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