure 3: Expected evolution of current market structure



Source: Drivers of equity market structure workshop and PwC analysis.

Again we observe changes across many of the market structure components though regulation is likely to have an even more significant part to play in this change. Our industry workshop participants noted that politics (through influence on regulation) and demographics are also likely to be significant influencing factors.

Our industry workshop participants expected the size of the European equity market in five to ten years' time to be larger relative to the current market, particularly in terms of the number of listed companies and trading volumes – even after accounting for the stunted economic growth continuing in European economies. The demographic shift in emerging economies will increase global investment capital as middle classes grow in these countries and seek to invest their wealth, which should benefit European markets. Although the counter-trend will be for investors' demand for diversification and increased yield, which will encourage investment outside of

Europe as they seek out increased returns through investments in some of the growing economies.

In the investor space, going forward proprietary trading firms will likely become more widespread, especially if regulatory reforms such as the impending US Volker rule outlaw proprietary trading activities at investment banks that have a US presence. Increased activity (in terms of volumes) in the CGT/HFT/algorithmic space will continue, with proprietary trading firms and hedge funds leveraging their existing strategies and technologies to operate in other asset classes such as ETFs and fixed income where opportunities might currently be less exploited. Moreover, focus on returns (through chasing higher yields) and increasing understanding of underlying risk complexity of asset classes as well as other factors (such as geography, macro-economic conditions etc) will influence investor appetite for complex, structured products. Whilst this may reduce volume in the cash equities market, it is likely that asset classes will become increasingly interlinked by structured product offerings. Retail participation in equity markets will continue to increase with an increasing number of retail investors participating in regulated markets, either directly, through retail service providers (“RSP”) or via some of the emerging platforms that are designed to encourage and facilitate retail execution.

Finally there will be an increasing regulatory emphasis on the shadow banking sector particularly unregulated hedge funds, off balance sheet investment vehicles, money market funds, and sovereign wealth funds. This will be intended to ensure that the sector’s influence is brought more into line with that of other institutional investors.

Across the intermediary space, margins will likely be squeezed as investors become more able to provide peer-to-peer financing via crossing networks and other buy-side liquidity transfer methods. Regulation, such as potential future capital controls and limitations around brokers’ crossing networks and other dark pool trading facilities, will be the key driver for change in the intermediary space continuing to shape how they provide trading services to clients. Traditional broker-dealers who do not diversify their services are expected to increasingly lose share, a result of disintermediation as well as loss of competitive advantage with other intermediaries. As a consequence of this, intermediaries will increasingly seek to diversify and increase their levels of interoperability in order to stay ahead of and avoid regulatory measures – as demonstrated by several investment banks looking to increase their transparent intermediation facilities, such as MTFs, rather than continue to press ahead with further developments of their dark trading facilities. There will also be a continued increase in firms operating as systematic internalisers.

Proposed regulation in the revised EU MiFID looks likely to introduce the concept of a new type of regulated trading venue, the Organised Trading Facility (“OTF”). If the proposed OTF regime for equities is introduced as part of the revised MiFID this could have a significant impact on the market structure affecting how intermediaries provide services and may force some participants to move much of their trading to more transparent trading venues. This potential change in trading venue, especially combined with proposed changes in transparency (e.g. the change of 3 day delayed post trade reporting for block trades to 1 day delay) may cause intermediaries to re-think their appetite for offering risk against the client if it becomes more difficult to hedge their risk as a result of price transparency increasing. Moreover, regulatory demands on banks’ capital requirements will continue to limit the types of risks they are prepared to take and to whom they will offer risk.

Industry participants posited a further potential impact of proposed changes to the regulation of trading venues, namely that of the ‘harmonisation’ of waivers. Currently, certain trades facilitated by MTFs are exempted from providing pre-trade transparency if they meet certain criteria (e.g. where a system derives its pricing information from another system, or a trade that is particularly

large in scale)<sup>3</sup>. The proposed changes to these waivers, which could lead to a homogenising effect across trading venues, could lead to significant changes in structure as providers would no longer be able to tailor to client demands.

From an infrastructure perspective, this regulatory agenda will heavily influence the infrastructure provision aspect of market structure in five to ten years' time. Whilst predicting the likely future of regulation and hence impact on market structures might be misleading, there are various other factors that impact service provision in this space. For example, decreasing cost of technology will lower the barriers to entry for certain parts of the market and could lead to an increased number of exchange venues, although this is likely to be counterbalanced by competitive trends and reduced revenues at the exchanges that typically lead to consolidation. Trends in the proliferation of new OTFs may emerge (depending on regulatory outcomes), whereas MTFs and other MiFID-specified venues will maintain their market presence without changing dramatically. However, traditional exchanges will also continue to diversify their liquidity provision offering, for example with the potential for acquisitions of MTFs, in conjunction with specialisation to provide distinct services to small sections of the investor population.

Industry participants note that the current work to implement changes in clearing and settlement legislation will help to foster greater interoperability and competition, much of which is already developing but limited through the current regulatory environment – it was suggested that the unification of clearing and settlement rules in Europe could increase efficiencies in settlement and lead to real benefits for intermediaries and investors.

## Drivers of change

A range of drivers have influenced the evolution of equity markets and its characteristics into its current form and they are likely to play an important role in defining market structures and characteristics for the future – as discussed above. Whilst an exhaustive analysis underpinning the entirety of drivers that are relevant in shaping markets is beyond the scope of this report, we have attempted to focus on core macro drivers (and the relevant sub-drivers within) which are likely to explain the bulk of market transformation that has occurred historically and is likely to occur in the future.

**Technology** - Technology has played a key role in shaping market structures in terms of supporting the backbone of the market infrastructure and interactions (for example automation of trade channels and greater interoperability), as well as facilitating innovation and new business models by allowing the development of new trading methodologies and strategies (i.e. reliance on computer generated trading and sophisticated algorithms). Whilst these developments are expected to continue, industry experts we engaged during this project suggested that it will have less of an impact on CGT/HFT as improvement in speed of execution and access technologies has already reached a point where further technology enhancements are likely to have a smaller incremental impact. The areas where technology may have increased impact and benefit in the future are in the risk management, surveillance and regulatory monitoring areas.

**Regulation** - Regulation will be central to shaping market structures and characteristics, as it has been in the past. Industry interviewees suggested that regulation (and the political drivers behind current regulatory developments) was the single biggest factor in influencing how the market structure would develop over the next five to ten years. An unknown factor here is the timing of regulation over the coming years, as there is a tension between the political need to

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<sup>3</sup> 'Waivers from Pre-trade Transparency Obligations under the Markets in Financial Instruments Directive (MiFID)', Committee of European Securities Regulators, 20/05/2009, p.2, <[http://www.esma.europa.eu/system/files/09\\_324\\_Update\\_22102010.pdf](http://www.esma.europa.eu/system/files/09_324_Update_22102010.pdf)>.

stimulate economic growth following the recent financial crisis of 2007/2008 and the need for increased regulation to prevent a crisis like that occurring again. However, what is clear is that impending regulation - both at a systemic and market specific level - will shape underlying frameworks and interactions across market participants. In particular the Volker rule under the Dodd-Frank Act has led and might continue to lead to in many cases either a spinoff of trading desks at investment banks to form independent trading firms or closure of that business line. Moreover, regulatory policies such as the revised MiFID/MiFIR, which support European integration through allowing pan-European players in the intermediary and infrastructure space, will lead to greater integration of market structures and harmonisation of trading techniques and mechanisms. Similarly, CRD IV (implementation of Basel III in Europe) which underpins requirements for adequate capital will influence participation in financial markets at the intermediary and investor level. In summary, these policies in parallel with other new and upcoming regulatory guidelines, will redefine the role and operating models of institutional investors, financial intermediaries and infrastructure providers.

Finally, there is a perception that market participants have become increasingly focused on adapting to, and where possible alleviating the effects of the large volume of regulations under development. The investment budgets, intellectual capital and management bandwidth available is increasingly being diverted away from corporate development, product & business model innovation and other business development activities, and towards adapting to or analysing the impact of regulation.

**Competition** - Competition has led to fragmentation and concentration across different segments of the value chain, a case in point at the infrastructure level is the market entry by MTFs which have squeezed margins for incumbent exchanges and provided investors with alternative options for executing trade orders. The precise impact of competition itself varies across different members in the market – intermediaries for example have certainly been negatively impacted due to declining margins and spreads on transactions whilst CGT/HFT traders who value opportunities for price dislocation and arbitrage have benefited. The current shape and form of the market broadly suggests that it is fully fragmented and hence there might be consolidation across the value chain as a reaction to these developments as well as the reducing revenues in the industry arising from increasing regulation. However, as trading patterns change, for example increasing interest in new asset classes, especially from CGT/HFT participants, we may see the same levels of fragmentation develop in these emerging trading spaces. Thus we anticipate a continuation of both fragmentation towards specialisation in some areas of the market and consolidation in other areas where decreasing margins and standardisation create the conditions for mergers (subject to national regulation and political factors).

**Geopolitics** - It is important to recognise the role of emerging economies, such as those in South America, Africa, Asia and the Middle East (SAAAME) in creating new dynamics for the capital markets through changes to global trade flows and the resulting shift of wealth. It is likely that these flows will require trade finance and credit for corporate institutions; investment management and banking services for growing affluence in the retail and wealth space; and improved or new venues for primary issuance. Such interactions would be complemented (and assisted) by continued automation and developments in communications' framework which would allow increased movement of and greater participation of investors and issuers in an increasingly global market place (assuming the right regulatory and legal environment can be created). Whilst emerging economies will continue to play an important role in shaping market interactions and structures, it is likely that the top financial centres of the world will continue to dominate given their inherent critical mass of infrastructure, industry participants, legal and advisory suppliers.

**Demographics** - Demographics factors, such as increased retail participation in trading in emerging economies as well as important trends within the domestic European markets such as ageing populations and higher life expectancy, will impact investor behaviour (particularly in relation to risk/return dynamics) and market participation. Retail activity, within and outside Europe, will lead to greater volumes, hence providing an important source of liquidity. However, the impact of demographic factors is less clear. Demographic changes resulting in a larger ageing population might lead to more risk averse investors prompting a shift away from cash equities into less risky assets. An alternative view is that people may take more active roles in their pension portfolio (perhaps as the government's ability to support future pensioners dwindles and a realisation of the need for sustainability) and hence might be willing to take on greater risk within the portfolio to seek out increased returns and thus focus more on equity and/or other asset classes that match the risk/return dynamics they seek.

**Asset class developments** - Evolution in asset classes and sophistication of products, driven by demand from within and outside of Europe (particularly emerging markets) for certain assets with particular risk/return characteristics will impact equity markets, perhaps through driving volume to other markets and asset classes. The key factor determining such trends in the future will be the interaction of financial markets with the real economy as equities, as per any other asset class will be assessed and invested in depending on the return premium it offers over and above the risk free rate (typically measured as yields on government bonds). Recent tracking of equities performance as an asset class in western markets over the last ten to fifteen years has seen a relatively low yield on the asset when comparing it to the historical performance of equities over the previous ten to twenty years. As a result, we are seeing a number of active investment managers close these funds as investors move to passive/index tracking funds with reduced costs as well as a diversification of portfolios to include alternative assets with higher yield profiles.

### **Future market – interactions between drivers and implications for market structure and characteristics**

The table below presents an overall summary of the expected market characteristics of future markets, drivers that influence such characteristics and their impact/interactions with associated market structures:

**Table 1: Key changes expected in market characteristics**

Characteristic	Driver	Impact on Structure
Fragmentation – the market is likely to be more fragmented than it is currently, continuing the trends we have seen over the past five years, especially as new trading patterns and asset classes develop	Competition, regulation & technology	Increasing disintermediation will likely lead to an increasing multiplicity of intermediaries, with investors being provided more numerous routes of access to finance
Price transparency – the market will likely have lower levels of price transparency than it does currently, owing to the likely proliferation of dark pools and other unlit venues. Though new regulation might provide a counterbalance to this	Technology, competition, regulation	This should not impact the structure directly, but rather lead to investors using increasingly specialised intermediary services to counteract the adverse effects of falling price transparency
Automation - will increase in line with technological growth forecasts	Technology	Higher levels of automation will likely lead to increased disintermediation, interoperability & will contribute to further growth in buy-side crossing networks
Asset class sophistication – products will become increasingly sophisticated, with structured offerings becoming more widespread	Competition, technology	Asset class sophistication may not impact on market structure specifically, although it is likely to complicate and diversify the relationships between investors and intermediaries
Investor profile – the profile of the investor base will be larger and increasingly diverse, with traditional investors adopting newer strategies	Geopolitics, demographics	Similarly to asset class sophistication, the diversification and growth of the investor base will make investor-intermediary relationships more complex, and will contribute to the European equity market becoming more interlinked with the global market

Source: Drivers of equity market structure workshop and PwC analysis.

## 2 Introduction

### Context and background

Financial markets have evolved dramatically in the last few years, having been particularly influenced by a number of key historic drivers including: economic changes, regulation, fiscal pressures, social and behavioural change and varying levels and degrees of state intervention. In addition to these elements, technology has been an increasingly key factor in the structure of markets, particularly cash equities. CGT has grown rapidly over the last few years – impacting both the markets as a whole as well as at a micro-structural level. This in conjunction with the evolution of trading strategies has led to a huge increase in the role that computer generated trading plays with regard to the volumes of orders and flows, with an estimated 70% of equity volumes now generated in the United States and 50% in Europe coming from computer based trading.<sup>4</sup>

Legislators and regulators have been required to respond not only to the evolution that has occurred in equity markets but also to analyse the expected trends and drivers that shape the future structure of equity markets and the role of different market participants – to prepare and inform the regulatory policy debate governing the underlying financial markets.

The Foresight Group, as part of the Department for Business, Innovation and Skills have been reviewing the drivers of equity market structure in Europe, particularly with a view to understanding the role of computer based trading and its expected evolution in the future. To investigate and better understand the market dynamics and role of computer based trading, as well as to inform the regulatory debate in shaping the future form of regulation, the group has commissioned a number of different studies that have aimed to ascertain the market drivers and their role in shaping the current and expected future market structure for equity trading. The purpose of this study is to complement the current thinking, particularly through identifying the drivers of European equity market structure and providing more detail on interactions across the market players and current underlying structure for trading as well as its expected evolution in the next five to ten years.

### Scope of this report

As part of this assessment and to inform their current thinking, the Department for Business, Innovation and Skills have commissioned a report by PwC to analyse and document the drivers of equity markets and their associated impact on market structure in Europe – particularly with a view to:

- understand how the market has evolved over the last five years, focusing on changes in market structure and characteristics;
- review the current market structure for trading, highlighting the role of different market players and interactions; and,
- outlining expectations of how the market might evolve in the next five to ten years.

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<sup>4</sup> Government Office for Science, Foresight, Linton, O and O'Hara, M (2011), "Paper 2 – The impact of computer trading on liquidity, price efficiency/discovery and transaction costs", working papers, p. 27.

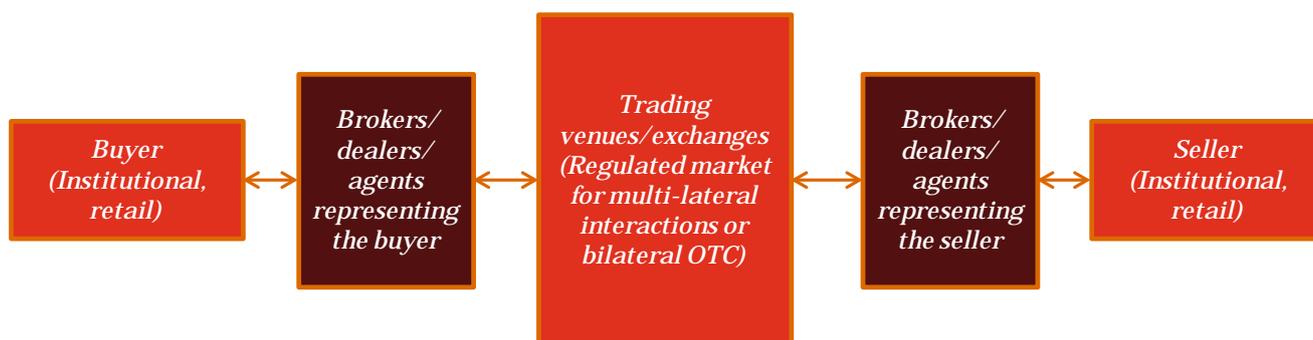
Similar to previous studies, the purpose of this study is to inform the current regulatory and policy debate on equity market structures including the role of computer based trading in shaping as well as supporting the equity markets, however, the objective is to not only identify the drivers but also map out implications on market structures itself – from a historical perspective, in its current form and possible future models. In principle, the analysis focuses on equities. However, for completeness we also make some references to developments and implications across other asset classes to the extent they are relevant to computer based trading and its different forms. Additionally, the analysis concentrates on secondary markets, as opposed to primary markets, given the emphasis of the study on trading. In the next section we briefly explain the role of markets in general, as well as the distinction between primary and secondary markets.

## Market definition

In its broadest sense, markets represent fora whereby buyers and sellers are brought together in order to interact and exchange goods. Similarly, financial markets allow investors to purchase securities (such as cash equities, foreign exchange, commodities etc) from sellers either directly or routed through intermediaries such as brokers-dealers. As such, markets can be grouped into primary and secondary categories – where:

- Primary markets represent interactions between suppliers of capital (investors) and people who demand capital (issuers) for business purposes, usually supported by intermediaries on each side. Typically this represents an initial sale of the security (for example cash equities) by a firm or a conglomerate which is then subsequently listed or made available for trading on exchanges and/or through other developed market infrastructures. Primary markets cover equity and debt securities which represent the dominant form of securities based financing for commercial businesses; and
- Secondary markets represent interactions across investors, also usually supported by intermediaries on each side, whereby traded securities (those already issued and circulating in the market) are bought and sold. Similar to primary markets, transactions in secondary markets occur on established trading venues and exchanges. Over time, there has been a significant evolution of the underlying venues for such transactions with the rise of a number of different platforms (such as brokers crossing networks and/or other pools of liquidity) implying that a significant proportion of such transactions can occur outside an exchange or formal market place, a practice referred to generically as over-the counter (“OTC”).

Whilst the underlying structure can be quite complex, involving different participants across the value chain who interact amongst themselves and with other segments in the market, essentially the aim of such interactions is to transfer ownership of financial instruments to buyers who are willing to pay the quoted price – although with sophistication in asset classes and product innovation investors can acquire exposure to certain asset classes without outright ownership (for example through derivatives). Nonetheless, abstracting from such complexities, the figure below represents a simplistic view of secondary markets, which is the primary focus of the discussion in this report, and its key role in bringing together buyers and sellers of securities allowing them to interact through their respective intermediaries to exchange financial instruments (such as shares, commodities etc). In section 3 we discuss the different categories of market participants and core components within each category.

**Figure 4: Illustrative market interaction**

Source: PwC analysis.

As financial markets have evolved over time, the role of technology (among others) in influencing and shaping market interactions and structures has been extremely significant. Floor trading (i.e. a physical market where brokers interact face-to-face) has been replaced by more automated trading mechanisms and investment decision making process has become more complex with particular emphasis on quality of market information, speed of execution and innovation in business models. The inherent complexity of market structures and associated interactions has continued to increase with the rise of new market players and infrastructure providers. Moreover, technological advancements coupled with evolution of trading techniques and mechanism has supported the rise of electronic trading. This has been particularly true of computer generated trading (“CGT”) which includes algorithmic trading (“AT”) and high frequency trading (“HFT”). We discuss these and their definitions in the next section.

## Electronic trading

Technology has supported the rise of electronic platforms where virtual trading has replaced conventional floor trading of the past. In the current market, buyers and sellers of securities (such as cash equities, bonds, foreign exchange, commodities etc) can communicate and share information electronically to execute trades on stock exchanges and/or other venues which can then be cleared and settled in their respective central counterparties (“CCP”) and central securities depositories (“CSD”). Electronic trading itself is a very broad term encompassing developments in trading mechanisms, such as greater reliance on computer generated trading, as well as supporting infrastructure - whereby buyers and sellers interact by sending messages electronically (automation of trade channels). Some of the details underpinning the evolution of the market in terms of improvement in IT infrastructure and technology include:

- Automation in trade affirmation and confirmation procedures where electronic dispatches are used to match and confirm trade orders across participating funds, institutional investors and brokers. There has been a growing participation of technology firms and associated protocols in the trading arena facilitating interactions across market participants – for example the process of connecting counterparties through electronic trading is supported by the Financial Information eXchange (“FIX”) Protocol which is widely used by market participants.
- Increasing use of smart order-routing systems and electronic order execution by brokers where electronic interfaces are used to transmit orders which source liquidity in markets, split block trades to limit market impact, provide efficient execution and support price discovery.
- Developments of trading techniques, mechanisms and algorithms that are driven by technically advanced computer software governed by complex mathematical modelling of fundamental market pricing and expected trends.

- Increasing reliance on direct market access (“DMA”) where participating funds and investors are able to access trading venues and exchanges through services offered by brokers using the broker’s underlying technology infrastructure. In these cases the order is placed on the trading venue in the name of the broker rather than the investor utilising the broker’s membership, with the investor’s identity not being revealed to the venue. Another form of this trading is referred to as sponsored access, whereby an investor places orders directly onto the venue using electronic systems access, again in the name of the broker “sponsoring” this access but the order does not pass through the broker’s in-house trading/order-routing platforms.
- Low latency direct computer connectivity to trading platforms for intermediaries and institutional investors, for example through using co-location services. Co-location is where the investor’s/trader’s systems are physically located close to the computers that house the exchange/venue trading and order-matching systems such that the time between the trading decision made by the computer algorithm and placing that order onto the venue’s systems is minimised.
- Evolution in market participation across the value chain and underlying interactions, such that a broader network of firms can be supported on the trading infrastructure, as well as increasing levels of interoperability. Whilst technology and underlying software usually vary across exchanges and/or trading platforms as they typically develop their own trade matching engines, nonetheless they are compatible across markets and participants. Also, there are instances where exchanges use software developed by other exchanges to support market interaction and connectivity.<sup>5</sup>

Whilst technology has supported a range of developments in the last several years which have transformed financial markets, one of the most significant changes has been the evolution of computer generated trading (“CGT”). Computer generated trading or ‘black box trading’ as it is sometimes referred, is an aspect of the financial markets that has grown rapidly since its early beginnings in the 1970’s. Originating as order flow input on the New York Stock Exchange, the gamut of products traded under its guise has extended from equities and now includes foreign exchange, commodities, and futures. There are different variants of computer generated trading, some are relatively simple which focus on electronic execution of orders by traders whereas other rely on computers making trading decisions based on a range of market fundamentals and strategies – the next sections discuss some of the subsets that are covered in the later group – particularly algorithmic trading (“AT”) and high frequency trading (“HFT”).

## Algorithmic trading

Algorithmic trading, a subset of computer generated trading, refers to particular trading strategies where computer algorithms governed by high-tech computing, dynamic programming and complex software determine market characteristics and fundamentals before taking the appropriate trading decisions. In principle, algorithms are built based on investors’ and market participants’ views on strategy and interpretation of market changes – and as such are based on systems where the underlying rules are determined by humans. However, once the algorithm is designed, it involves little human interaction and the algorithm itself executes the order taking

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<sup>5</sup> A case in point is the use of LIFFE’s Connect system by the Chicago Board of Trade’s electronic trading platform.

account of underlying trade order fundamentals and limitations. For example, a trader might use an algorithm to trade throughout the day, splitting large orders when targeting particular stocks for exposure or to offload a strategic position through a limit sell order. In addition to trade execution and origination, algorithms also support development of simple order placement into a series of trading strategies, which include trend-following, geographic arbitrage, delta-neutral and pair trading.

The European Commission defined algorithmic trading as: “The use of computer programmes to enter trading orders where the computer algorithm decides on aspects of execution of the order such as the timing, quantity and price of the order”.<sup>6</sup>

## High frequency trading

High frequency trading is a particular type of algorithmic trading where traders use sophisticated statistical and quantitative techniques coupled with advanced technological infrastructure to review pricing fundamentals and make trading decisions across different markets. Typically, these are latency driven technologies motivated by their ability to undertake split-second analysis of public information to make trading decisions and typically involve trading in very large volumes but with relatively small order sizes (i.e. number of shares). High frequency traders at times function as market makers, where they can be aggressive through capitalising on their market linkages to provide and/or take liquidity away from the market or they can be passive by placing limit orders onto electronic order books. In principle, such traders actively trade throughout the day and take positions in securities that in their perspective are mispriced – however, they usually close their positions by the end of the day such that they have no or little overnight exposure. Additionally, their trading strategies are supported by detailed market and transaction cost analysis to assess the feasibility of individual transactions.

The SEC offers the following description of HFT:

*The term is relatively new and is not yet clearly defined. It typically is used to refer to professional traders acting in a proprietary capacity that engage in strategies that generate a large number of trades on a daily basis... Other characteristics often attributed to proprietary firms engaged in HFT are: (1) the use of extraordinarily high-speed and sophisticated computer programs for generating, routing, and executing orders; (2) use of co-location services and individual data feeds offered by exchanges and others to minimize network and other types of latencies; (3) very short time-frames for establishing and liquidating positions; (4) the submission of numerous orders that are cancelled shortly after submission; and (5) ending the trading day in as close to a flat position as possible (that is, not carrying significant, unhedged positions over-night).*<sup>7</sup>

## Overview of our methodology

Our methodology focuses on analysing and documenting the drivers and interactions that have shaped the current European equity market as well as its expected evolution in the next five to ten years, with a view to painting a picture of the current and future expected market structures and associated characteristics. Taking the current market structure as the base case, we extrapolate backwards to determine the market structure five years ago and assess how the

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<sup>6</sup> European Commission (2010), “Public Consultation - Review of the Markets in Financial Instruments Directive (MiFID)”, page 14.

<sup>7</sup> Securities and Exchange Commission (2010), “Concept Release on Equity Market Structure”, release number 34, page 45

market has transformed since, structurally as well as in relation to its underlying characteristics. This period has been chosen as it is approximately five years since the implementation of the Markets in Financial Instruments Directive (MiFID) in November 2007, a piece of European regulation that has had a significant impact on European markets. Similarly, we repeat the exercise to form an overall perspective on the future market structure and characteristics in five to ten years from today. In analysing market structures, we have paid some specific attention to the role of CGT in transforming trading mechanisms and infrastructures as well as its role in the future for shaping European equity markets.

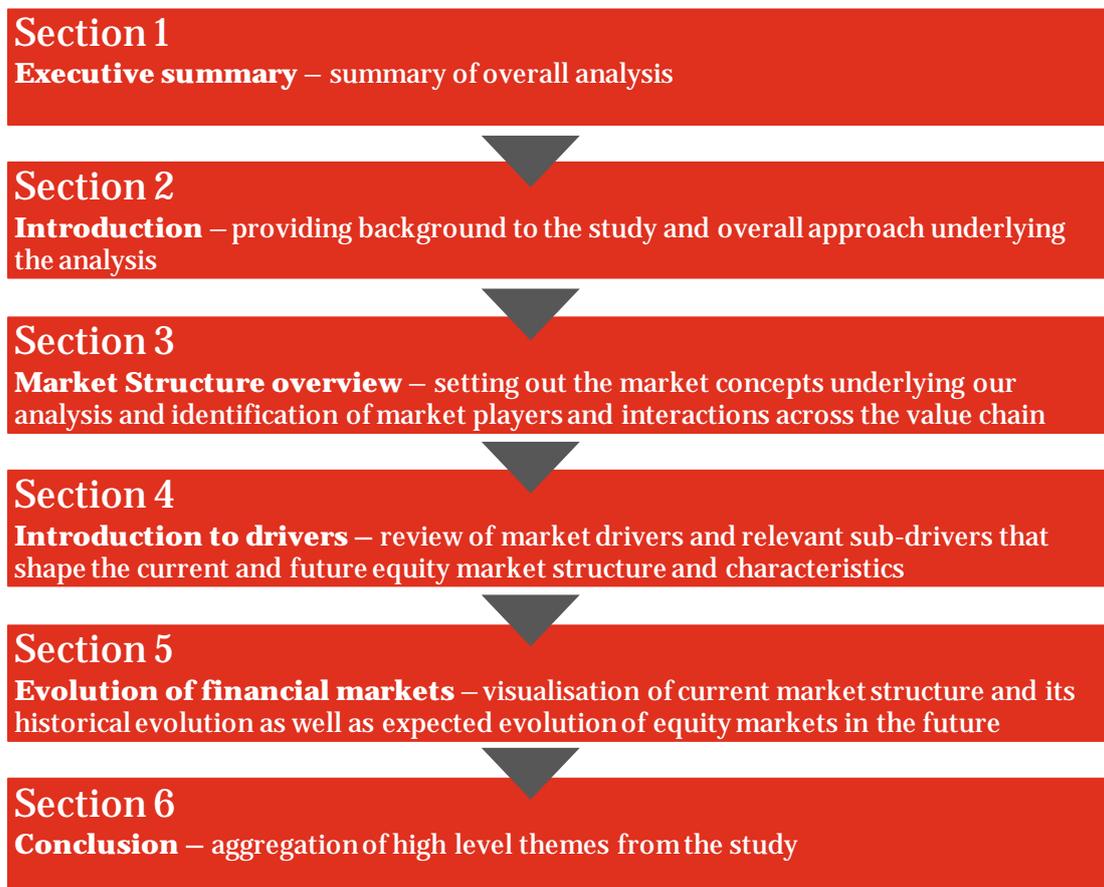
We believe a key output from the study is the depiction of market structures at a level of detail that identifies market participants across the entire value chain and demonstrates a number of the key interactions between these participants – both within and across specific segments of the market – including the trading infrastructure that supports such interactions. With this in mind, we have tried to develop maps of the market over time that reflect developments in trends underlying market participation and interactions across the trading value chain. We also highlight developments and trends in fundamental characteristics of the market over time such as liquidity, price discovery, trade sizes, financial stability and transaction costs.

We have used a number of different sources to help inform our understanding of the market, both in terms of evolution to the current stage as well as expectations of how it will evolve in the future. In particular, we have relied on:

- An industry workshop that has allowed us to engage with a wide range of actors and stakeholders in the market to develop a deep understanding of drivers and interactions that are relevant in shaping the current and future markets, as well as the depiction of the current market structure;
- Our subject matter experts who have significant understanding of financial markets and trends that have shaped them historically as well as others which will determine the framework for future market structures and interactions;
- Desk top research to gather information to construct the base view of the market, identify key drivers, interactions and trading infrastructure trends and characteristics to develop a view of the future market structure;
- One-on-one interviews with some of the key players in the market to test our thinking and impression of the market; and
- Input and commentary from the Foresight Steering Committee.

## Structure of this report

The structure of the report is summarised in the figure below:



## 3 Market structure overview

This section sets out our conceptual understanding of the market structure and its characteristics. We start by identifying the core structure of the market and its key participants and then move onto describing our understanding of market characteristics and their relevance in the current context.

### Market participants and structure

#### Introduction

Having set out our conceptualisation of market structure above, this section focuses on describing the participant groupings that we will be using in the latter part of the report, as well as setting out exactly how we intend to document the interactions between participants in these groups. The aim of the section is to provide the contextual framework in which the substantive analysis on changes in market structure can be understood. It will achieve this by first providing an overview of participant groupings and interactional dynamics (supported by some illustrative detailed examinations), before moving on to look at how examining participants and their interactions in concert can inform our understanding of market structure and how it has changed.

#### Participant grouping approach

There are several issues to consider when attempting to form a view of European equity markets that is based on different groupings of participants. Firstly, the choice of groups itself is not a given, as there are several different ways of interpreting market structure. An alternative approach to conceptualising the market is to delineate based on outcomes rather than participants – this results in a picture which is aligned with market objectives (risk transfer, supply demand equilibrium etc), but is unable to represent the nuance of changes in composition, whereas a depiction based on participants and interactions is capable of capturing these changes. We have decided to use the most straightforward categorisation of participants possible so as to limit the potential for disagreement about the validity of our conceptualisation of the market. Similarly, the amount of qualitative and quantitative information available that uses traditional participant groupings lent further credence to our interpretive framework.

The other significant issue to consider when identifying market participants is that certain participants will fall into multiple categories – either simultaneously or alternatively depending on the situation. While this does make the task of providing hard and fast classifications difficult, it is a necessary feature of any depiction of roles in the market. Our analysis is based on interactions in the market that document specific interactional activities, and as such may at times depict the same actor as having different roles in a given process. This will be clearly explained when it occurs, and as such should not detract from the analysis. Indeed, as later parts of this report will discuss, the blurring of roles of participants is increasingly becoming a defining feature of the European equity market.

#### Participant groupings

Our view of the market is comprised of three main groups of participants: investors, intermediaries and infrastructure providers, with issuers being a supplementary group (important but not considered central as the focus of this report is on secondary, not primary markets).

#### Investors

We define investors as market actors who buy or sell instruments within the market – either in the hope of it generating income for them, or because there is an intrinsic benefit in them holding the asset for example capital gains and/or the ability to influence the company's operations and

management through share ownership. This is an intentionally broad description, and as such includes the following groups (and sub groups):

### ***Institutional investors***

#### **Pension funds:**

Pension funds invest the money provided by contributing members of the pension scheme in order to provide a qualified retirement pension provision, as well as to make a profit themselves. Owing to their nature, pension funds have traditionally been long-only funds that look to make long term investments in the market. Increasingly, they have been adopting portfolios designed to correlate to the payment obligations of the fund to its beneficiaries.

#### **Insurance companies (chiefly life insurers):**

Similar to pension funds, insurance companies invest the premiums they collect in order to be able to make coverage payments and to make a profit themselves. Portfolios are increasingly designed to track market risk and align returns to the liability profile of those they insure.

#### **Government agencies:**

These are investment arms run on behalf of a governmental agency – they invest money entrusted to them on behalf of whichever government agency they represent.

#### **Sovereign wealth funds:**

These are investment funds created to invest national wealth created by trade/budget surpluses or state funded pension plans on behalf of sovereign governments or major governmental organisations. An example would be the Abu Dhabi Investment Authority.

### ***Investment managers***

#### **Fund managers (long only):**

These organisations represent professional investors who invest in certain asset classes or strategies, typically on behalf of pension funds and insurance companies, opting to take long-only positions. Long only refers to the practice of only purchasing assets with the expectation that they will increase in value – cf. short-selling; the practice of borrowing assets with the expectation that their value will depreciate. These form a traditional portion of the investor base in the European market, and are more aligned with pension funds and insurance companies in their investment risk appetite.

#### **Investment managers (long/short funds):**

Similar to above, but different in that they are also willing to take short positions in the market, funds of this type are newer than the long-only funds. In principle, mandates for investments are set out for investors to understand and allow a certain percentage of derivatives (and/or related asset class) usage for hedging purposes as well as to improve overall investment returns on portfolios.

#### **Hedge funds:**

A hedge fund is pooled investment vehicle managed by a manager that uses aggressive, highly sophisticated and often risky investment strategies in the market in order to make significant returns for investors. They often use complex trading strategies, which we have not sought to list or define given their underlying diversity, but examples include pairs matching and statistical arbitrage. In principle, hedge fund managers have been the early adopters of computer generated trading (CGT) and have been the developers of some of its most sophisticated applications such as high frequency and complex algorithmic trading. Moreover, hedge funds and other related investors are key liquidity providers in the market and are also involved in various forms of securities transaction financing.

**Investment banks:**

Investment banks act in the investor space when they proprietarily trade shares in the market to make a profit for themselves.

**Proprietary trading firms:**

Proprietary trading firms exist to make a profit from firms' capital using different trading strategies. They sometimes function as part of larger organisations such as proprietary trading desks within investment banks that make principal investment and trading decisions using the bank's capital.

**Retail investors:**

Private individuals who invest in the market either based on their own trading decisions; on the advice of professional investment advisors, or by depositing cash with an investment/wealth manager who makes investment and trading decision on the individual's behalf (referred to as discretionary management). Many retail investors operate in the market utilising internet trading facilities and trading arcades often using investment analysis tools supported through sophisticated computer programmes.

**Intermediaries**

Intermediaries typically represent agents who primarily support market intermediation and facilitate interaction and as such generally do not invest in the market directly, but rather exist to facilitate the investment of others. This includes acting as a market maker for the investor (essentially providing liquidity on the market through holding equities in an inventory so that they can meet orders for buying and selling as they arise). Moreover, they often function as part of vertical silos where they provide broker-dealer services to proprietary trading desks in the firm.

Intermediaries are motivated to participate in the market by the fees and commissions they charge for their services, rather than any benefit that might arise from the resource/risk allocation machinery of the market directly. Having said this, many intermediaries also act as investors, and it is therefore important to recognise that a market agent may act as intermediary and investor simultaneously, even within the same interactional process.

In including market participants in the intermediaries' category, we have thought in the context of services provided by market participants, such as credit intermediation (broker-dealers and investment banks), timing intermediation (market makers) and trading interaction (crossing networks), as opposed to explicitly considering category of participants themselves, since in principle, a broad range of services can be offered by individual intermediaries.

With this in mind, intermediary participants are set out as follows:

**Broker-dealers:**

Broker-dealers are firms that act to buy and sell securities from market participants that are looking to either invest and/or divest their holdings (brokering between investors and hence acting as agents), as well as take positional risk in securities through principal trades (acting as a dealer for example through buying securities and then selling them in the market as principals).

**Market makers:**

Market makers perform the key function of being liquidity providers in relation to specific securities, in which they will "make markets" i.e. hold themselves out in the market offering to both buy and sell financial instruments. They essentially control and make money off the spread on underlying securities.

**Investment banks:**

Investment banks act in the equity capital markets in order to assist corporate investors with their capital financing strategies. Moreover, they are also innovative traders directly for their own capital accounts.

**Custodians:**

Custodian banks act to safeguard the financial assets of investors operating in the market, rather than acting to invest in the markets themselves

**Alternative liquidity providers (dark pools & crossing networks):**

Alternative liquidity providers such as dark pools and crossing networks exist to provide liquidity to investors who do not want to trade openly on the exchange. The rationale for using these services is because investors are typically seeking to sell large blocks of securities and so are seeking to avoid moving the public price against them by trading these in these other locations. Dark pools can exist as independent entities, facilities provided by broker-dealers or as alternative services provided by exchanges. There is an argument for situating dark pools within the 'infrastructure provider' part of the framework; however we have opted to define them as an intermediary as they operate largely to provide a specific service for clients, rather than acting to provide a marketplace for all investors.

**Infrastructure providers**

The last of our three main participant groupings contains those agents who provide the infrastructure which the market uses to operate. Whilst these parties do not participate in the trading mechanisms of the market directly, they are a critical participant group as they act as enablers for the market to occur and therefore support the underlying transactions. For the purpose of the current report, we focus on trading platforms and exchanges that provide the market infrastructure for transactions; however, it is important to realise that clearing houses and central securities depositories which clear and settle such transactions are a key segment of the market and have grown in systematic importance over time. The key distinction between intermediaries and infrastructure providers is that intermediaries actively aid investors in seeking one another to form both sides of the trade – infrastructure providers merely offer the space in which this interaction can take place.

Infrastructure providers are, however, similar to intermediaries in that they are motivated to participate in the market by the fees they can charge investors for using their services. Participants that fall into the infrastructure provider category in the European equity market are as follows:

**Exchanges:**

Exchanges act as marketplaces for the buying and selling of securities – they facilitate the coming together of intermediaries, investors and issuers to form a market.

**Multilateral trading facilities:**

Multilateral trading facilities (MTF) are similar to exchanges in that they facilitate the buying and selling of securities, but have arisen subsequent to the enactment of MiFID regulations to provide alternative fee structures to traditional exchanges, and operate almost exclusively in the digital space.

**Clearing houses/Central Counterparties (CCPs):**

Clearing houses provide transaction execution and settlement services for investors; essentially facilitating the settlement of trades in accordance with market rules and with regard to minimising the credit exposure of their clients. In the equities market the clearing houses are

used to reduce settlement risk by providing the calculation of net settlement between participants.

**Market data providers:**

Market data providers report market information such as buy and sell prices for securities.

**Trading platforms:**

Trading platforms are IT solutions that enable traders to interact with the market.

**Other IT providers:**

This covers all other aspects of IT provision that operates in the market, including trade reporting/order book technologies & IT security systems.

**Issuers**

A supplementary participant grouping used in our depiction of the European equity market is that of issuers. Issuers are termed as any parties engaged in the issuance of financial instruments. In the most part, this refers to corporations who issue securities either through a public listing, or via a rights issue. Whilst governments are large scale issuers in the fixed-income market, due to the nature of equity investments they do not constitute a significant part of issuance in the equity market, and as such will be omitted from this report.

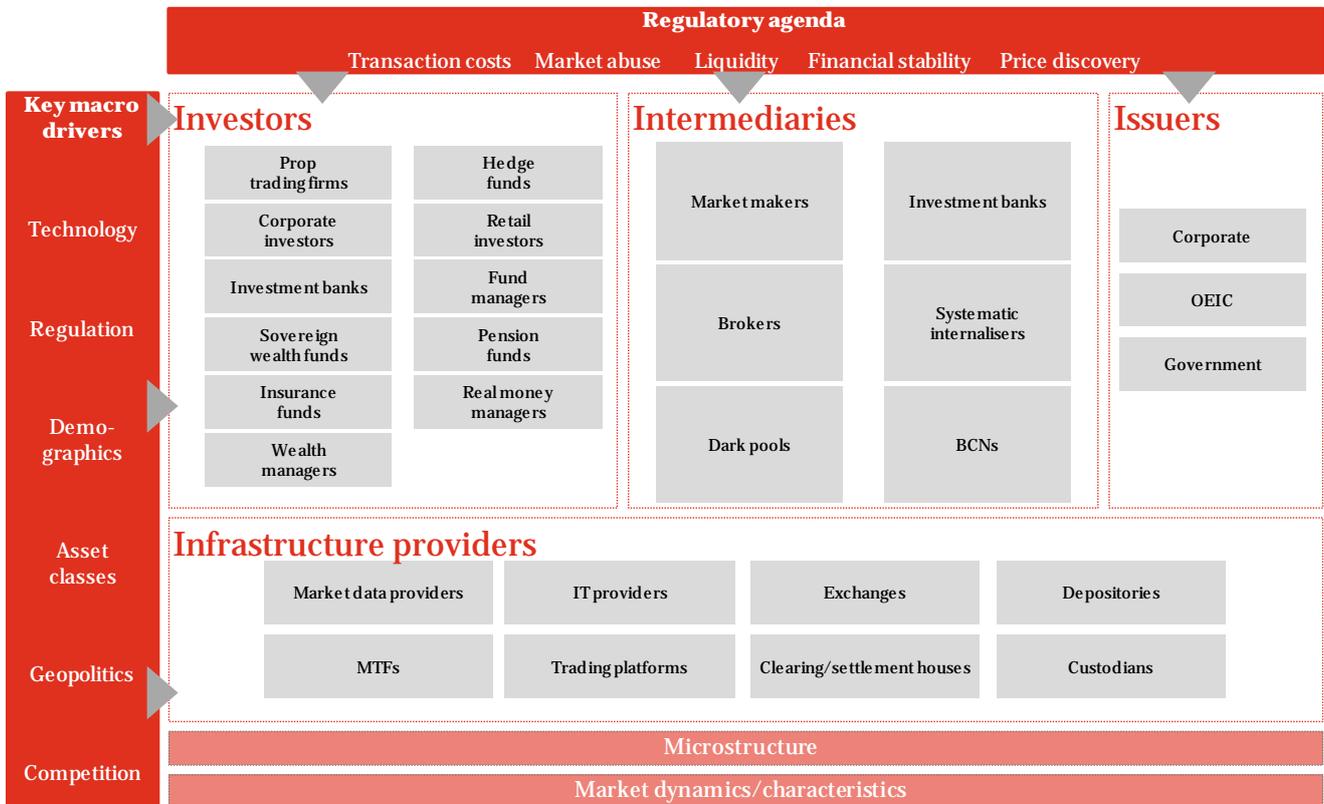
**Regulators**

Whilst the three broad grouping above cover the different categories of participants above, it is important to include regulators whose interventions directly influence markets structures, its underlying characteristics, associated roles and interactions and market conduct. Moreover, they also function as data aggregators.

**Conclusion**

Our view of the market is comprised of these three main groupings, with issuers as a supplementary category that serves to reflect the influence of the primary markets on the secondary. It also incorporates the impact of macro drivers, as well as the desired outcomes of the regulatory agenda as influencing factors. Equally, it highlights microstructure and characteristics as two of the key elements of analysing changes in the market. This view of the market was used to facilitate the industry workshop. These groupings of associated participants & structural elements are reflected in the figure below and will be used in a recurring way throughout the report, acting as a referential framework for the analysis of changes in the market; retrospectively and in the future.

Figure 5: Core market structure



Source: PwC analysis

We have also included market micro-structure above, whilst it is a broad term encompassing a wide range of elements within, at a high level it relates to the underlying mechanisms of trading in financial markets and ways in which the working process of such markets impacts their underlying characteristics. Examples of microstructure include exchange fees/rebates and tick sizes. We discuss market characteristics in the next section.

## Market characteristics

In the context of the current analysis, it is important to make a conceptual distinction between market structure and its associated characteristics. As discussed above, market structure typically refers to physical aspects of the market particularly in relation to its core segments (i.e. value chain), participants within those core segments and interactions that govern the relationships between the different market actors. Whilst the shape and form of markets are defined by its underlying structure, its attractiveness for market participants is determined by the associated characteristics. As such, market characteristics reflect its underlying attributes that change through time and can essentially be benchmarked throughout the evolutionary process.

Market structures and characteristics are inherently linked and each influences the other – hence to look at either in isolation would be an incomplete exercise. One can draw parallels between the two in terms of an analogy from the IT sector – the physical structure of the market represents the hardware whereas the characteristics represents the software that operates in conjunction with the hardware to provide the functionality that users (i.e. market participants) need.

The list below presents some of the more significant market characteristics that define market attractiveness as well as its overall functionality, based on the discussion in the workshop as well as our own analytical analysis. Whilst there was a dispersion of views on some of the most

important market characteristics in the workshop, we have tried to focus on themes where there was a general consensus amongst industry participants in terms of their underlying relevance:

- **Fragmentation** – is a market characteristic that defines whether there is a concentration of market participants across different elements of the value chain offering broadly similar services. Greater fragmentation, driven by competition and market entry, has supported market efficiency; however, it has also led to segmented market structures.
- **Price transparency** – refers to the ability of market participants to access market data and pricing information when undertaking or facilitating transactions in financial instruments. Regulatory policy guidelines (on pre and post-trade transparency) in conjunction with evolution in information technology has supported increased price transparency across European markets.
- **Automation** – refers to the increased reliance on electronic platforms for trading securities as well as communication and interaction across different participants in the value chain. Whilst significant investments have been made in improving market infrastructure and network for trading, this has been complemented by introduction of trading techniques and mechanisms which rely on computers and complex algorithms to guide the investment decision making process.
- **Asset class sophistication** – this relates to innovation and sophistication in the types of assets that are traded in financial markets. A wide range of factors, particularly, supply and demand dynamics, expansion of investors across markets and associated risk appetite has led to an increase in type and complexity of assets that are traded in financial markets.
- **Market participant roles** – this covers the role of market participants, interactions and focus across different elements of the trading value chain. There has been an increase in the type of market participants and range of services they offer, with more diversified profiles covering operations across different elements of the transactions arena.

In principle, drivers and influences that shape market structures (see discussion in section 4) also impact underlying characteristics of the market itself. Moreover, it is inherently difficult to segment between drivers and characteristics as there is a degree of circularity between the two – drivers can impact market characteristics, however, they can then themselves be influenced by evolution in the underlying characteristics. For example, competition as a driver impacts market fragmentation, however, market fragmentation in itself will lead to greater competition in the market. Drivers are discussed in more detail in section 4.

Whilst a detailed review of the impact of different influences on market structures and characteristics is covered in later sections (namely 3 & 5), it is useful at this stage to give a few examples that explain how some of the characteristics are likely to be affected.

- Increase in market fragmentation, particularly in the infrastructure space through market entry (as has been the trend historically – see section 5), will lead to lower transaction costs as exchanges compete with each other for greater share of the volumes. However, such fragmentation might lead to lower liquidity (and higher bid-ask spreads) as investors would find it difficult to fill block trades on order books. This (and continued fragmentation in markets) will impact price formation, transparency and availability of consolidated trade data.

- Competition across brokers will lead to lower commissions and hence transaction costs. As pressure on margins increases, intermediaries would focus on improving market efficiency. Although fees and commissions for broker-dealer service will decrease, the actual costs of doing business and providing such services whilst preserving minimum margins of profitability will represent a floor to the underlying decrease in costs. Moreover, regulatory minimum functional requirements will also keep these costs from being an ever-declining arc.
- As the diversification of the investor base increases across financial markets, the volume of underlying transactions will increase. A particular likely effect is that increased participation at the retail level might lead to further decreases in average trade size in conjunction with higher volumes. Greater participation will also improve price discovery and increased demand for product innovation and sophistication.

## 4 Introduction to drivers

This section sets out the key macro drivers that have influenced the shape of the current European equity markets and are likely to shape equity markets of the future. We also consider the relevant sub-drivers within each category that have had the most significant influence on developments of these markets. The purpose is to set out their respective influences and touch upon some of the potential impacts on market structure and characteristics, which are then further explored in section 5 across current and future markets.

The analysis reflects PwC's internal thinking as well as discussions and evidence gathered from the workshop conducted by PwC on the 'Drivers of Equity Market Structure' where a wide range of industry participants were asked to agree on specific macro drivers and identify sub-drivers within each category that are fundamental in shaping financial markets. In the context of the current report, we have attempt to collate the most relevant drivers, including sub-drivers within, reflecting views of workshop participants in terms of the most significant market impact, current as well as forward looking. Whilst we have attempted to make the discussion exhaustive in terms of drivers that are covered, in some instances we have also briefly included others which were mentioned in the workshop but were not believed to be too material in shaping impact on market structures.

### Technology

Technology is considered a key driver in shaping the structure and characteristics of the current financial markets as well as its evolution in the future. Majority of workshop participants agreed that technology has transformed trading techniques and infrastructures as well as supported the growth of financial markets through allowing greater participation and access – thus impacting the market on both the buy-side (i.e. investor) and the sell-side. Firms continue to invest significantly in technology infrastructure and a growing number of financial services firms are partnering with technology firms to access and use different technologies to support their operations. Additionally, proliferation of information technology and investments in infrastructure has lead to development of peer-to-peer market models where buyers and sellers are increasingly interacting with each other using online trading systems (platforms). As such, these platforms allow individual members to complete financial transactions through an auction-style process where financial assets and securities (typically cash equities) are bought and sold on 'best offer' basis. Development of such models has implications on both market structure and characteristics – as the role of intermediaries and associated costs are sidelined.<sup>8</sup>

One of the themes that stood out in the workshop discussions was technology's key impact in supporting greater automation of trading mechanisms such that there is enhanced efficiency of order flow and speed of execution – particularly in relation to algorithmic and high frequency trading strategies. Whilst there is reason to suspect that advancements in the latter (i.e. speed of execution) in the future will likely be of less relevance, as some participants suggested that marginal improvements in the future will be less significant, majority of participants agreed that technology certainly has played (and will continue to play) a key role in improving efficiency of markets and underlying participants. Additionally, technology has enabled firms to analyse market data across a wide range of sources and formats more swiftly, accurately and with increased sophistication. This, in conjunction with development of trading infrastructure, which

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<sup>8</sup> There are also more complex form of peer-to-peer models across asset classes which can potentially involve automated intermediation across participating members.

supports enhanced participation and interoperability across market participants, as well as innovation in trading techniques has impacted the functioning of financial markets as well as its underlying characteristics.

Whilst technology has led to or facilitated significant changes in financial markets, its participants and interactions, workshop participants highlighted that it has nonetheless also made the markets more susceptible to different sources of risk with broader implications for the real economy. For example technical glitches and/or human error can generate market instability. Moreover, some trading algorithms can lead to self-reinforcing feedback loops, whereby small changes in the market (driven by new information for example) loop back and trigger bigger developments. Another impact is a phenomenon called the ‘normalisation of deviance’ where unexpected and risky events come to be seen as ever more normal until a stock market crash occurs. An additional concern is the ‘gaming’ of the market by participants in supporting their algorithmic and high frequency trading, through particular strategies which might imply market abuse. A case in point is trade orders being generated and subsequently cancelled to augment market liquidity and artificially support pricing – however a growing number of exchanges such as NYSE Euronext have ‘throttling’ systems that detect and prevent order message traffic exceeding acceptable levels. Also, many European exchanges are introducing new fee structures which penalise firms where their order to cancellation ratio exceeds a certain threshold - thereby encouraging more genuine orders to be placed (i.e. orders that an investor expect or hopes to be completed). This should improve price discovery and improve overall executable liquidity.

Therefore, there is a need to realise that technology as a driver also has a crucial role to play as a risk management and mitigation mechanism – which in parallel with regulatory policy guidelines can help stability in financial markets and manage risk effectively.

We have set out below some of the key sub-drivers within technology that were identified during the workshop as being relevant in shaping the structure and characteristics of financial markets.

- **Automation of trade channels** – technology has supported the rise of more sophisticated means of trading, such as movements from floor trading to automated execution, and smart order-routing systems such that markets are able to perform more effectively and efficiently. Brokers are typically able to execute orders electronically without any manual input guided by pricing fundamentals and trading algorithms. In essence, this also allows broker-dealers and other market participants the ability to manage orders effectively and limit market impact. Workshop delegates identified and agreed that trade order management and execution is automated across the majority of European equity markets, particularly Western European economies, and is a rising trend across some of the other less developed European markets. There has also been a marked increase in straight through processing across European markets, where electronic communication facilitates automated trade order origination, matching and confirmation.
- **Information sourcing and digitisation** – this relates to the development of data channels and information sourcing techniques, which makes exhaustive market pricing information readily available to investors and brokers alike, in conjunction with trading tools that are able to digest information from various sources and make appropriate trading decisions. It was suggested during the workshop discussions that the evolution of such technologies has dramatically reduced search costs for market participants and supported trading strategies that are well informed and based on relevant market considerations. Whilst such technologies are high on the agenda for market participants in Europe, there is a wide spread in terms of their application and use across different European markets. Additionally, participants in the workshop also suggested that there is an increased trend of moving towards the use of data

clouds which is changing the way financial intermediaries approach business as more companies store, manage and process data externally.

- **Speed of access and execution** – in addition to the developing ability to digitise information, technology has revolutionised the speed of access and execution for market participants, particularly in terms of developing trading strategies and algorithms that have the ability to gather and act upon market information when executing trades on order books. As such it has led to the following:
  - The rise of high frequency trading where latency is a key concern. However, it was noted in the different sessions during the workshop by some participants that future increases in speed of access and execution technologies are likely to be less significant. Moreover, over time the impact of high frequency trading in shaping market structures and associated characteristics will likely be less relevant.
  - It has led to the use of co-location services and individual data feeds offered by exchanges and others to minimize network and other types of latencies.
  - Trading on a single screen covering multitude of information across asset classes and markets.

Such developments are more prevalent in developed European markets such as UK, France, the Nordic regions, Germany and Italy compared to some of the less developed European markets.

- **Interoperability and market participation** – interoperability refers to the ability of market participants across different platforms to effectively communicate, interact and share information through different trading channels. Evolution in technology and investments in IT infrastructures has supported increased market participation and connectivity/interoperability across investors, intermediaries and infrastructures. Moreover:
  - It has led to development of networks which complement trading fundamentals and are able to support greater interactions across market participants. Broker-dealers are typically able to cross client and proprietary trade orders through crossing networks and/or source liquidity across multiple trading venues; and
  - Additionally, workshop participants also discussed its role in supporting development of trade channels, such as direct market access (“DMA”), where IT infrastructure allows direct access to trading venues (routed through broker-dealers) for investors. In principle, impacting market structures as well as its fundamental characteristics.
- **Innovation in business models** – An important role of technology has been in defining innovation in business models and trading techniques – particularly in relation to supporting the ability of mathematicians to model effective trading strategies and develop algorithms that can make trading decisions based on certain pre-defined parameters and/or market dynamics. As such, it has supported the development of quantum computing and allowed market participants to develop sophisticated trading and execution algorithms.
- **Proliferation by market participants** – As suggested earlier, evolution in technology and investments in IT infrastructure have allowed greater market entry across the different category of market participants, however, in terms of structural implications for the market the role of technology has been extremely important in allowing participation at the infrastructure level – in particular the role of MTFs. This is likely to have implications on the trading framework in terms of consolidation or fragmentation over time – as discussed later in section 5.

- **Retail participation** – in addition to supporting institutional investors and brokers, one of the key roles of technology discussed during the workshop was its support of technological advancements that have opened the market to retail investors who are increasingly becoming a more relevant source of liquidity in the market, particularly through retail service providers (RSPs). Moreover, evolution of trading techniques complemented by further advancements in technology might allow development of retail investors across such markets with functions similar to those of institutional investors. Currently, retail participation in equity markets is more prevalent across continental Europe compared to the UK, although there is a growing trend in the UK as well.
- **Social media** – this refers to modes of communication and information flow which are supported by evolution of technology and as such are starkly different to contemporary modes of interaction across individuals and/or market participant. Social media is changing the way that people communicate and conduct business, and can refer to a variety of different things, including some of the following developments across different markets:
  - Access to the internet continues to increase globally and trading through the internet (casino trading) is high, particularly across retail investors in Western European markets.
  - Globally, more people have mobile phones than bank accounts and the use of mobile phones to complete potential transactions might increase rapidly.
  - Social networks (e.g. Twitter) and information feeds (e.g. bulletin boards) from non-traditional sources can have a significant influence on investment and trading decisions.
  - Market access technologies can drive trading mechanisms and strategies – in principle allowing information sourcing and trade execution across multiple channels and proliferation of market participants and products<sup>9</sup>
- **Role in risk management** – workshop participants identified that technology can be used as a mechanism for monitoring systemic risk and volatility resulting from intra-day trading to limit the need for corrective actions across financial markets. Whilst technology is seen by many as a key enabler of efficient market practices, its role in ensuring financial stability and promoting fair and effective trading practices is important. Although important developments have been made in risk management systems across all components of the market – investors, intermediaries and infrastructures – supported by technology in conjunction with underlying regulation, there are certainly areas where markets can benefit from using technology in monitoring and evaluating market risk.

A number of others sub-drivers within technology were also discussed during the workshop, such as cost of technological innovation and ubiquity of sophisticated technologies across different regions and their compatibility. Whilst some participants suggested these were core drivers, others argued that they represent outcomes as technology evolves and impacts market structures. Whilst we have not explicitly included these as core (sub) drivers in the discussion above, we note that they are linked to some of the points above (for example compatibility of technology is linked to the point about interoperability) and are important in shaping market structures and outcomes for the future.

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<sup>9</sup> Additional information on some of these tools is covered in the Appendix B where we provide a summary of Project Blue.

## Regulation

In well-functioning financial markets, especially in the trading arena, it is in the interests of participants (both direct actors and indirect beneficiaries) to have a market that is orderly, appropriately transparent and provides equality of access. Historically regulation has been used as a tool to govern, supervise and provide guidelines to all participants to ensure these objectives are met and that the integrity of the market is maintained.

However, in recent years in addition to regulatory changes that aim to keep pace with market developments such that the regulatory tools remain relevant and appropriate, we have also witnessed changes that aim to create, foster or at least facilitate deliberate market structural changes. One example of this is the European Markets in Financial Instruments Directive (MiFID) that was implemented in November 2007 as part of the European Commission's Financial Services Action Plan, which helped to create a more cohesive, and consistent European wide market place. MiFID, in conjunction with a number of other regulatory policy guidelines, has aimed to improve market transparency, investor protection, conduct of business and integration across a range of asset classes with implications on market structure and functioning of capital markets.

The financial crisis of 2008 and beyond raised questions on whether global, regional and local regulatory regimes were able to protect the integrity of the markets which is required to underpin the confidence of direct participants, and other stakeholders including citizens and national governments. Whilst there are real concerns about the distinction between perceptions of market failures and their underlying causes, clearly regulation (or lack thereof) cannot solely be blamed for the financial turbulence witnessed recently (see for example the outcomes underlined in the Turner Report), however, it is important to realise the influence of overarching political imperatives on shape and form of regulation and the need to ensure that regulatory policies are informed based on deep understanding of market mechanisms and causes and effect analysis – for example market participants and commentators have questioned whether the short selling ban was based on sufficient understanding of the mechanics of the market.

Abstracting from interplay between regulation and politics, regulatory policies have a crucial role to play in developing trust in financial markets and ensure their underlying stability. Under the auspices of the G20, the Financial Stability Board (FSB) commenced work on number of themes aimed to reduce the risk of such failure in the future. Some of these key themes can be summarised as:

- OTC derivatives
- Transparency
- Governance
- Capital and liquidity
- Recovery and resolution
- Compensation
- Shadow banking

Many regulations that are either in the process of being implemented, or are in the consultation phase, are a direct response to this thematic work. Examples of this are the changes to the trading of OTC derivatives where the requirements to trade and clear such instruments and the impact of capital requirements on such activity is covered under regulations including MiFID, Dodd Frank Title VII, European Markets Infrastructure Regulation (EMIR) and Basel III (implemented through CRD IV in Europe).

What is becoming clear from the large volume of regulation that is being written and consulted on at the moment is the complexity and interdependencies – a theme that has been echoed in the recent workshop as well. The regulators need to ensure that the regulations are interacting in a way that incentivises the market and its participants in a way that meets the regulatory objectives. This is also in the context of maintaining consistency with international regulation to prevent arbitrage and whilst many of the regulatory bodies have only recently been formed e.g. ESMA.

Further, given the observation that typically, and historically, regulations have been a response to natural market evolutions to ensure that the integrity of the market is maintained, and hence the confidence of the participants and the wider public is likewise maintained, we can now observe that many of the current raft of new or revised regulations are designed to change the structures and the dynamics of markets on the basis that the financial crisis demonstrated that just keeping the natural evolution in “check” was not enough. However, the un-intended consequences of such regulations must be carefully considered to ensure that the outcomes not only meet the expectations of regulators and governments but of participants also so as to maintain the purpose of the markets i.e. to facilitate the free flow of capital in an orderly manner.

Given this backdrop of a thematic view of regulatory reform, we can see a number of market focussed outcomes on which the new regulations are focused, namely:

- Price discovery/transparency
- Liquidity
- Stability
- Costs and level playing field
- Market quality (including aspects such as market efficiency, depth, participation etc)

Figure 6 below shows the different regulations and their relevance across different asset classes as well as focused outcomes for the market.

Figure 6: Regulatory reform and implication on market outcomes

Regulation	Asset classes						Focused outcomes					
	Equity	Listed derivatives	Fixed income	OTC derivatives	Commodities	Structured products	Price discovery	Transparency	Liquidity	Stability	Market quality	Costs and level playing field
MiFiD (Markets in Financial Instruments Directive)	X	X	X	X			X	X	X	X	X	X
EMIR (European Market Infrastructure Regulation)				X			X	X		X	X	X
Revised MiFiD /MiFiR (Markets in Financial Instruments Directive II)	X		X	X	X		X	X	X	X	X	X
CRD IV (EU implementation of Basel III)	X		X			X			X	X	X	
Dodd Frank	X	X	X	X			X	X	X	X	X	
EU Short selling regulation	X	X					X		X	X	X	

Source: PwC analysis

Improvement in all of these market outcomes would likely be seen by most, if not all, participants and stakeholders as a good thing.

In summary, we have identified a number of key sub-drivers under Regulation that are relevant for consideration when assessing how the market is changing, they reflect majority of the perspectives of participants in the workshop and include:

- **Volume and complexity of regulation** – as noted above, the volume and complexity of regulation is becoming an issue for all market participants as they seek to understand their obligations to comply and re-interpret their business and operating models in the context of the regulatory environment.
- **Regulatory cost driving consolidation** – the cost associated with complying with increased regulation might itself be extremely significant if regulation is too prescriptive and can potentially impact market participants' behaviour. Workshop participants stressed that higher cost of regulation can lead to increased consolidation and/or market exit if incumbents are unable to meet the regulatory guidelines. There is a risk here that increased consolidation and the perception of a significant compliance burden would restrict market entry and potentially decrease liquidity in the market.
- **Sophistication and role of regulators** – there has always been, and will continue to be, debate about whether regulators are able to understand sufficiently the complexities of the market place and therefore how they should regulate. Discussion on this topic, during the workshop as well as in the context of broader regulatory policy debates, typically refers to the need for regulators to focus on the macro regulation such as improving market stability, price

discovery, liquidity, reducing transaction costs and market abuse, whilst avoiding a focus on regulating the microstructure where complexity and interdependencies can be more difficult to interpret. In addition some participants observed that the continued pressure on the regulators to operate in multiple capacities such as supervisor/“policeman”, policy maker, and also a participant in the political debate creates an ongoing challenge for regulators.

- **Financial transactions tax** – this includes taxes proposed by a number of European governments that would impose a percentage based tariff on all transactions executed by a firm operating in its jurisdiction, or potentially any firm conducting a transaction in a security that is listed or admitted to trading in its jurisdiction regardless as to the location(s) of the trading firm. A number of different participants argued that incorporation of financial tax on transactions, depending on its associated magnitude, could potentially negatively influence market participation through increasing the cost of trading and thus leading to lower turnover velocity. Others also argued that it might also potentially increase trading across asset classes where the impact is likely to be less significant (or non-existent) or perhaps as a more significant implication influence investors to trade in markets where the tax is not present.
- **Capital requirements** – increased capital requirements for financial intermediaries will likely limit their ability to trade as counterparties on principal trades thus having implication on liquidity and price discovery in the market. Moreover, there might be a growing trend towards greater consolidation and/or spin-offs across business segments that are influenced by such regulation – nonetheless this might imply efficient allocation of capital.
- **Better risk management** – workshop participants argued that regulatory focus on risk management, either driven by market-wide systemic concerns or trading patterns associated to particular asset classes and/or participants are likely to influence investor behaviours and trading strategies. Increased margining requirements and credit buffers for risk mitigation would perhaps limit market participation and influence trading mechanisms. Moreover, regulation that is too prescriptive might restrict opportunities for positive change whilst too lax a framework would perhaps lead to increased market instability and system abuse.
- **Other regulatory guidelines** – a number of different regulatory proposals were discussed during the workshop such as minimum resting times, cancellation order limits, ban on direct electronic execution, legal reform and infrastructure investment which can influence market in different ways – for example minimum resting times may limit market abuse and/or volatility, however, they might restrict participation by market makers (leading to reduced liquidity and wider spreads). Regulation, if adopted across such avenues, has to balance between these competing effects and ensure that it does not negatively influence market behaviours. Moreover, such policies will all become increasingly important as instruments of competition to attract foreign trade and investors across markets.
- **Transparency** – most participants agreed that improved price transparency was a good thing, although a focus on implementing or enforcing existing rules (e.g. post trade transparency) might improve price transparency quality more than the introduction of new rules. Of most significance was the concern by some workshop participants that decreases in the delayed reporting of block trades from 3 days to 1 day might damage the ability of institutional investors to complete such trades at a reasonable price due to the impact on the intermediary who is on risk to hedge or facilitate the trade.

As suggested above, for the purpose of this section we have focused on key regulatory sub-drivers that will likely shape the market for trading in Europe. Whilst the list of sub-drivers is extremely diverse, we represent industry perspective in terms of driver relevance and impact – with a number of drivers not included in the list above as they are of less importance and/or unlikely to have a significant impact compares to those that are identified above.

## Geo-political developments

Geo-political factors are a key driver of current and future European equity market structures. Today the world's top financial centres of London and New York face increasing competition from countries in South America, Africa, Asia and the Middle East (SAAAME). The 'war for natural resources' and disputes over resource ownership drive increased competition, market volatility, new regulation and protectionist behaviours across different economies. Moreover, focus on economic growth, following the recent recession and the potential deleveraging across global economies will play a significant role in shaping financial market structure and its underlying characteristics. For example, as discussed earlier, capital adequacy requirements under CRD IV in Europe will have implications on market structure and characteristics, through impacting capital pools available to intermediaries and agents who trade as principals. Going forward, trends in economic outlook and expectations of economic growth will significantly determine Equity market structures in Europe.

As discussed earlier, regulation plays a significant role in shaping equity markets; however, regulation itself to some extent is influenced by politics – particularly during periods of economic downturns when regulatory policies are a key tool for politicians to influence market behaviours and trends. The link between political sentiment, resulting guidance to regulators and government initiatives for example through regulatory policy recommendations such as those of ICB (Independent Commission on Banking) requiring separation of retail and investment banking operations in the UK will have implications on market participation and structure.

Participants during the workshop discussions also stressed the point that regulatory policies which are too prescriptive in nature and/or protectionist with an aim to restrict capital flows across markets – possibly as a reaction to economic sluggishness and/or downturn, would lead to segmented markets with limited interaction and opportunities for diversified investments.

In some cases, notably in emerging markets, there are examples of government intervention decreasing in an attempt to foster innovation, promote social equality and boost economic growth. Recent strategies of emerging countries across Asia, Africa and the Middle East are grounded on inclusive growth and setting new strategic economic direction, in contrast to the competition agendas (i.e. economic competition between states) of a number of developed countries. Changes in the balance of trading between retail and professional and product types may also favour one region over another. Moreover, on the institutional side, increased competition from sovereign wealth funds and development banks can be expected for the most attractive investment opportunities, particularly those within emerging markets.

Majority of workshop participants agreed that the key impact of geo-politics will be in determining the future centres for capital markets and location of investors, intermediaries and issuers. Developments across other markets (particularly emerging markets) might move financial centres to other places such as Shanghai, Johannesburg, Rio and Delhi, however, most commentators believe that strong legal system, developed market, level of automation and the natural critical mass of advisors, auditors, market participants, intermediaries etc will potentially allow London and New York to lead the global list of financial centres.

Some of the relevant sub-drivers within geo-politics – that were identified by the workshop participants include:

- **Interplay between regulation and politics** – national politics can play a role in shaping regulatory agenda, particularly during periods of economic difficulty. In principle, regulations should be formulated objectively with a view to improving efficiency and stability of financial markets as well as increasing trust/confidence in the market. Governments are directed by politicians, who are able to set the overall regulatory agenda through legislation, who in turn are influenced by sentiment of the population and thus there are times when political direction of regulation can be self interested and potentially damaging due to a ‘knee jerk’ reaction to strong public sentiment. Conversely, politics can have a positive influence where politicians are courting the markets to operate in their countries, for example due to impact on underlying tax collection, which leads to the imposition of benign regulations, laws and tax regimes.
- **Economic growth** – trends in economic growth, regional as well as country specific, have influenced the shape and form of equity markets in Europe and will continue to be a key factor influencing development of financial market structures, participation and interactions and characteristics. Strong economic growth across markets will lead to more integrated and harmonised structures with clearly well defined characteristics.
- **Public opinion** – this refers to the social utility that the wider public associates with functioning of financial markets. Inherently volatile markets with negative implications on functioning of the real economy will lead to lower investment and capital in the market. Moreover, where financial market fundamentals disrupt functioning of the real economy for example in relation to pricing and/or volume of specific underlying commodities/products, this will lead to instances where public opinion (through political interference) is biased towards more stringent regulation and policies that support market intervention – in essence impacting equity market structure and characteristics – for example through restricting activities of certain participants and/or providing additional liquidity to support market pricing.
- **Market interaction and network effects** – global interaction, particularly with emerging economies, plays a key role in shaping market structures through influencing capital flows, market entry, demand for different asset classes, sophistication of products and market characteristics such as liquidity, pricing, volumes and trade size. Growing economies with integrated markets will benefit from higher volumes and better liquidity underlying harmonised market structures that are consistent with defined regulatory and strategic objectives. As such, these economies support development of a ‘global village’ where demand and supply of capital is balanced across a wider network of financial intermediaries.
- **Other considerations** – A number of other considerations are also relevant in the current context:
  - Different forms of taxation (such as capital gains tax or stamp duty in the UK) will have implications on market characteristics such as turnover and influence participation by different actors in the market;
  - Deleveraging of global economies following the financial crisis through regulatory policies and/or other mechanisms will impact market participation and activity, particularly in the investor and financial intermediary space; and,
  - Evolution of regulation policies across emerging markets, such as China and India, would determine market interactions and shape market characteristics and outcomes.

The elements within geo-politics identified above relate to core category of sub-drivers as opposed to an exhaustive list of categories.

## Competition

Competition across financial markets, in the institutional investor, intermediary and infrastructure space has evolved significantly over the last several years. There are a large number of intermediaries (broker-dealers) that offer agency trading services and also manage their own proprietary trading desks – in essence competing with institutional investors to whom they offer brokerage services. Quite often large global financial intermediaries operate as vertical silos with segments within the business competing for business across other units (for example a broker-dealer business competing for execution of trade order from another broker-dealer's proprietary trading desk). Similarly, increasing participation by retail investors on regulated markets through retail service providers (RSPs) have added another dimension of competition in the market – necessarily leading to lower bid-ask spreads and increased liquidity.

Workshop participants noted that increase in competition across markets has particularly been driven by technological advancements – such as automation in trade execution channels – which although has led to a fundamental increase in trading volumes has nonetheless been accompanied by thinning of margins and lower profitability – and thus the need to capture a greater share of the market by respective participants across the value chain. Moreover, digitisation and sophistication of algorithms (for instance in relation to execution of block trades) coupled with focus on speed of execution has meant that there is a continued need of investment in IT and infrastructure supporting trading fundamentals – with market efficiency driving competition across key players.

On the infrastructure side, regulatory policies (MiFID in particular) in conjunction with technological advancements have allowed greater market entry from pan-European players' thus increasing competition in the trading arena (some of the MTFs are pan-European players and hence function across multiple markets). Lower transaction costs and demand for enhanced liquidity, coupled with proliferation of market investors has supported the rise of such MTFs. Competition has also led to evolution of pricing fundamentals across MTFs and incumbent exchanges, with a number of participants offering fee rebates to intermediaries who direct larger volumes to their venues. Hence, whilst volumes have continued to increase, the pricing structures have changed as a reaction to lower margins and/or underlying profitability from market participation due to competition. Moreover, investments in IT infrastructure and technologies that allow compatibility and interoperability across different trading venues and use of existing trading models/technologies by brokers/dealers and investors have meant that incumbent exchanges are competing with market entrants and as such are losing their share of market over time.

Whilst competition has played a significant role in shaping current markets, some of the workshop participants were of the view that its role in the future is less certain. Nonetheless, majority of participants in the workshop suggested that there is no doubt markets will continue to evolve as technology and regulation take shape, and competition will continue to increase across markets putting downward pressure on margins and profitability thus forcing consolidation and/or exit across different segments of the market.

Some of the key sub-drivers that the workshop participants considered underlie competition include:

- **Market participation** – Supply and demand pressures from providers and users of capital, specialisation and concentration of market participants across the value chain in terms of service offerings and particular regulatory developments (such as MiFID) have increased competition across different segments of the market leading to greater fragmentation. Whilst competition is widespread across the value chain in European equity markets, one of its most significant areas of influence has been in the infrastructure space –where market entrants such as Chi-X and BATS have taken a greater share of the market from the incumbents (such as LSE in the UK) thus having implications on market structures and associated characteristics.

A number of workshop attendees highlighted that increased market participation and greater competition allows options for investors and/or broker-dealers in terms of trade execution and order-routing and thus supports market efficiency, enhanced price discovery and lower bid ask spreads. Moreover, fragmentation in markets, particularly in cash equities, is in the interest of high frequency and some algorithmic traders as they benefit from price dislocation and ability to arbitrage on prices. The current market, particularly for infrastructure service provision, appears to be fully fragmented, hence, at this stage it is unclear if fragmentation will likely continue in the future or would there be more consolidation across firms as a reaction to lowering margins and profitability.

- **Consolidation in infrastructure** – this occurs as a result of mergers and/or acquisitions across market participants where business entities either converge or operate as sub-entities in larger groups. A case in point in the infrastructure space is the merger of Borsa Italiana and LSE in 2007 leading to a diversified exchange group in Europe. Different reasons underlie such developments; including stiff competition across the value chain which leads to lower margins and profitability causing certain participants to either exit the market or consolidate with others. In addition to consolidation, many exchanges are looking to diversify or increase volumes in their asset class offerings in areas such as ADRs/GDRs, ETFs and derivatives in order to compete with other market venues. Moreover, consolidation might also be driven by benefits associated with operating at a larger scale and/or coverage in terms of markets offering diversification benefits among others (a potential reason underlying the merger between the two entities above). It can also be driven by a simple perception of the board that they need to attain a larger market capitalisation to reduce the risk of takeover.

In the event of increased consolidation across intermediaries and infrastructure providers, workshop participants noted that the number of actors in the market would reduce with plausible implications on market fundamentals, for example reduced competition might lead to higher bid-ask spreads on traded securities thus lowering liquidity or it could reduce the number of venues and thus increase liquidity. In addition, such developments might be outweighed by benefits from diversification and scale of operations which are unlikely to be realised in fragmented markets, such as efficient order matching and lower market impact across isolated venues.

- **Pan European players (borderless markets)** – these include BATS and Chi-X (among others) which are multilateral trading facilities operating across multiple markets. As such, they allow investors and brokers trading on such markets to benefit from diversification through access to different markets as well as lower execution costs and greater market

depth. They have transformed the infrastructure landscape across the European equity markets – providing greater liquidity and option for trade order execution – and have increased in prominence in the recent past having taken a greater market share from incumbent exchanges.

- **Dark pools & broker crossing networks** – a consequence of increased fragmentation and electronic trading in the market has been the rise of dark pools which are providers of liquidity typically to institutional investors who buy or sell large block trades off-exchange. Increase in dark pools offers another source of competition to lit venues (exchanges) as it has increased in significance over the recent past. Whilst such trading venues suffer from reduced transparency, they offer an attractive source of liquidity to investors – particularly for larger trades where price movements are of significant importance as trades take longer to execute and settle. Moreover, they allow investors to remain anonymous as well as limit gaming opportunities by particular investors in the market as information on pricing is not readily available (it has been argued that high frequency traders particularly benefit from transparency in lit markets as there is more publically available order book information to trade on).
- **Direct market access (DMA)** – direct market access refers to arrangements where institutional investors can trade directly on exchanges without explicit membership (this could either be routed via the brokers where they solely act as a facilitator for the trade or sponsored access where brokers platforms are used for execution without requiring their associated services). A large number of investors, institutional and otherwise, use direct market access or broker sponsored access – although brokers compete for facilitation of such services the adoption of such strategies in itself suggests limited role for brokers in such markets.

## Asset classes

Evolution and sophistication of asset classes over time coupled with their respective risk and return dynamics determines market participation and allocation of capital by investors. The category of assets traded in financial markets, either electronically or otherwise, is extremely diverse ranging from relatively simple asset classes such as cash equities to more complex derivatives, synthetic products and other exotic instruments. Whilst product diversity has continued, this has been augmented by increasing number of investors in current markets, both retail and institutional, thus leading to increase demand for products.

Commoditisation and development of investment products, such as ETFs, have also allowed market access for issuers improving liquidity in the market whilst providing product diversification and risk exposures across selected markets for investors. Going forward, commoditisation in OTC markets is expected to increase as a result of EMIR<sup>10</sup> which focuses on moving the trading of standardised OTC derivatives to central clearing with the revised MiFID pushing the trading of the most liquid standardised contracts onto regulated venues.

The economic situation, among others, is already influencing risk/reward appetite as lack of growth and returns on traditional assets (equities and bonds) is leading to demand for alternative asset classes that will deliver higher yields such as derivatives, exchange traded funds, structured products, hedge fund investments (long only, funds of funds and others related

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<sup>10</sup>European Market Infrastructure Regulation.

strategies) and other complex financial instruments. As asset classes evolve, focus will continue to be on expected returns and risk exposure from investments and drivers that will influence such expectations including taxes, transaction costs, regulation and various other demographic factors such as age and geography (discussed in the next section).

A key implication of developments in other asset classes, for example derivatives and exchange trade funds both in Europe and beyond, might be movements in volumes away from cash equities to such products within and outside Europe – whilst investor orientation and risk/return dynamic will shape this change a major influence on capital allocation decision will be the size of the capital base itself. As such, if assets under management do not increase in-line with product development and innovation across markets and asset classes, there might be reason to believe that there would be diversification away from equity markets, however, on the contrary if assets and size of markets continue to increase (i.e. there is a larger pie) then such diversification might be limited or its effects would be much less significant.

Some of the other sub-drivers that are relevant to the current discussion are:

- **Impact of ETFs on equities** – an exchange traded funds represents a portfolio which is an aggregation of stocks, fixed incomes securities or commodities traded on exchange and usually tracks defined indices. As proliferation of asset classes (particularly ETFs) continues to grow across equity markets, investors may be keen to benefit from trading in ETFs as they may be perceived to provide benefits of diversification as well as possibly having associated tax advantages<sup>11</sup>. Thus, in principle, ETF's would likely become an integral part of equity markets with implications for the underlying volumes and liquidity of traded stocks. They are also likely to become an important source of hedging market risk for investors.
- **Correlation between asset classes and geography** – as asset classes and associated return expectations evolve and become an integral part of market for electronic trading they are likely to generate significant interest across market participants from different geographical regions who are keen for specific market exposures and/or risk/return dynamics. As such, investors demand for risk exposure and associated returns would be driven by the evolution of asset classes and their underlying characteristics. Moreover, a global market connected by increased automation will allow investors to spread their risk and reduce correlations which will influence new supply and demand dynamics – thus in principle influencing market structures and interactions.
- **Evolution of Fixed income** – currently computer generated trading (and HFT) is concentrated across equity markets and certain other asset classes such as listed derivatives, ETFs, commodities, FX etc. However, over time CGT/HFT might move to other asset classes such as fixed income securities and OTC derivatives (as they become standardised) as technology evolves, markets become more efficient and accessible and where in the short to medium-term margins might be greater. Certainly, day traders can benefit from similar opportunities that arise in fixed income markets where spreads are wider and there are greater benefits associated with market making activities as asset classes are less liquid. Over time, they would become an integral part of European market infrastructure.

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<sup>11</sup> ETFs are more tax-efficient due to their construction. Moreover, capital gain taxes (CGT) are only realized on an ETF if the entire investment is divested, in comparison to a mutual fund which incurs capital taxes each time the component assets in the fund are sold.

## Demographics

Demographic factors have increasingly become more prominent in shaping equity markets and interactions underlying such markets.

A key factor shaping European equity markets is ageing population and higher life expectancy, particularly across European countries. The saving rate and investment decision are determined by an individual's age relative to average life expectancy, his/her financial position and the desire to sustain life-styles post-retirement – typically investors in earlier stages of their life save and invest in risky asset (such as cash equities) to generate higher returns. As they gradually age, their appetite for risk declines and their portfolio moves to less risky assets (bonds), eventually comprising exclusively of such assets when at retirement age. This is referred to as life-styling effect and as such determines participation in equity (and other) markets by investors over time. There are reasons to believe that as average age across European economies increases (along with life expectancy) individuals' risk aversion will increase leading to a gradual shift away from participation in equity markets towards less risky asset. However, contrary to this view, other might argue that the need to save for longer lived populations and the sheer extra volume of money from compulsory individual savings will support greater equity market participation having a knock-on effect on market volumes and liquidity in European equity markets. Additionally, the role of intermediaries and wealth managers in offering financial products and services to clients/investors will evolve significantly in the future coupled with innovation in the underlying products themselves – in essence shaping market participation and interactions.

The maturing of SAAAME populations (i.e. increased skills and education as well as trend towards saving and investment age), combined with high rates of GDP growth and an emerging 'middle classes'<sup>12</sup>, focusing on investments across developed markets has led and will continue to lead to greater market integration and increase in market turnover and liquidity as well as reduction in transaction costs across European markets. Growth in the global middle class will be driven by rising incomes in emerging economies, notably India and China, and as they grow consumption and investment decisions will become more discretionary and market participation will typically increase. Whilst the majority of these will trade through local intermediaries and financial institutions, the anticipated increase in retail participation originating from such markets will have a multiplier effect on market volumes – particularly across European equity markets. Moreover, there has been an increase in the number of High Net Worth Individuals (HNWI), globally, particularly in Asia. An implication of this is that there would be greater demand for particular asset classes as well as greater investment and trading across European (and US) equity markets (US and Europe).

Proliferation of retail investors and increased market participation, particularly in Continental Europe, has played a significant role in bridging the supply and demand gap and has become an important source of liquidity in the market. A change in demographics as highlighted above is one key driver of this increased participation. Retail traders interact across markets and trade on specific venues across different asset classes, leading to increased intra-day trade volumes. Moreover, in conjunction with algorithms that segment block trades (among others), participation of retail traders in equity markets has added to the declining trends in average trade sizes. Whilst retail market participation is somewhat lower in the UK, it is increasing in-line with broader European trends.

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<sup>12</sup> 'Middle class' is defined as households with daily expenditures between USD10 and USD100 per person in purchasing power parity terms.

Some of the key sub-drivers that underlie demographics include:

- **Retail markets and investors** – this refers to participation in European equity markets by retail investors, particularly through retail service providers. Throughout Europe (and in the US) there has been an increasing trend of retail participation in equity markets as well as other asset classes (spread betting in particular). As market participation by such class of investors' increases, aided by technological advancements and developments in social media, they will become an increasing part of liquidity provision in the market.
- **Knowledge development**– a deeper understanding of financial markets and its underlying operations, including developments in technology and interlinkages with trading techniques and mechanisms supporting financial markets will encourage participation in equity markets and lead to more informed investment decisions – particularly at the retail level. However, information asymmetry in financial markets remains a real issue and as markets become more sophisticated a deeper understanding of it by individuals' (i.e. market participants) will be difficult yet important to achieve to sustain the evolution of its underlying dynamics. Moreover, at the institutional level, as technology continues to evolve, both in terms of advancements in platforms supporting trading and the underlying algorithms that govern trading patterns themselves, market participants will become more tech-savvy and open to different trading techniques across asset classes – thus impacting trade channels and market interactions in the future.
- **Investor base composition will increasingly be from emerging economies & new middle class populations** – role of emerging economies, particularly middle classes within such economies, will continue to gather pace in shaping equity markets through greater participation, impacting fundamental characteristics of the market. As size of the middle classes in emerging economies and their participation in financial markets and discretionary investment spend increases, global equity volumes and trade orders will increase benefitting European equity markets. This might lead to broader market reorganisation through advancements in technology infrastructure and platforms such that retail investors become a part of market structure sourcing liquidity across different asset classes.
- **Ageing population** – as the underlying demographics of the population across European markets changes, the risk appetite and return requirements will reformulate such that exposure to risky assets would reduce. Moreover, deteriorating government financials coupled with uncertain global economic environment imply that state's ability to support an increasing number of pensioners is likely to be limited and thus there is a greater realisation that would-be pensioners will be responsible for managing their own finances to ensure a steady stream of cash flow post-retirement to sustain lifestyles - this will again influence risk appetite for investments with two potential and differing outcomes:
  - i. savers/investors can become more risk averse, resulting in a move away from equities towards bonds:

Or

  - ii. they realise the need to generate returns to be able to sustain lifestyles later and hence increase their risk appetite and focus on equities and related asset class that represent high risk and high return scenarios.

## Conclusion

During the workshop with industry participants attendees were asked to rate the influence of key drivers in shaping the market to where it stands today and how it might change in the future. The table below shows the average ratings as well as the spreads of these ratings:

**Table 2: Driver ratings**

Driver	Rating (0-10) (present)	Rating (0-10) (future)
<b>Technology</b>	7 (5 – 9)	9 (8- 10)
<b>Regulation</b>	7 (6 – 8)	9 (9 – 10)
<b>Competition</b>	8 (7 – 9)	6 (5 – 7)
<b>Demographics</b>	6 ( 3 – 9)	8 (7 – 9)
<b>Geopolitics</b>	7 (5 – 9)	9 (7 – 10)
<b>Asset Classes</b>	5 (3 – 7)	7 (4 – 9)

*Source: Drivers of equity market structure workshop and PwC analysis.*

The following high level conclusions can be drawn from the above based on the discussion in the workshop:

- Overall technology is likely to be more relevant in the future particularly in shaping market structures, interactions, innovation in business models and its role in risk management and mitigation – however, the general view expressed by participants during the workshop was that future increases in speed of access and execution technologies in relation to computer generate trading (including HFT) are likely to be less significant;
- Regulation will be a key driver for the future and participants were concerned about the influence of national politics on regulation;
- Some participants argued that competition as a driver is likely to have less influence across equity markets as these markets are already quite fragmented, however, its impact is likely to be more focused on markets for other asset classes;
- Demographic changes as a driver will increase in importance over time as there is recognition of the impacts of ageing populations and the locus of growing younger populations;
- Geopolitics, specifically public sentiment and national politics will be a key future driver; and
- Asset classes are less important as a driver compared to regulation and geopolitics. Moreover, the development and innovation within asset classes might be an outcome in itself rather than a driver of change.

## 5 The evolution of European equity markets

In this final section of the report, we will consider the evolution of the European equity market; both historically and the potential direction it will take in the future. The purpose of this section is to draw together the observations, opinions and conclusions we have drawn from our workshop participants, and more broadly, about market structure (in terms of underlying participants and associated characteristics) with our interpretation of the key macro drivers influencing the market in order to arrive at a view as to how the market may develop over the next five to ten years.

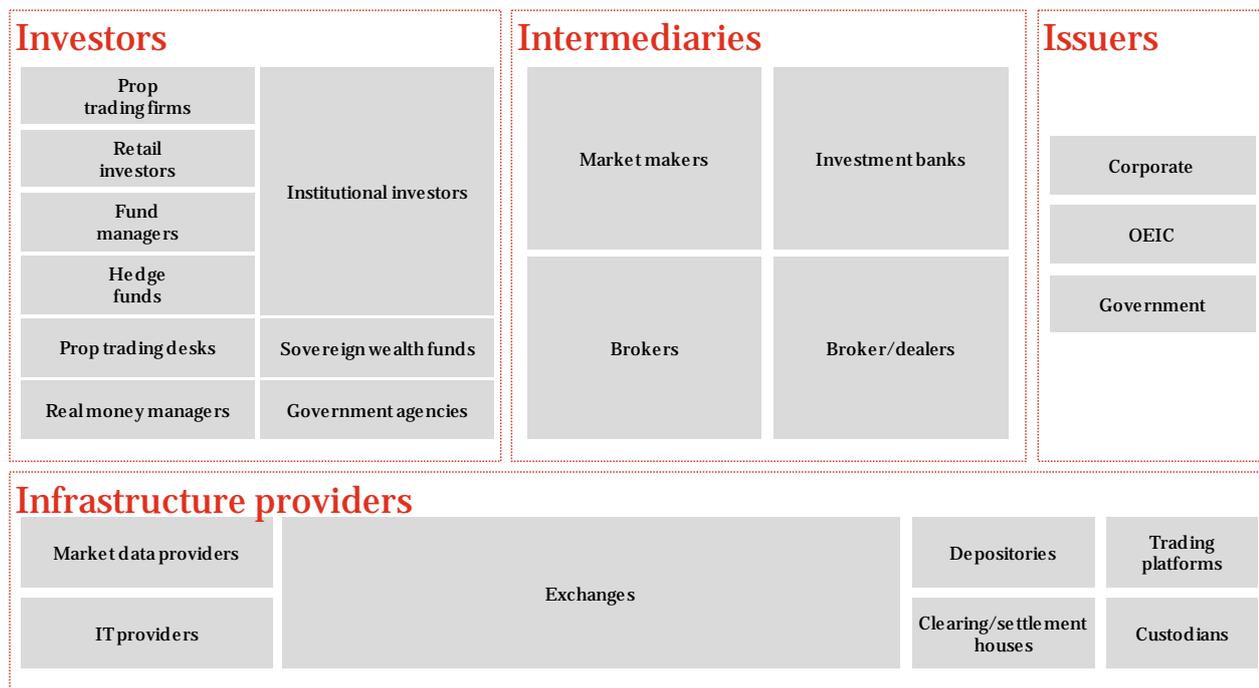
We will achieve this by first documenting the market of five years ago, assessing how it has changed over the past five years – both at a macro level as well as specific areas of change – before moving on to identify the role of key drivers that have led to the changes we have seen over the past five years. The market has changed significantly over the past five years. Firstly, it was prior to the implementation of MiFID in Europe which both directly affected and facilitated numerous changes in market structures. Secondly the global financial crisis in the last few years has dramatically changed attitudes and confidence from participants from all sides which has affected the characteristics of the markets such as liquidity, available credit and balance sheet, risk pricing, etc. This has also led to many regulatory changes that have already been implemented, or are in consultation, that will have direct and indirect impacts on the European equity markets structures that are the focus of this report. These significant changes in the intervening period make it an appropriate historical benchmark for discussing the market of today, and the market in the future.

We will then look at the market as it stands today, looking at how the key drivers we have identified previously may cause changes in the market over the next five to ten years, accompanied with a view of what the market may look like in five to ten years. This analysis will consist of depictions of the market structure, accompanied by discussion of the key issues for consideration in addition to detailed diagrams that will depict some of the key changes in composition of the market and changing interactional dynamics between participants.

### The historical evolution of market structure

Rather than show the European equities market of five years ago in absolute terms, we articulate this in terms relative to the market of today. In order to frame this discussion, we will begin by diagrammatically representing the equity market of five years ago, before evaluating the key factors and changes that have resulted in the equity market of today. The figure below shows the historical structure of European equity market and identifies the key participants within each segment of the market. Not all participants are shown in order to focus the discussion on some of the major interactions.

Figure 7: Market composition five years ago



Source: Drivers of equity market structure workshop and PwC analysis.

### Evolution of the investor profile over the last five years

Investor sentiments over the past five years have been significantly affected by the global financial crisis and subsequent global recession. There has been a marked loss in confidence in the markets, leading to a significant drop in overall trade volumes and liquidity as well as a resulting increased level of scrutiny over the objectives and practices of those operating in the market. Much of the developments and changes in the investor base over the past five years should be viewed in light of these events.

One of the most significant developments in the equity markets in the last five years has been in relation to computer generated trading and HFT in particular. Volumes as a percentage of overall trading activity on regulated trading venues have reached 40% by some estimates (though this number varies by estimate and by venue)<sup>13</sup>. Much of this increased activity has come from specialised proprietary trading firms (both regulated and unregulated) and market makers, although some of this was also driven by hedge funds and proprietary trading desks of investment banks, though this element has reduced markedly due to regulatory concerns. During the financial crisis, in particular during 2008/2009 many algorithmic and HFT firms were particularly active partly due to the high volatility and reasonable trading volumes as many such algorithms work particularly effectively in terms of generating good returns in such a trading environment. Although volatility has remained high in the last couple of years, trading volumes are significantly lower which has reduced the returns of many of these strategies, whilst still profitable in many cases. This has started to lead to a shift in investments into other areas where better opportunities in the future may lie (e.g. fixed income and derivatives).

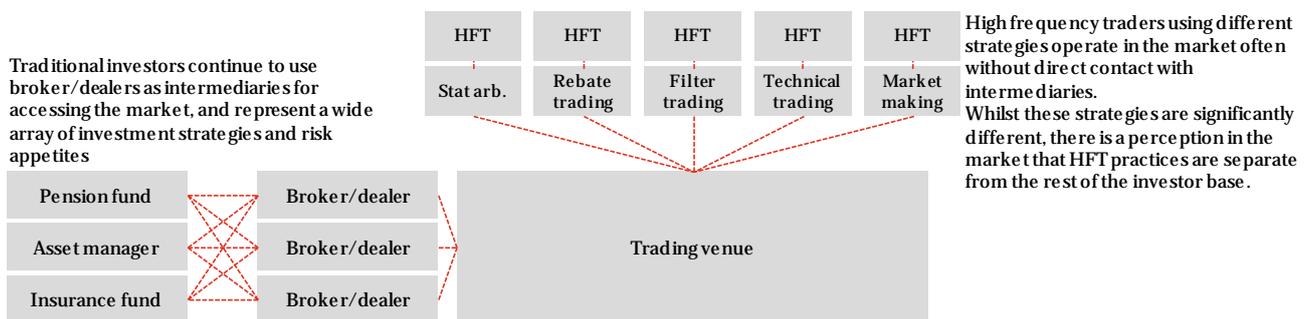
Several industry participants referred to the perception – particularly in the political sphere and in some sections of the traditional investor base – that HFT has had a negative effect on the

<sup>13</sup>Patience and Finance', A Haldane, speech to the Oxford China Business Forum, Beijing, 02/09/2010, <<http://www.bankofengland.co.uk/publications/Documents/speeches/2010/speech445.pdf>>.

market. Many of the workshop participants opined that this might be a result of a lack of understanding about HFT operates, and moreover its place in the market. It is apparent that several aspects of HFT are perceived to have the potential to cause harm in the market. One such observation was that the increasing interconnectedness, speed of operation and complexity of HFT investors could lead to unpredictable and potentially hazardous feedback loops. These would occur where a particular trade execution or other market activity conducted by one HFT operator would be picked up by automated trading strategies of others and subsequently duplicated and amplified exponentially within a matter of seconds. Certain contributors highlighted the “Flash Crash” of May 2010 as an example, with subsequent mini-crashes serving to further highlight the potential issues. Whilst it has not been conclusively established that HFT operatives caused the crash of 2010, it is clear that they may have contributed to amplifying the effect in the market<sup>14</sup>. Whilst several studies have attested to some of the benefits that HFT brings to the market, such as liquidity, price transparency and volume;<sup>15</sup> firm evidence of its benefits is as yet unavailable.<sup>16</sup>

An observation from some industry participants on the large volume of HFT trades in the market related to the potential homogeneity of this activity in comparison to historical trading patterns. Whilst HFT operators vary to a considerable degree in terms of their strategies and approaches, there is a perception that some of the bigger HFT players are largely similar in nature from a liquidity perspective, even though the specifics of the underlying strategies might be different. Whilst the nuances of trading strategy may make them quite distinct in reality, their relatively obscure operational methods ensure that this perception remains. It is perhaps useful, therefore, to contrast strategic variance within the HFT space with historical investment patterns. Traditionally, a wide range of players such as asset managers and pension funds would come to market with different views on asset value due to a wider range of investment considerations; including length of investment, geographical and political considerations, and tailoring to the investment strategies of their clients. Operators that form part of the perceived ‘natural’ market such as the aforementioned are seen to be ‘normal’ participants that are trading based on differing views of asset values. A counter observation was that even if this was the case, it is not harming the market; it is merely introducing additional volume, liquidity and efficiency.

**Figure 8: HFT interactions within the market**



Source: Drivers of equity market structure workshop and PwC analysis.

<sup>14</sup> What caused the flash crash?, *The Economist*, 01/10/2010, <[http://www.economist.com/blogs/newsbook/2010/10/what\\_caused\\_flash\\_crash](http://www.economist.com/blogs/newsbook/2010/10/what_caused_flash_crash)>.

<sup>15</sup> HFT helps market structure and liquidity, academic study finds', *Automated Trader*, 05/06/2012, <<http://www.automatedtrader.net/headlines/127545/hft-helps-market-structure-and-liquidity--academic-study-finds>>.

<sup>16</sup> High Frequency Trading: How the market developed and where it is headed', *The Hedge Fund Journal*, 09/2011, <<http://www.thehedgefundjournal.com/magazine/201109/commentary/high-frequency-trading.php>>.

The concerns over HFT displayed by traditional market participants has been reflected in the wider political sphere, with a noticeable sentiment linking the rise of HFT with the Global Financial Crisis of 2008<sup>17</sup>. Several industry participants highlighted the loss of trust with the financial services sector as being one of the most significant developments in the investor space over the past five years – the re-establishment of which they saw as being crucial to the future prosperity of the market.

Looking beyond the specific developments within the HFT space, there has been a significant diversification of hedge funds over the past five years. This has been driven partly by the growing availability of sophisticated technology, of which HFT forms a part, which funds have used to enhance their statistical and algorithmic trading strategies. During the crisis many investors withdrew capital from a range of hedge funds to either pay for losses in other investments or because of bad performance of a number of funds where investors were trying to limit losses. This led to a number of funds either liquidating in their entirety or to blocking investor redemptions. Recently, analysis has shown that global hedge fund assets under management have returned to levels approximating levels seen prior to the Global Financial Crisis.<sup>18,19</sup> This resurgence has been driven in part by many of the larger funds or in specialised funds such as credit-related funds that have been created to take advantage of the current financial and economic situation. Indeed, new SEC reporting rules - which require funds to report their leveraged assets in addition to their investment capital – reveal that many large hedge funds are showing leverage equal to or exceeding pre-crisis levels.<sup>20</sup>

Similarly, up until the financial crisis we had seen a significant growth in activity of proprietary trading within investment banks and also from independent proprietary trading firms. Proprietary trading desks of investment banks have come under increasing regulatory scrutiny owing to their perceived impact on the crisis due excessive risk taking onto their balance sheets making recovery or resolution of banks particularly difficult and with systemic implications. Impending regulation, in particular the Volker rule under the Dodd-Frank Act, has led in many cases to either a spinoff of these trading desks to form independent trading firms or closure of that business line. Examples have been Morgan Stanley, JP Morgan Chase and Goldman Sachs. Staff that have been made redundant by these firms have gone on to create start up proprietary trading firms which to some extent has filled this void and replaced some, but not all, of the liquidity. However, the risk absorption that was partly provided by this proprietary trading has still not recovered due to increased costs, lower leverage, reduced confidence and more rigorous credit assessments.

Aside from the specific developments relating to the Global Financial Crisis and HFT there have been noticeable macro trends in the composition of the investor base itself. Particularly, there has been a noticeable rise in investment from the retail sector. The patterns of this vary across Europe, with typically a more active retail equity trading environment in continental Europe and more funds based retail investments in the UK (though retail trading activity in the UK is on the increase). Technology has been a key driver of this growth; the proliferation of internet trading platforms being one of the main enablers of the growth of this part of the investor base. There has also been a significant development in terms of investors becoming more educated, and thus being more willing to invest in the market directly. Growth in the retail investor base has also been supported by the growth of social media, with a variety of ‘social trading’ platforms

<sup>17</sup> High-Frequency Trading', *The New York Times*, 10/10/2011,

<[http://topics.nytimes.com/topics/reference/timestopics/subjects/h/high\\_frequency\\_algorithmic\\_trading/index.html](http://topics.nytimes.com/topics/reference/timestopics/subjects/h/high_frequency_algorithmic_trading/index.html)>.

<sup>18</sup> Focus – Hedge Funds', *The Economist*, 31/01/2012, <<http://www.economist.com/blogs/graphicdetail/2012/01/focus-4>>.

<sup>19</sup> Global hedge fund assets still over \$2 trillion, up slightly in 2011', *Global Review 2012 – Hedge Fund Intelligence*, Spring 2012, pp.7-9.

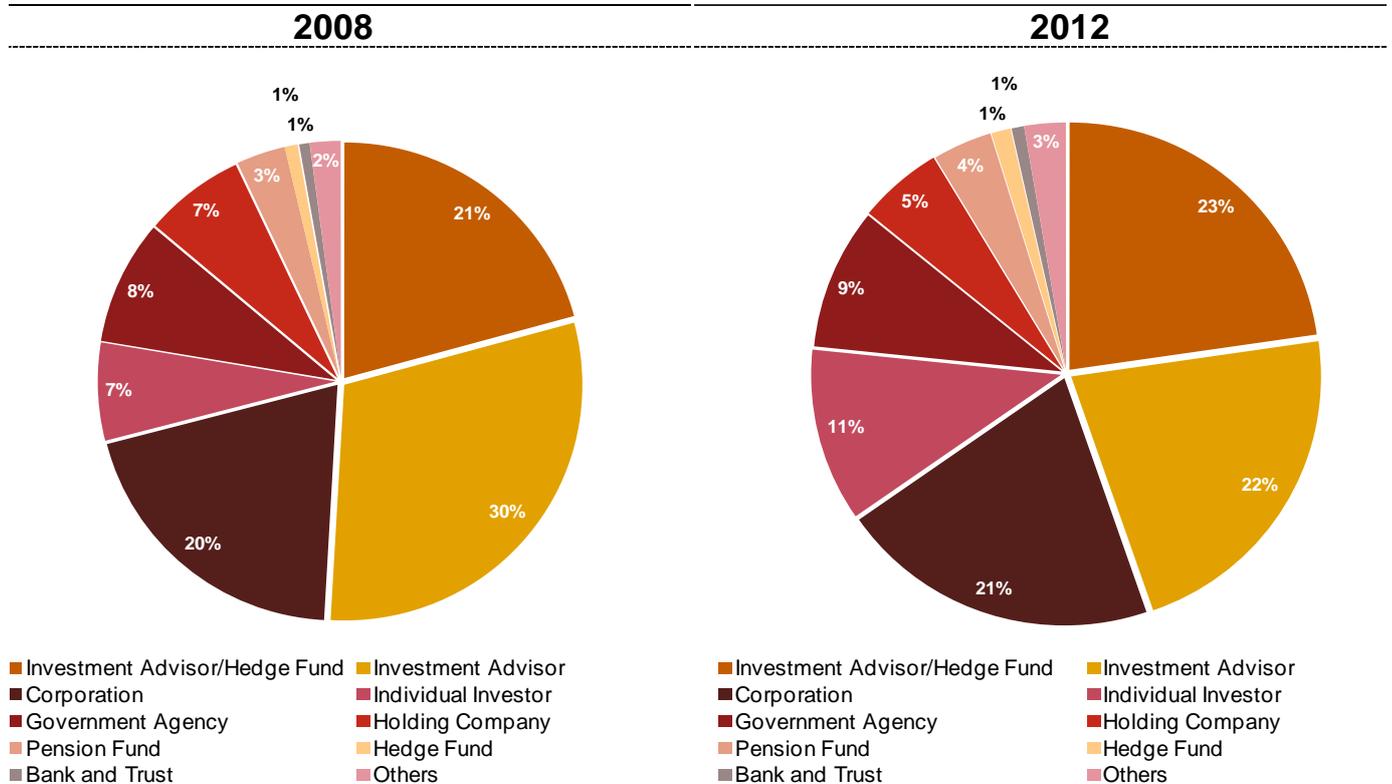
<sup>20</sup> Citadel, Millennium Above \$115 Billion With Rule Change', Bloomberg, 13 April 2012, <<http://www.bloomberg.com/news/2012-04-13/citadel-soars-to-115-billion-with-reporting-rule-change.html>>

coming into existence, such as Zecco.com.<sup>21</sup> The growth of the retail sector has coincided and is perhaps correlated with a shift broader shift from active investments to “passive” type investments. Whereas a large degree of investment in the past was based on investment fundamentals and “stock picking” activities, the growth of index tracking funds and other passive investment vehicles. Whilst this shift to passive investment may be reflective of changes in risk appetites and a growing gap between the retail investment space and the complexity of the market, it may have ramifications for the wider market, particularly if the dwindling number of investment strategies reduces the level of “natural” liquidity in the market. Viewing the investment shift from the more active retail participation of the past to the current situation in which investment banks and other advisors take a more active role in the managing the money of retail investors, it is perhaps sensible to see this as a shift in investment effort rather than a true de-stabilisation in the market.

The composition of fund managers has also changed significantly, with ownership structures becoming more diverse, and the development of several ‘fund-of-funds’. In a similar vein, many traditional long-only funds have been adopting long-short strategies more in line with hedge fund techniques, with the number of investment funds adopting hedging strategies having increased by 17% since 2007<sup>22</sup>. Many investors have also diversified their investment portfolios, moving away from cash equities into other asset classes - most notably exchange-traded funds (“ETF”) – and often dual-listing on different exchanges.

The figure below sets out the changing composition of the investor profile of the European equities market over the past five years:

**Figure 9: European equity market investor composition (2008/2012)**



Source: Thomson One and PwC analysis.

<sup>21</sup> Zecco.com is an online investing company providing users access to its stock, option, mutual fund & bond trading platform.  
<sup>22</sup> Thomson One analysis.

Removing from the technical changes within the investor base, it is evident that equities have declined in popularity as an asset class over the past five years. This has been demonstrated by a fall in the number of IPOs, as well as a decline in trading volumes over the past five years. Industry participants reflected a growing concern that tabled transparency requirements in the equity space could force investors to move into the synthetic instrument space, or indeed to other asset classes – thereby exacerbating this decline.

### **Summary of key changes to the investor profile over the last five years**

- Proliferation of proprietary trading firms;
- Growth in computer generated trading and HFT;
- Changing ownership structures and development of funds of funds;
- Changing investment portfolios through diversification from 'traditional' assets of equities and bonds to other classes; and
- Decline in equities both from investor perspective as well as capital raising

### **Evolution of the intermediary space over the last five years**

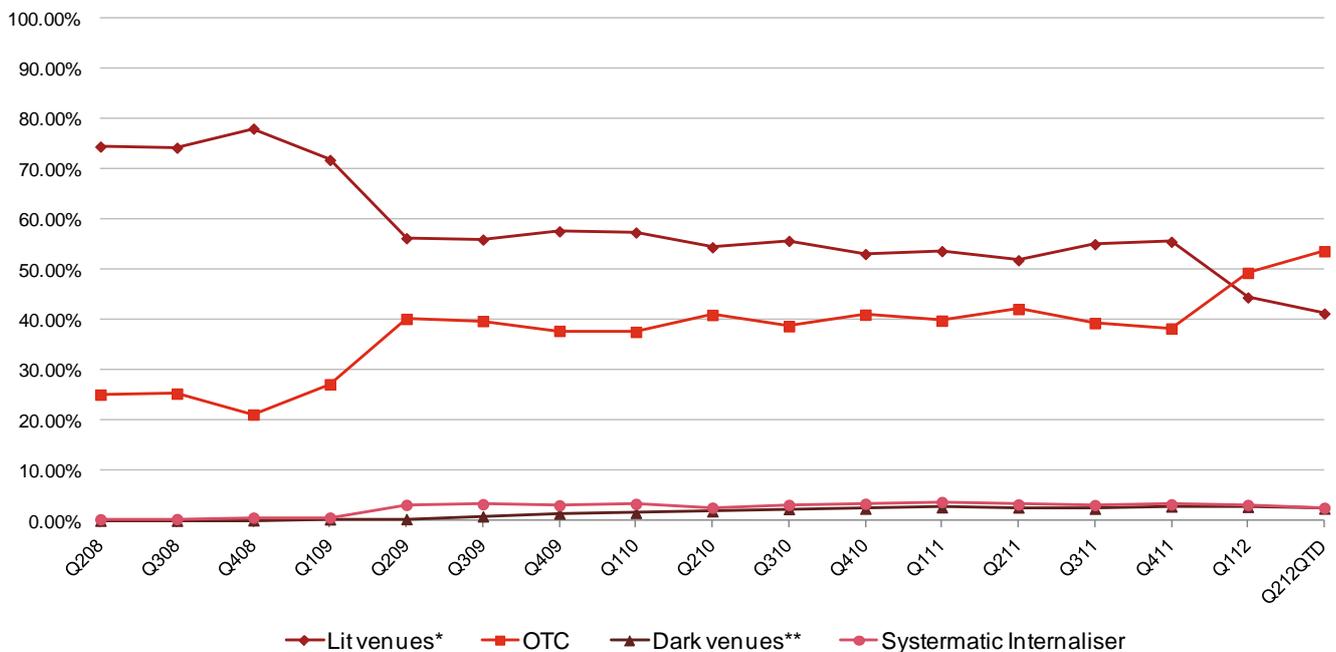
In terms of changes in the intermediary space over the past five years, events have been driven largely by changing demands from the investor base, in conjunction with the pressures exerted by MiFID and other regulatory directives. There has been a proliferation of dark pools, driven by a desire from large scale investors wishing to execute block trades so as not to reveal their trading intentions to the rest of the market. Without this their ability to execute such large trades before their intentions became known would impact the pricing they could achieve as such trades can typically take many hours to execute and can take even longer to hedge. Many other “lit” trading venues such as exchanges and MTFs simply do not provide liquidity in trade sizes that makes it possible to fill the order sizes required by many institutional investors at reasonable prices and in any reasonable timeframe and so these dark pool have developed in order to bring together buying and selling interests at the larger end of the investment base. It is important to note that whilst we have omitted Dark Pools and BCNs from our representation of the market, they did exist in some form five years ago. We have opted to include them as a feature of the market that has developed over the past five years as they were in a nascent state at the start of the time period.

One of the most overarching and impactful changes to the intermediary space, and indeed the entire market, over the past five years has been the enactment of MiFID. MiFID was tabled, legislated and enacted in order to encourage transparency and liquidity, enhance client protection, and develop a pan European securities market and to harmonise the regulatory environment across European markets. It is evident from the observations of workshop participants and other industry experts we engaged that whilst MiFID was in many ways a viable framework, it has not achieved everything it set out to do. Views expressed on the effectiveness of MiFID were largely split between specific observations about discrete effects it has had on market structure, and more general observations about a perceived failure to ameliorate the issues it sought to address. A particular concern was raised about the effect of the adoption and subsequent abolition of the ‘concentration rule’ a requirement forcing all trading of a security listed on a given venue to be traded solely on that venue, and more specifically on the “home” exchange where the security is traded. The original intention for ‘concentrating’ trades on their home exchange was to aid reporting and price discovery. However the rule, which was subsequently banned, was never universally adopted (the UK, for example, has never had a ‘concentration rule’) and moreover was seen to act to constrict liquidity, price competition, and the overall interconnectedness of European exchanges. In order to maintain the same levels of price transparency subsequent to its abrogation, MiFID established new, detailed rules for pre-

trade and post-trade transparency, together with transaction reporting rules. However, several of the industry participants consulted expressed a concern with the efficacy of these measures; suggesting that data quality is generally poorer than it was in the pre-MiFID world, especially in relation to post-trade transparency, and so cannot be relied upon. There has been a greater degree of fragmentation in the market over the past five years, and yet this has not been offset by increased transparency. A view expressed by several industry participants was that this decline in data quality has contributed to the decline in confidence in the market, with subsequent effects on cost of capital and liquidity – however the extent to which there is a direct relation is still a matter of debate at this point, in the absence of hard statistics demonstrating a correlation.

The figure below charts the increasing share acquired by OTC trading over the past five years, along with the appearance of dark pools and SIs. It is interesting to note that whilst Dark Pools relatively steady growth since 2008, they still only constitute a fraction of the reported market. Whilst evidence of the volume of unlit activity is necessarily obscure, it is likely that Dark Pool trades constitute a far larger proportion of total trade volumes.

**Figure 10: FTSE100 – total volume traded by venue type 2008-2012**



\*Lit venues refer to all trade venues where pre-trade information is published, with all trades being executed ‘on-book’; this includes exchanges & most types of MTF.

\*\*Dark venues are those where orders are not visible pre-trade.

Source: Fidessa Fragulator, PwC analysis.

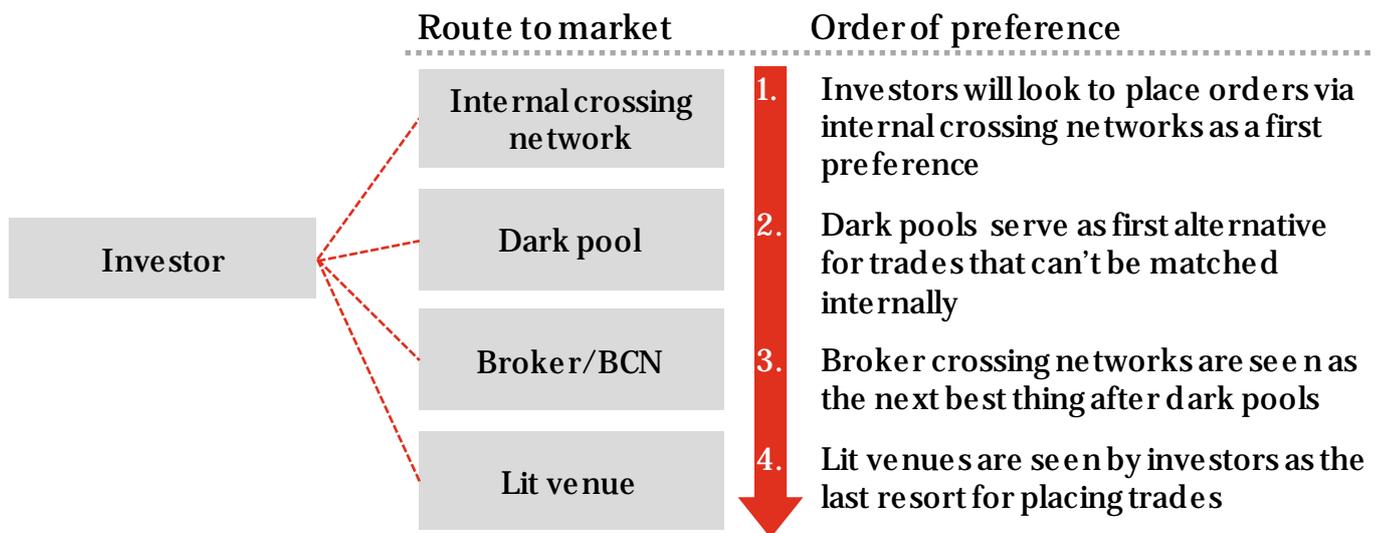
Issues raised on the impact of regulation on the market over the past five years also point to a more fundamental change, namely the changing nature of how intermediation is taking place in the market. Some traditional views of the role of intermediaries suggest that they facilitate bringing savers and investors together,<sup>23</sup> and this may be providing assistance to buyers and sellers to “seek” each other out, or providing liquidity to allow for timing differences between buy and sell orders by holding an inventory of assets – this requires capital to be used by the intermediary to buy and hold inventory. On the first role of intermediaries – helping buyers and

<sup>23</sup> B. Scholtens & D. Wensveen, ‘The theory of financial intermediation’, SUERF – The European Money and Finance Forum, 2003, p. 9, <<http://www.suerf.org/download/studies/study20031.pdf>>.

sellers to seek each other out - it has been argued automation has increased the opportunity for buyers and sellers to be found for an asset by increasing connectivity across the market and by increasing the speed at which this can occur – thus effectively enabling buyers and sellers to seek each other out with greater speed and frequency. However the suggestion of a number of workshop participants was that the second type of intermediation (capital for timing intermediation) is becoming increasingly strained. The aftershocks of the Global Financial Crisis, in combination with fears about perceivably punitive regulatory measure such as Basel III, bank levies, liquidity rules and CCPs has led to a situation where many intermediaries do not hold enough assets in inventory to meet the needs of investors. Federal Reserve data indicates that corporate bond holdings are at an all time low in American markets, with intermediaries holding only \$45bn in inventory, down from a high of more than \$200bn in 2007.<sup>24</sup> Whilst this is somewhat removed from the market under consideration in this study, it should serve as a viable proxy, and is indicative of an overall trend in the intermediary space. The view from industry participants and market commentators is that this is likely to worsen as further regulation comes into force and ‘sucks’ capital away from certain parts of the market. An example quoted was the move of OTC derivatives to central clearing that is anticipated to increase capital requirements for both cleared and non-cleared trade as well as increased collateral (liquidity) requirements.

In terms of the evolution of the market venues, there has been an ongoing change of how investors are buying and selling due to a lack of trust in ‘lit’ venues as well as a search for optimal prices at the lowest cost of execution. During the workshop we hosted, buy-side players noted that they have a preferred order they will use to satisfy their buy and sell orders. Typically they will first seek to utilise internal crossing networks to see if they can find a matching buy and sell order within the various funds they operate, and if they are unable to do this they will look to dark pools to source liquidity. If neither of these options is available then broker crossing networks are seen as the next best alternative. Finally, if the investor is unable to place a trade via any of these routes, they will look to go to a regulated venue as a last resort. There was a perception that lit venues are where they are likely to encounter proprietary traders and hedge funds, many of which operate HFT strategies and that as a result they will not obtain the optimal price for the order. The figure below illustrates this flow:

**Figure 11: Investor preferences**



Source: Drivers of equity market structure workshop and PwC analysis.

<sup>24</sup> Dealer and investor talks over liquidity fears', *Financial Times*, 01/06/2012, <<http://www.ft.com/cms/s/0/26a7d180-ab6f-11e1-b675-00144feabdc0.html#axzz1wWq5Hw15>>.



included it here. Although a number of firms have registered as SIs, currently this only stands at thirteen for the whole of Europe.<sup>25</sup> The new regulation has not given the type of pre-trade transparency that the regulators might have expected; this might in part be caused by the lack of prescriptive rules that govern when a firm should notify their local regulator that they are an SI. Also, firms may feel that due to the increased regulatory burden and lack of flexibility around providing pricing and liquidity, in particular price improvement for professional investors, under the regime they may have restructured their activities to avoid the regulations. However, it is debated amongst participants on both the buy-side and sell-side whether this lack of firms meeting the SI definition has had any significant impact on investors or transparency. Indeed much of the debate on the quality of price transparency in the current markets focuses on post trade rather than pre-trade (which is one of the key foci for SIs).

In response to the growth in the retail investor market, some intermediaries have developed specialised offerings for retail investors. Similarly, many new participants have entered the retail service providers (“RSP”) market on the belief that trading as principal against this flow that can adequately manage the risk and makes returns from “beating” the prices on the primary markets and other regulated venues (e.g. MTFs). RSPs are types of market makers that typically provide time-limited quotes on a principal basis to retail brokers who are operating on behalf of the ultimate retail investors in an agency capacity (RSPs do not see the identity of the actual retail investor and so their client is the retail broker). Interestingly many of the new RSPs that provide liquidity in the most liquid stocks (e.g. FTSE 100, CAC 40, BEL 20, etc) do so using computer generated/algorithmic trading strategies when both providing quotes and for managing their resultant market risk by trading out of their positions in the market or with other counterparties.

### **Summary of key changes in the intermediary space over the last five years**

- Changing demands from investor base in particular for appropriately calibrated transparency rules that match their investment needs – broker crossing networks and dark pools have developed and become increasingly utilised as a result of this need
- Decline in post-trade transparency & data quality caused by ineffective enforcement of MiFID stipulations
- Retail participation – rise of specialist retail service providers
- SI status has not been widely adopted by infrastructure providers and thus has not significantly contributed towards the level of pre-trade transparency

### **Evolution of infrastructure provision over the last five years**

One of the key regulatory impacts that has taken effect over the past five years was the enactment of MiFID in 2007, which has led to a new regulatory environment in which the infrastructure provider landscape has changed significantly. One of the most significant changes has been the formal creation of Multilateral Trading Facility (MTFs) representing regulated trading venues which bring together multilateral buying and selling interest similar to that of an exchange but with some ability to have differing levels of pre-trade price transparency. In addition, the prohibition on the concentration rule has allowed MTFs to offer trading facilities in a wide range of securities from many markets. There are now 147 MTFs regulated in Europe covering a range of asset classes.<sup>26</sup> The introduction of MTFs was designed to diversify the exchange landscape in the European market and foster more competition, and as such has resulted in a proliferation of MTFs, reductions in volumes on traditional exchanges, and

<sup>25</sup> For data on SIs & MTFs see ESMA's data at <<http://mifidatabase.esma.europa.eu/>>.

<sup>26</sup> Ibid.

increasing competition for volume between exchanges and other regulated (MTFs) and unregulated (e.g. dark pools) venues. It is important to point out that although MiFID codified the concept of an MTF, several infrastructure providers were already providing MTF-like trading venues prior to its enactment – Chi-X being a notable example. The key step of MiFID was to define exactly what an MTF was.

There has also been a tendency for trading venues to operate on a regional rather than just country level, catering to investors in several different geographical regions simultaneously. This has been supplemented by European legislation allowing investors from one member state to trade openly on the exchanges of other states under the “passport” rules. Conversely to the growth of MTFs, traditional infrastructure providers such as exchanges have consolidated over the past five years. There has been a trend for large exchanges to purchase smaller ones in other parts of Europe in order to increase their regional capabilities – both in terms of European acquirers as well as exchanges outside of Europe wanting to increase their international reach. The table below details some of the key acquisitions over the past five years:

**Table 3: Acquisitions by exchanges, 2007-2012**

Acquirer	Target	Date
LSE	Bourse Italiana	2007
LSE	Turquoise	2010
BATS Global markets	CHI-X Europe	2011
NASDAQ	OMX	2007
NYSE	Euronext	2007

Source: Drivers of equity market structure workshop and PwC analysis.

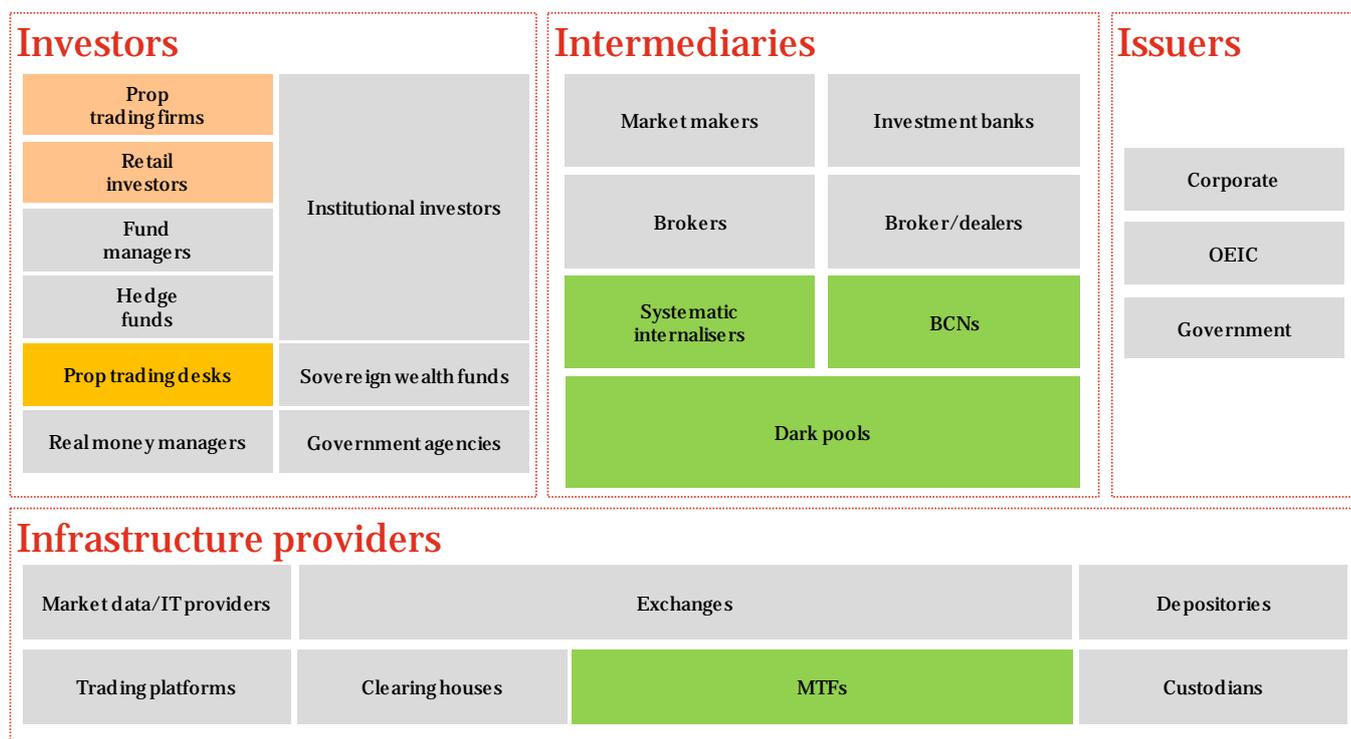
### Summary of key changes in infrastructure provision over the last five years

- MiFID-established MTFs have grown to become significant part of the market
- Increasingly international focus of trading venues – operating across a given region is becoming more common

### Current market structure

In order to understand how the changes over the past five years have affected the structure of the market, we have drawn a picture of the market as it currently is, before moving on to identify the key characteristics that are different. The below diagram highlights the key changes that have occurred:

Figure 13: Current market composition



- Legend:
- New entrant
  - Growth
  - Decline
  - Disappearance
  - No change

Source: Drivers of equity market structure workshop and PwC analysis.

### Characteristics

- The European equity market of today is more fragmented than it was five years ago, and has more types of infrastructure provider and intermediaries.
- Exchange ownership is less diverse, and has become more consolidated over the time period.
- The investor base is also more diverse than it was five years ago, with traditional institutional investors adopting new strategies and with more hedge funds and retail investors.
- In terms of technology, sophisticated trading algorithms are more common, and latency times are lower.
- The overall level of automation in the market is higher than it was five years ago.
- Overall volumes traded in the market are lower than they were five years ago, although this is largely attributable to the loss of confidence following the global financial crises and subsequent economic downturns.

The below table provides a summary of the key changes that have occurred over the past five years across the key participant sectors of investors, intermediaries and infrastructure providers. We have also identified the key drivers that have led to these changes:

**Table 4: Key changes historically**

Participant grouping	Drivers of change (sub drivers)
<b>Investors</b>	
Growth of retail investor group	Demographics (education, growth of global middle class)
Proliferation of hedge funds	Technology (sophistication)
Traditional institutional investors increasingly taking long/short positions and utilising hedging strategies	Technology (sophistication), Competition (interoperability)
Institutional investors and asset managers have begun to use internal crossing networks – a form of disintermediation	Technology (sophistication), Competition (interoperability)
<b>Intermediaries</b>	
Rise of dark pools and crossing networks	Regulation (avoiding regulatory pressure), technology (interoperability)
Traditional broker-dealers increasingly offering their own crossing networks to investors	Regulation (avoiding regulatory pressure), technology (interoperability)
Market makers and undiversified broker-dealers losing share to new intermediaries	Regulation (avoiding regulatory pressure), technology (interoperability)
General fragmentation of players	Regulation (avoiding regulatory pressure), technology (interoperability)
<b>Infrastructure providers</b>	
Rise of MTFs	Regulation (avoiding regulatory pressure), technology (interoperability)
Traditional exchanges losing market share to new trading facilities	Regulation (avoiding regulatory pressure), technology (interoperability)
Exchanges looking to offer alternative trading facilities themselves	Competition (interoperability), regulation (avoiding regulatory pressure), technology (sophistication)
Falling costs of technology lowering barriers to entry for market	Technology (falling costs)

Source: Drivers of equity market structure workshop and PwC analysis.

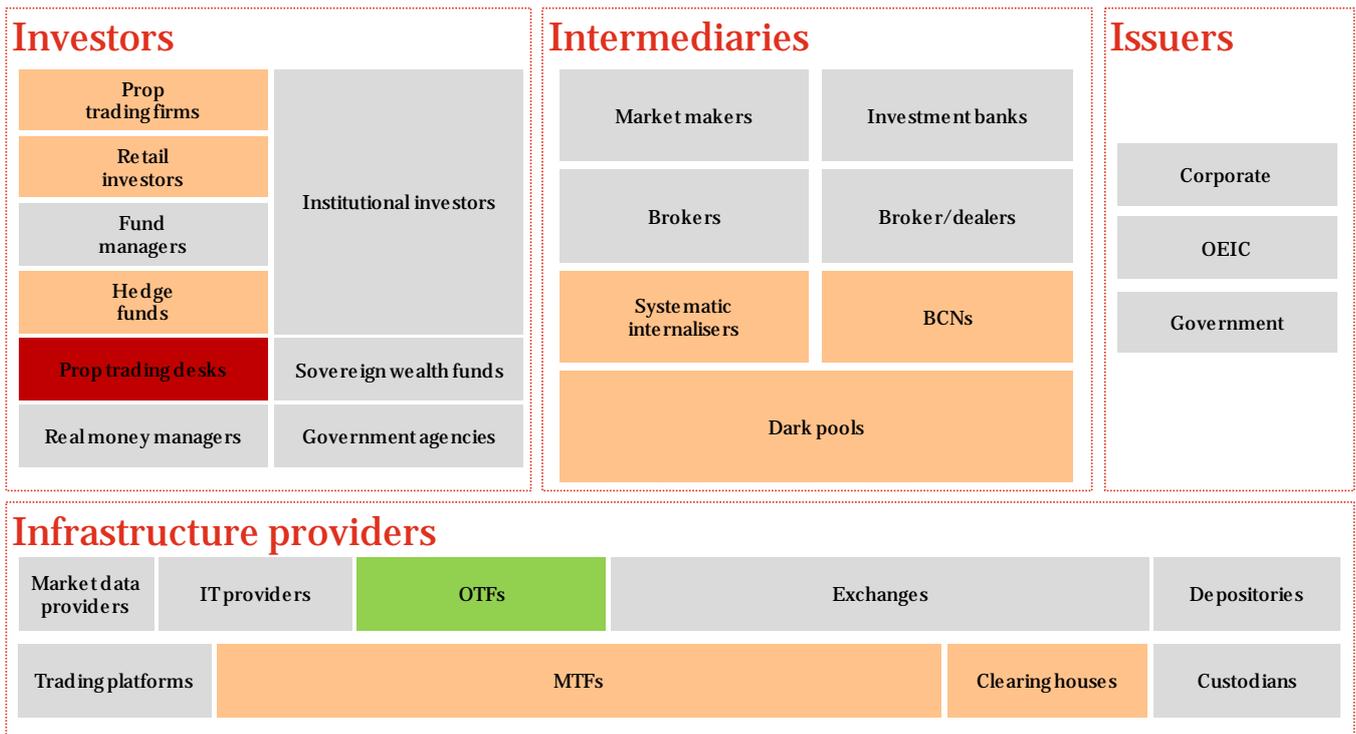
The European equity market today is distinct in several ways from the market of five years ago. There are a number of new liquidity-providing intermediaries who were either non-existent or relatively undeveloped five years ago. Dark pools, crossing networks & other liquidity facilities now occupy a significant part of the intermediary space. Necessarily, traditional market makers and broker-dealers have either been forced to adapt to the new environment by offering alternative liquidity sources and catering for new investor demands, or they have lost share.

Similarly, traditional infrastructure providers such as exchanges have seen their core market share eroded by MTFs, dark-pools and other forms of OTC trading. Similar to intermediaries, many traditional infrastructure providers have started to offer alternative liquidity services alongside their traditional offering.

## Future market structure

Determining the market structure of the future is clearly difficult to predict with any level of accuracy and also because regulation is such a key driver and much of the proposed new regulation is in a consultation stage it is early to predict the final outcome. However, it is possible to identify the direction of market structure changes, which key drivers are likely to influence this movement and comment on the resulting market characteristics that might describe such a future market structure. Whilst discussion heretofore has focused on historical trends informing participant/interactional composition of the European market, this section will necessarily have to make assumptions about the likely impact on the market of the key drivers discussed in section 4. This section will document the likely impact of the key drivers identified in section 4, before arriving at a conclusion of what the market will look like in five to ten years' time. It will then assess the characteristics of this future market relative to the market of today, and will pose some considerations for those setting the regulatory agenda. Based on these considerations, the table below together with the accompanying text represents the views of the workshop participants on the likely composition of the European equity market in five to ten years' time:

**Figure 14: Future market composition**



- Legend:
- New entrant
  - Growth
  - Decline
  - Disappearance
  - No change

Source: Drivers of equity market structure workshop and PwC analysis.

## Expected evolution of the investor profile

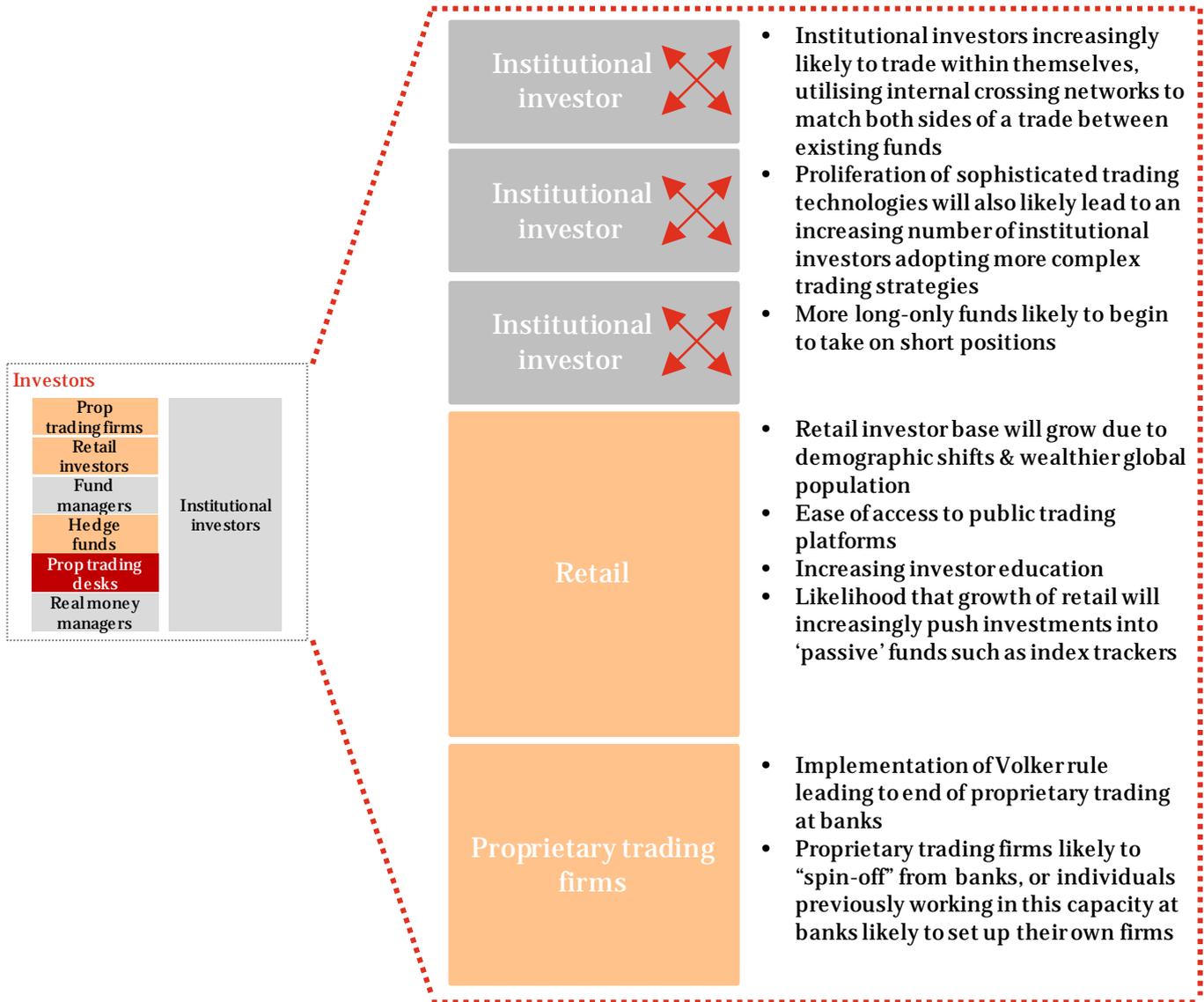
It is likely that the European equity market in five to ten years' time will be larger than the current market in terms of number of listed companies and trading volumes, irrespective of stunted economic growth continuing in European economies. Demographic shifts in countries such as India and China, combined with the rise of emerging economies, will contribute to a larger global population of wealthy investors. Whilst some of this demographic shift in some emerging economies will encourage investment outside of Europe for increased returns it is expected that overall the total investment capital will increase which should benefit European markets. This will be supported by the increasing globalisation of markets, supported by technological proliferation. The result of this will be a European market that has a larger and more globally diverse investor base, with retail investors likely contributing a larger part of the market.

Proprietary trading firms will likely become more widespread, especially if regulatory reforms such as the impending Volker rule outlaw proprietary trading activities at investment banks. The potential for profit-making will remain in the market, and as such proprietary trading firms are likely to persist. In particular reference to algorithmic and HFT, it should be noted that some of these proprietary trading firms are already starting to leverage their existing strategies and technologies into other equity related (and unrelated) asset classes such as ETFs and fixed income where opportunities might be currently less exploited or current economic and trading characteristics (e.g.. volumes and liquidity) might more suit their techniques. Additionally, firms using algorithmic trading strategies are continuously adapting their models to reflect market conditions and so we are also likely to see the adoption of new trading styles that for instance trade in larger sizes or take bigger risks in terms of quantum or investment time horizon. In addition, regulatory developments especially in relation to the trading and clearing of standardised derivatives on regulated platforms may create further opportunities for algorithmic trading strategies to exploit market opportunities but also create liquidity in this new regulated platform-traded asset classes.

Investor appetites for complex, structured products will also likely increase, whilst this may reduce volume in the cash equities market, it is likely that asset classes will become increasingly interlinked by structured product offerings, with asset managers looking to provide multi-asset product offerings.

Finally the continued growth of the shadow banking sector (e.g. unregulated hedge funds, off balance sheet investment vehicles, money market funds, and sovereign wealth funds) will continue to influence investor appetite directly in the markets or indirectly through their investment via traditional asset managers. This will also continue to challenge regulators given the lack of insight and transparency into their activities. The diagram below highlights some of the key changes which are likely to occur in the investor space:

Figure 15: Future investor profiles



Source: Drivers of equity market structure workshop and PwC analysis.

**Summary of key changes expected in the evolution of the investor profile**

- Increased range and sophistication of investor profile
- Innovation into new asset classes
- Growth of proprietary trading firms

**Expected evolution in the intermediary space**

If current trends continue, traditional broker-dealers who don't diversify their services will increasingly lose share, a result of disintermediation as well as loss of competitive advantage with other intermediaries. Across the intermediary space, margins will likely be squeezed as investors become more able to provide peer-to-peer financing via crossing networks and other buy-side liquidity transfer methods. It is apparent that regulation will be the key driver for changes in the intermediary space, as least as much as it has been over the past five years and possibly more so. Reactive developments will be heavily influenced by the regulatory agenda over the next five to ten years. It is likely that intermediaries will increasingly seek to diversify

and increase their levels of interoperability in order to front-run and avoid regulatory measures such as potential future controls and limitations around brokers crossing networks and other dark pool trading facilities. This has been demonstrated by several investment banks looking to increase their transparent intermediation facilities, such as MTFs, rather than continue to press ahead with further developments of the dark trading facilities. Proposed regulation in the revised EU MiFID looks likely to introduce the concept of a new class of regulated trading venue, the Organised Trading Facility (“OTF”). Both at an EU, and also more global, level there is regulatory pressure to move most trading activity on to some kind of regulated and transparent platform, except for that trading activity that is very bespoke and requires a genuine OTC trading arrangement. The OTF regime is a response to this and has been currently drafted quite broadly to capture future trading innovations. If the proposed OTF regime for equities is introduced as part of the revised MiFID this could have a significant impact on the market structure affecting how intermediaries provide services and may force some participants to move much of their trading to more transparent trading venues. It was felt by some workshop attendees that this potential change in trading venue, especially combined with proposed changes in transparency (e.g. the change of 3 day delayed post trade reporting for block trades to 1 day delay) may cause intermediaries to re-think their appetite for offering risk against the client if it becomes more difficult to hedge their risk with price transparency increasing. This will have the net effect of less risk absorption availability to investors and/or price of risk increasing. A supplementary aspect of proposed revisions to MiFID is regulation relating to OTFs could also significantly impact on the intermediary space – namely specific restrictions around OTF owners not being allowed to trade in their own venues could further restrict the activities of certain intermediaries, although the exact specification of these proposals is not yet clear. Overall, as intermediary roles become increasingly blurred, the intermediary space will become ever more defined by the regulation and tax agenda. Clearly all of these developments will need to satisfy the demands of their, typically, institutional investors and so close collaboration in understanding the future investment strategies and how this translates into price transparency, risk pricing etc will be as important as ever.

Further to some of the shortcomings highlighted in MiFID's specifications, industry participants also expressed a more general concern with some of the proposed regulation. Several participants at the workshop and during subsequent conversations cited regulation as being the most significant impacting force on the market over the past five years and that this will continue. One particular sentiment is that one of the effects of the proposed regulatory agenda may be to stifle innovation in the market, with activities such as product approval taking up an increasing proportion of senior focus, with boards and even regulators spending a significant proportion of time addressing these issues. In the extreme regulators are set to have powers to ban or restrict activities in products that they feel do not adequately protect investors and markets. Intermediaries have become increasingly focused on adapting to, and where possible alleviating the effects of MiFID and other regulations such as Basel III (which affects investment banks more specifically than other intermediaries). The intellectual capital and management attention bandwidth available to intermediaries is increasingly being diverted away from corporate development, product & business model innovation and other business development activities, and towards adapting to or analysing the impact of regulation.

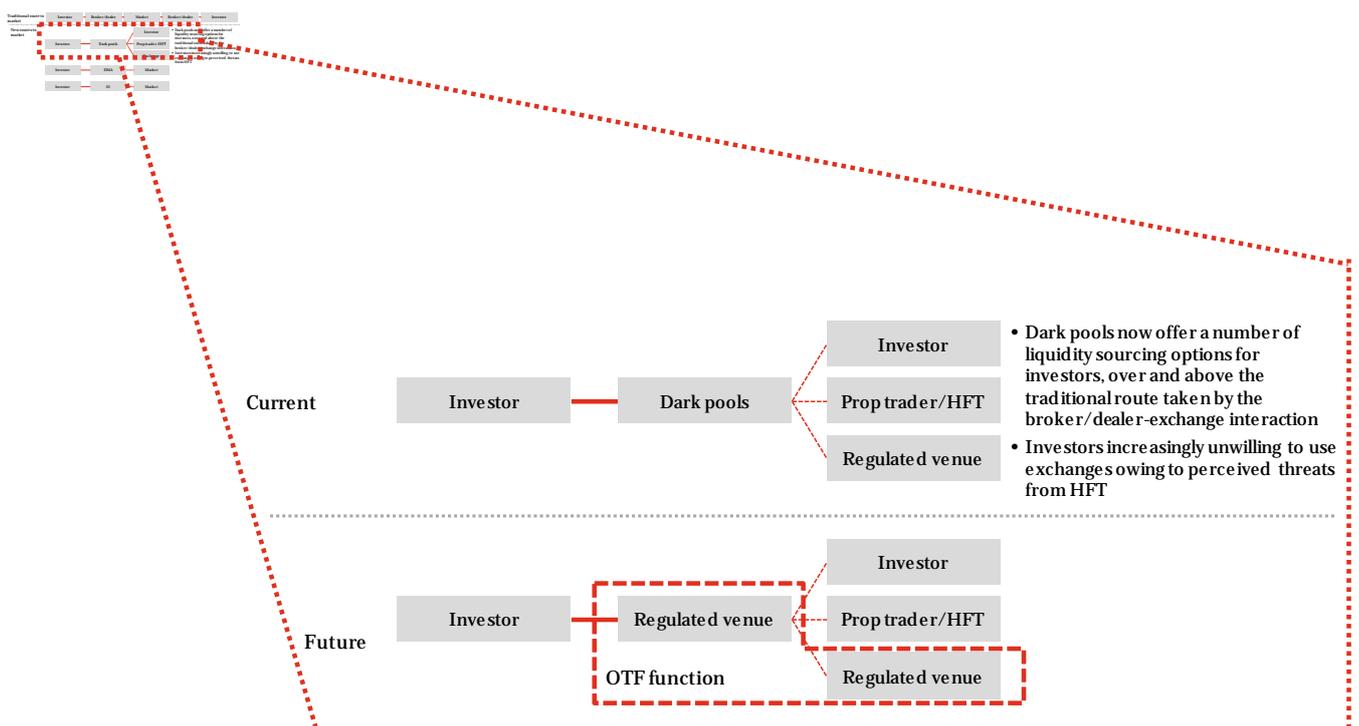
Intermediaries such as banks have traditionally provided two key services: capital to investors (i.e. absorbing risk) and the facilitation of the buying and selling of assets. Both of these elements are impacted by many of the key drivers we discussed at the workshop including investor appetite through demographic changes, regulation and economics/politics. Regulatory demands on banks' capital requirements will continue to limit the types of risks they are prepared to take and to whom they will offer risk, plus regulation will continue to shape how they providing trading services to clients. Although the workshop discussed innovations and regulatory driven changes in these trading service offered by intermediaries, it was still felt that

over time firms offering such services are likely to consolidate for the purpose of reduced operating expense and also the ability to offer a wide range of services to clients. It was also suggested by some that this consolidation could also be driven by those banks that are offering capital/risk to clients (as we have traditionally witnessed) given that organisations with larger balance sheets are better placed to acquire such business when competing on price. Interestingly, on a similar vein it was also suggested by some workshop attendees that it also seems likely that growth companies in the small-to-medium-enterprise (“SME”) sector will continue to be acquired by larger multi-national corporations rather than listing on exchanges as a way to continuing growth or receiving capital injections. This would mean that the stock universe that is eligible for trading by investors and intermediaries in the European equity markets may not grow significantly despite the regulators best efforts to encourage such developments.

It is likely that broker algorithmic trading will increase over the next five to ten years, with other types of market maker also looking to adopt more sophisticated trading strategies. Workshop attendees highlighted continued developments by intermediaries that are being built with input from investors in areas such as smart order-routing, offering exchange co-location services through to buy-side firms and improved offerings in relation to the handling of indications-of-interest (“IOI”), which is another area of focus of European regulators in terms of improved price transparency. Similarly, while HFT may not proliferate significantly, it is likely to constitute a larger share of volume in the European equity market than it does currently. It is also likely that latency times and other speed-related factors will become less of a critical factor as the market develops as it was agreed by most workshop attendees that the “arms race” especially in the cash equities markets had largely played out. Instead, HFT will likely develop into other asset classes, and perform more niche roles within the equity market itself – benefitting from increasing fragmentation of the market and driving competition through price arbitrage in the intermediary space as new regulated types of venues emerge.

The figure below highlights some of the key changes that will likely occur in the intermediary space:

**Figure 16: Future intermediary profile**



Source: Drivers of equity market structure workshop and PwC analysis.

## Summary of key changes expected in the intermediary space

- Traditional market makers losing share
- Innovation in asset classes
- Regulation and tax increasingly affecting intermediary structuring
- Broker algorithmic trading becoming more widespread

## Expected evolution of infrastructure providers

Similar to intermediaries, the infrastructure provider aspect of market structure in five to ten years' time will be heavily affected by the regulatory agenda. Given that predictions on likely regulation would be misleading, there are several other factors that are likely to determine the state of market infrastructure provision in five to ten years' time. Trends in the proliferation of new OTFs may emerge (depending on regulatory outcomes), whereas MTFs and other MiFID-specified venues will maintain their market presence without changing dramatically. In a similar way to in the intermediary space, technological advances in the infrastructure space will not cause as dramatic changes as they have done previously. This may lead to a consolidation of technology providers, as differentiation becomes increasingly difficult to maintain.

Excepting the difficulties in predicting the course of regulation, the role of technology in driving market changes is likely to differ. Whereas latency times offered by exchanges and other regulated venues such as MTFs have come down significantly in the past, the extent to which further improvement in latency will have such a significant impact on market structure was considered by the workshop participants to be doubtful. It is more likely that technological improvements will boost the efficiency and security of intermediary services. In particular, competition amongst trading venues has been such that there are likely to be only 3-4 major trading venue software solutions operating across the European equity markets with most already having made the move to one of these platforms (with some platforms owned by the exchange and others provided as third party software providers). If latency continues to be a factor in the infrastructure space, it will likely be as a facet of software sales rather than a true differentiator in the market. This will be driven by a lack of true competitive advantage amongst different service providers, forcing a focus onto sales-focused performance elements of service, such as low latency. Especially as the providers of these software solutions also aim to provide these platforms into other global markets.

In addition to the proposed implementation of the new OTF regime, industry participants posited a further potential impact of proposed changes to the regulation of trading venues, namely that of the 'harmonisation' of waivers. Currently, certain trades facilitated by MTFs are exempted from providing pre-trade transparency if they meet certain criteria – such as occurring on a system which derives its pricing information from another system, or a trade that is particularly large in scale.<sup>27</sup> The proposed changes to these waivers, which could lead to a homogenising effect across trading venues, may cause significant changes in structure as infrastructure providers would no longer be able to tailor to client demands.

It is likely that the decreasing cost of technology will lower the barriers to entry for certain parts of the market, and could lead to an increased number of exchange of venues. Traditional exchanges will also continue to diversify their liquidity provision offering, with potential acquisitions of MTFs, like LSE's of Turquoise in 2010 likely becoming more common. Barriers to

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<sup>27</sup> Waivers from Pre-trade Transparency Obligations under the Markets in Financial Instruments Directive (MiFID)', Committee of European Securities Regulators, 20/05/2009, p.2, <[http://www.esma.europa.eu/system/files/09\\_324\\_Update\\_22102010.pdf](http://www.esma.europa.eu/system/files/09_324_Update_22102010.pdf)>.

entry for custodians will potentially be higher than they have been owing to high costs on asset protection imposed by regulation. MTFs will also likely diversify their product offerings, diversifying into ETFs and other equity derivatives.

There is also likely to be a need for, if not an actual change in clearing and settlement legislation – the unification of clearing and settlement rules in Europe could increase efficiencies in settlement and lead to real benefits for intermediaries and investors. Defining a global set of clearing and settlement guidelines across Europe will become increasingly desirable as the markets become more sophisticated, and with greater dependence on the interconnected nature of different markets, this may become a priority.

Aside from the general proliferation of new forms of trading venue, it is likely that trading venues will continue to specialise to provide distinct services to small sections of the investor population. These niche services may lead to a growing trend for a closing-off of venue membership, to provide greater levels of privacy to specialised investors.

### **Summary of key changes expected in infrastructure provision**

- Significant regulatory impact
- Proliferation of new forms of OTF
- Technology will have less of a structural impact than it has had over the past five years
- Trading venues specialising with niche offerings

The below table provides a summary of the key changes that have may occur over the next five to ten years across the key participant sectors of investors, intermediaries and infrastructure providers. We have also identified the key drivers that have led to these changes:

**Table 5: Key changes expected in the future**

Participant grouping	Drivers (sub drivers)
<b>Investors</b>	
Continuing growth of retail investors	Demographics (wealth increases, ageing population), geopolitics (emerging economies)
Proliferation of hedge funds/more long only funds adopting long/short strategies	Technology (algorithm sophistication), competition (greater appetite for risk)
Proliferation of crossing networks	Competition (interoperability), technology (smarter routing)
<b>Intermediaries</b>	
Traditional market makers will continue to lose share	Competition (interoperability), regulation, technology
Blurring of roles between intermediaries/investors will increase	Competition (interoperability), regulation (avoiding regulatory constraints)
Broker-dealers will increasingly offer crossing networks and other unlit liquidity sources	Regulation, technology (sophistication)
Dark pools may move into other asset classes	Competition (diversification)
<b>Infrastructure providers</b>	
Exchanges will continue to diversify offering, may look to acquire/develop MTFs	Competition (interoperability)

Source: Drivers of equity market structure workshop and PwC analysis

### Characteristics

The broad consensus views of the workshop participants was that the European equity market in five to ten years' time will likely have a larger investor base than it does now, and with a greater proportion of investments coming through the retail channel. Similarly, sophisticated trading strategies will be more widespread amongst traditional investor groups. Disintermediation will continue, with buy-side crossing networks removing liquidity from the open market. It is likely that there will be a general blurring of roles between intermediaries, as interoperability increases. Infrastructure providers will be increasingly diversified, and the level of automation in the market will increase. The table below highlights these characteristic changes:

**Table 6: Key changes expected in market characteristics**

Characteristic	Driver	Impact on Structure
Fragmentation – the market is likely to be more fragmented than it is currently, continuing the trends we have seen over the past five years	Competition, regulation & technology	Increasing disintermediation will likely lead to an increasing multiplicity of intermediaries, with investors being provided more numerous routes of access to finance
Price transparency – the market will likely have lower levels of price transparency than it does currently, owing to the likely proliferation of dark pools and other unlit venues. However developing regulation may counterbalance this	Technology, competition, regulation	This should not impact the structure directly, but rather lead to investors using increasingly specialised intermediary services to counteract the adverse effects of falling price transparency
Automation - will increase in line with technological growth forecasts	Technology	Higher levels of automation will likely lead to increased disintermediation, interoperability & will contribute to buy-side crossing networks
Asset class sophistication – products will become increasingly sophisticated, with structured offerings becoming more widespread	Competition, technology	Asset class sophistication may not impact on market structure specifically, although it is likely to complicate and diversify the relationships between investors and intermediaries
Investor profile – the profile of the investor base will be larger and increasingly diverse, with traditional investors adopting newer strategies	Geopolitics, demographics	Similarly to asset class sophistication, the diversification and growth of the investor base will make investor-intermediary relationships more complex, and will contribute to the European equity market becoming more interlinked with the global market

Source: Drivers of equity market structure workshop and PwC analysis.

## Regulatory agenda in the future market

This section will assess the view of the market developed in section 5.2 in light of the key regulatory objectives of reducing transaction costs, reducing market abuse, increasing market liquidity, increasing financial stability and improving price discovery.

The table below sets out our envisaged status of the five key regulatory objectives discussed earlier in the report. These outcomes are based on the consensus of views we gained in the workshop, alongside our own analysis:

**Table 7: Changes in regulatory objectives**

Regulatory objective	Status	Comments
Transaction costs	Reduced	Greater interoperability, lower barriers to entry, reduced costs of technology and a higher degree of competition in the intermediary space should all contribute to transaction costs coming down in the future
Market abuse	Reduced	Given the increasing sophistication of technology, especially in the risk management space, it is likely that opportunities for market abuse will be reduced
Liquidity	Increased	Growth in market size, increasing interoperability, diversification of the investor base and increased technological sophistication are all likely to increase liquidity. However, one of the key determinants of liquidity – market confidence – is difficult to predict, and will largely be determined by incoming regulation, and the pace of the economic recovery
Financial stability	Unclear	The effect on financial stability in the future is difficult to determine. Fragmentation and interoperability trend towards greater financial stability, as does increasingly sophisticated technological risk management capabilities. However, unpredictability in terms of the economic recovery, combined with the possibly amplifying effects of technological sophistication, means that financial stability in the future is difficult to gauge
Price discovery	Reduced	Whilst increasingly globalised and improved market data provision should aid price discovery, trends towards increasing volume of trades occurring in unlit venues will likely result in net price discovery reduction in the future. Regulatory developments could significantly counterbalance this.

Source: Drivers of equity market structure workshop and PwC analysis

Making definite predictions about the success of the future market in meeting regulatory objectives is highly dependent on the specific regulations to be enacted. As this report will contribute to informing the regulatory agenda for European equity markets, it would be misleading and ultimately counterproductive to try to predict or suggest future regulation.

## 6 Conclusion

The European equity market has evolved considerably over the last several years and the change is likely to continue into the future, although the pace of the transition and structural implications across the value chain will be different. A number of drivers have influenced the shape of current markets; although the degree of their influence on elements of market structure and associated characteristics varies, nonetheless they have all played a key role in defining the market as it is today and how it will be in the next five to ten years.

### Drivers

In this study we have attempted to determine some of these drivers and interactions that help define the current equity market in Europe and those that are likely to be influential in defining its future market structure and characteristics. Our objective was to present a map of equity markets through time to identify how these markets have evolved – in terms of market participation, interactions and mechanisms that support such interactions across participants within the value chain. The challenges of mapping these relate to the inherent complexity of the market, its interdependencies, the different roles that the same participants can play in the market as well as the interplay between drivers and participants that can result in a new set of market structure changes. During our workshops and interviews during the data gathering phase there has been considerable debate amongst seasoned industry practitioners on how to describe the market and its changes. There is probably not one way of achieving this and we acknowledge that in compiling this report we have been forced to make certain simplifying assumptions to be able to present the information in a coherent format.

When setting out maps of market structures and its underlying characteristics, we have considered a range of different drivers, giving particular consideration to the role played by technology, in terms of supporting market infrastructure and interactions (for example automation of trade channels) as well as trading methodologies and strategies (i.e. reliance on computer generated trading). It is clear that technology will continue to play an extremely important role as a key driver and enabler of change in defining markets structures, shaping interactions, driving innovation in business models and risk management, however, its influence in relation to improvements in CGT/HFT trading strategies for example through improvements in access technologies and speed of execution will likely be limited. The current market already benefits from such innovations and the room for improvement is likely to be very marginal – thus in aggregate unlikely to have a material impact.

Although regulation has played a part in shaping current markets, its role is more important in the future – both on a stand-alone basis as well as in conjunction with other drivers such as technology in ensuring markets are orderly, appropriately transparent and provide equality of access. Regulatory policies such as the revised MiFID/MiFIR which support European integration through allowing pan-European players in the intermediary and infrastructure space or CRD IV (implementation of Basel III in Europe) which underpins requirements for adequate capital and thus participation in financial markets, in parallel with other new and upcoming regulatory policies, will redefine the role and operating models of institutional investors, financial intermediaries and infrastructure providers.

Moreover, as we saw in 2007/2008 global instability has the potential to disrupt commercial models and organisational structures across the financial services sector – and hence the role of regulation in managing and mitigating risks across markets will become even more prominent. There is a clear focus on achieving stability in the financial system and a return to economic growth, although commentators have noted that the regulatory approach at the moment is causing the banks to deleverage which is restricting growth by creating a shortage of credit in

the system. A key part of how the market changes over the coming years will be a result of how this tension between the need for economic growth and the need for increased regulation to prevent a crisis like that seen in 2007/2008. A number of industry participants are calling for a delay in these regulations to allow the conditions for economic growth to exist.

Competition has led to fragmentation of current markets across the value chain with different implications for different participants. Whilst certain market participants might have benefited from such competition, for example CGT/HFT traders who value opportunities for price dislocation and arbitrage; it has certainly negatively impact others due to declining margins and spreads on transactions. The current shape and form of the market broadly suggests that it is fully fragmented and hence there might be consolidation across the value chain as a reaction to these developments as well as the reducing revenues in the industry arising from increasing regulation. The precise impact on market characteristics of such consolidation (if it were to happen) are difficult to ascertain, as it requires benchmarking the magnitude of benefits to market participants of operations at a larger scale (as a consequence of consolidation) to a more fragmented/competitive market structure.

Our observations on the rise of the South America, Africa, Asia and the Middle East (SAAAME) as a trade flow and the resulting shift of wealth will create new dynamics for the capital markets and thus the equity markets. It is likely that these flows will require trade finance and credit for corporate institutions, investment management and banking services for growing affluence in the retail and wealth space and improved or new venues for primary issuance. However, there was considerable debate amongst industry participants on whether this would impact the main financial centres of New York and London given the critical mass of infrastructure, industry participants, legal and advisory suppliers. What is clear is that automation and communication will allow global participation in the markets if the right regulatory and legal environment can be created where investors and issuers have trust in the way the market operates.

Demographics factors, such as increased retail participation in trading in the emerging economies complemented by supporting infrastructure as well as trends within the domestic European markets (such as ageing populations and higher life expectancy) will impact investor behaviour and market participation. Whilst retail participation will increase market turnover and volumes, necessarily providing a core source of market liquidity, the demographic changes within European economies might lead to more risk averse investor base thus prompting a shift away from cash equities into less risky assets. However, an alternative view was also expressed by a number of different workshop participants which suggests as people start managing their pension portfolio on their own (perhaps as the government's ability to support future pensioners dwindles and a realisation of the need for sustainability) they might be willing to take on greater risk and thus focus more on equity and/or other asset classes that match the risk/return dynamics they seek.

Evolution in asset classes and sophistication of products, driven by demand from within and outside of Europe (particularly emerging markets) for certain assets with particular risk/return characteristics will impact equity markets perhaps through driving volume to other markets and asset classes. The key factor determining such trends in the future will be the interaction of financial markets with the real economy as equities, as per any other asset class will be assessed and invested in depending on the return premium it offers over and above the risk free rate (typically measured as yields on government bonds). Recent tracking of equities performance as an asset class in western markets over the last ten to fifteen years has seen a relatively low yield on the asset when comparing it to the historical performance of equities over the previous ten to twenty years. As a result, we are seeing a number of active investment managers close these funds as investors move to passive/index tracking funds with reduced costs as well as a diversification of portfolios to include alternative assets with higher yield profiles.

## Market structure

It is clear that the macro drivers discussed above have impacted and will continue to impact the market in diverse ways. The cumulative effect of these drivers on market structure is difficult to determine for several reasons. Firstly, any predictions about the future state of something as complex as the financial markets are necessarily dependent on innumerate factors, and as such are heavily dependent on underlying assumptions. Secondly, the interdependencies between the key macro drivers ensure that any divergence in the impact of one driver from what we will have envisaged will have a knock-on effect on other drivers and their ability to shape market structures – dramatically altering the composition of the market from what we might have proposed. Finally, difficulties associated with informing the regulatory agenda – as discussed above – must be considered. This report attempts to inform the debate on future regulation, whilst accepting current regulation being formulated as one of the key drivers of the market structure and its associated characteristics. The inescapable cyclicity of this aspect of the report should temper understanding in terms of the firmness of its predictions.

Despite the obvious difficulties associated with informing regulation, and moreover predicting the future, it is clear that certain trends in the market – should they continue – will affect it in ways that we are able to analyse and provide a descriptive account for in terms of implications on market structures and characteristics. It is these underlying trends and their impact on markets that we have tried to bring out in this report (section 4 and 5) and set out possible structure for equity markets in the future. This enables us to arrive at a view of the future structure of the European equity market, without being unnecessarily vague on one hand, or recklessly over-prescriptive on the other. Taking these things into account, we are able to make some tentative statements about the European equity market in five to ten years' time.

Descriptions of the future equity market falls into two main categories – overarching discussion of the market as a whole (including its fundamental characteristics) and specific discussions focusing on the three main participant groups (i.e. investors, intermediaries and infrastructure). Starting with the market as a whole, going forward markets will likely increase in size and will have more of a global focus, with harmonised trading mechanisms and regulations (particularly across the current developed markets), demographics (population), geopolitics, growth in emerging economies, proliferation of market investors (in equity and other asset classes) and technology will contribute to this trend. Market characteristics will evolve over time such that markets in general are more automated, transparent and supported by diversity of market participants – both in terms of the roles they perform as well as an overall increase in the number of market actors across the value chain. Moreover, the overall level of sophistication in the market will increase, with new interactions and participants increasingly improving (and diversifying) the ways in which they connect (with other players) and operate within the market.

In terms of the participants, it is likely that the market will display similar groupings of investors, intermediaries & infrastructure providers. The key difference will be greater diversity in the investor space, combined with a blurring of roles and higher degree of interoperability in the intermediary as well as the infrastructure space, largely owing to increased levels of competition and the enabling provisions of technology. The infrastructure space should be largely unchanged in terms of the key players, although the number of providers may increase significantly as the barriers to entry reduce further, and regulation shifts some intermediaries to effectively become part of the market infrastructure by providing similar services (such as crossing networks etc). There might also be consolidation in the infrastructure and intermediary space as a reaction to some of the evolving trends, thus making the overall impact in terms of market participation less clear. Technological improvements and increased levels of competition will also have their parts to play in the development of the infrastructure services and components within that facilitate transaction mechanisms and interactions.

The market in five to ten years' time is therefore not dramatically different from the current market in terms of its essential components. It will, however, become increasingly diverse, complex and interoperable, and as such will more than ever require sophisticated and informed regulation to guide its practices. It will also become increasingly able to adapt to regulation; as the overall level of interoperability in the market grows, it will become more difficult to regulate a given entity, and as such the need for smarter, proactive regulation focused on outcomes that satisfy the wide variety of participants and stakeholders is greater than ever.

## Appendix I – Glossary of key terms

**AT** – Algorithmic trading: Any of a number of trading strategies that utilise algorithms as part of the trade execution process

**Basel III** – The third accord of the Basel Committee on Banking Supervision, which specifies regulatory standards on capital adequacy, stress testing and market liquidity risk

**BCN** – Broker crossing network: A broker sponsored alternative trading system that seeks to match buy and sell orders electronically for execution without having to route the order to an exchange or other lit venue

**CCP** – Central counterparty clearing: A process in which financial transactions are cleared by a single counterparty

**CGT** – Computer generated trading: All forms of trading that utilise a computer program to execute part of the trade

**CSD** – Central securities depository: An organisation which holds securities to in order to enable their book transfer between different investors

**Dark Pool** – Any organised market where liquidity and pricing is not advertised to participants

**DMA** – Direct market access: An electronic trading facility which allows investors to interact directly with the order book of the exchange, utilising the access infrastructure provided by a broker/dealer or market maker

**ETF** – Exchange traded fund: An investment fund that trades on a stock exchange in the same way that a stock does; ETFs usually track an index, commodity or other specified basket of assets

**FIX protocol** – Financial Information eXchange protocol: An electronic protocol established in 1992 to enable the real-time exchange of information related to securities transactions and markets.

**HFT** – High frequency trading: A subset of algorithmic trading that is characterised by rapid entry and exit from positions, high trade volumes and low individual trade sizes

**MiFID** – Markets in Financial Instruments Directive: European Union legislation enacted in 2007 that seeks to provide a harmonised financial services regulatory environment across 30 member states of the European Economic Area.

**MTF** – Multilateral trading facility: A specific type of trading system codified by MiFID; MTFs provide similar services to exchanges, but are different in that they largely operate as software systems and do not have the same rights as exchanges.

**OEIC** – Open-ended Investment Company: A type of collective investment scheme under UK law

**OTC** – Over-the-counter: Trade in financial instruments that occurs directly between two parties; contrasted with exchange-based trading

**OTF** – A proposed trading system under MiFID II, an OTF is any system designed to bring together buying and selling interests or orders related to financial instruments. The OTF categorisation is designed to regulate venues that fall outside of the specification of an MTF

**RSP** – Retail service provider: A broker who offers market access to retail investors

**SAAAME** – South America, Africa, Asia and the Middle East: A categorisation of a number of significant developing economic regions

## Appendix 2 – Project blue

Project Blue (<http://www.pwc.com/gx/en/financial-services/projectblue/index.jhtml>) draws on the experience of the PwC global network and has been developed through interaction with financial services leaders around the world. It provides a framework to help industry executives organise their assessment of a world in flux, debate the implications for their business, rethink their strategies and, if necessary, reinvent their organisations. Seeing the future clearly, being first to adapt strategies and business models, and breeding a culture that shapes, rather than reacts to, the changing business environment will be the building blocks of sustainable competitive advantage in the future. The diagrams below depict the core elements of Project Blue:

**Many industry professionals (particularly in the West) are focused on adapting to global instability; however, the market is changing and opportunity exists for those who see it**

<b>PROJECT BLUE FRAMEWORK</b>	<b>ADAPT</b>	<b>Global instability</b>		
		<i>Regulatory environment</i>	<i>Fiscal pressures</i>	<i>Political and social unrest</i>
<b>PLAN</b>		<b>Rise and interconnectivity of the emerging markets (SAAAME)</b>	<ul style="list-style-type: none"> <li>• Economic strength</li> <li>• Trade</li> <li>• FDI</li> </ul>	<ul style="list-style-type: none"> <li>• Capital balances</li> <li>• Resource allocation</li> <li>• Population</li> </ul>
		<b>Demographic change</b>	<ul style="list-style-type: none"> <li>• Population growth discrepancies</li> <li>• Ageing populations</li> </ul>	<ul style="list-style-type: none"> <li>• Changing family structures</li> <li>• Belief structures</li> </ul>
		<b>Social and behavioural change</b>	<ul style="list-style-type: none"> <li>• Urbanisation</li> <li>• Global affluence</li> <li>• Talent</li> </ul>	<ul style="list-style-type: none"> <li>• Changing customer behaviours – social media</li> <li>• Attitudes to FIs</li> </ul>
		<b>Technological change</b>	<ul style="list-style-type: none"> <li>• Disruptive technologies impacting FS</li> <li>• Digital and mobile</li> </ul>	<ul style="list-style-type: none"> <li>• Technological and scientific R&amp;D and innovation</li> </ul>
		<b>War for natural resources</b>	<ul style="list-style-type: none"> <li>• Oil, gas and fossil fuels</li> <li>• Food and water</li> <li>• Key commodities</li> </ul>	<ul style="list-style-type: none"> <li>• Ecosystems</li> <li>• Climate change and sustainability</li> </ul>
		<b>Rise of state-directed capitalism</b>	<ul style="list-style-type: none"> <li>• State intervention</li> <li>• Country/city economic strategies</li> </ul>	<ul style="list-style-type: none"> <li>• Investment strategies</li> <li>• SWFs/development banks</li> </ul>

**Project Blue assesses the impact of these changes on all aspects of the leadership agenda**

**The CEO agenda**

**1** **Shaping the future:**  
*'Defining the future market and customer environment'*

- Economic rebalancing
- Industry structure
- Investor expectations
- New stakeholders
- Regulation
- Social policy
- Customer expectations

**2** **Rethinking the strategy:**  
*'Aligning the business model to the new commercial and market reality'*

- Short-term adaptation
- Alignment to global trends
- Managing new stakeholder objectives
- Determining risk appetite
- Redefining performance targets
- Portfolio rebalancing
- Driving competitive advantage

**3** **Reinventing the organisation:** *'Redefining the organisation to derive competitive advantage'*

<p style="text-align: center;"><i>Governance</i></p> <ul style="list-style-type: none"> <li>• Board composition and qualifications</li> <li>• Executive remuneration</li> <li>• Regulatory compliance</li> <li>• Risk management</li> <li>• Financial reporting and controls</li> </ul>	<p style="text-align: center;"><i>Target operating model</i></p> <ul style="list-style-type: none"> <li>• Legal and physical structure</li> <li>• Tax and capital efficiency</li> <li>• Allowable cost structure</li> <li>• Technology</li> <li>• Partnership structure</li> <li>• People and resources</li> </ul>	<p style="text-align: center;"><i>Competitive advantage</i></p> <ul style="list-style-type: none"> <li>• 'Seeing the future'</li> <li>• 'War for talent'</li> <li>• 'Constant reinvention'</li> <li>• 'Product innovation'</li> <li>• 'Strategic agility'</li> <li>• 'Operational alignment'</li> </ul>
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Source: PwC Analysis

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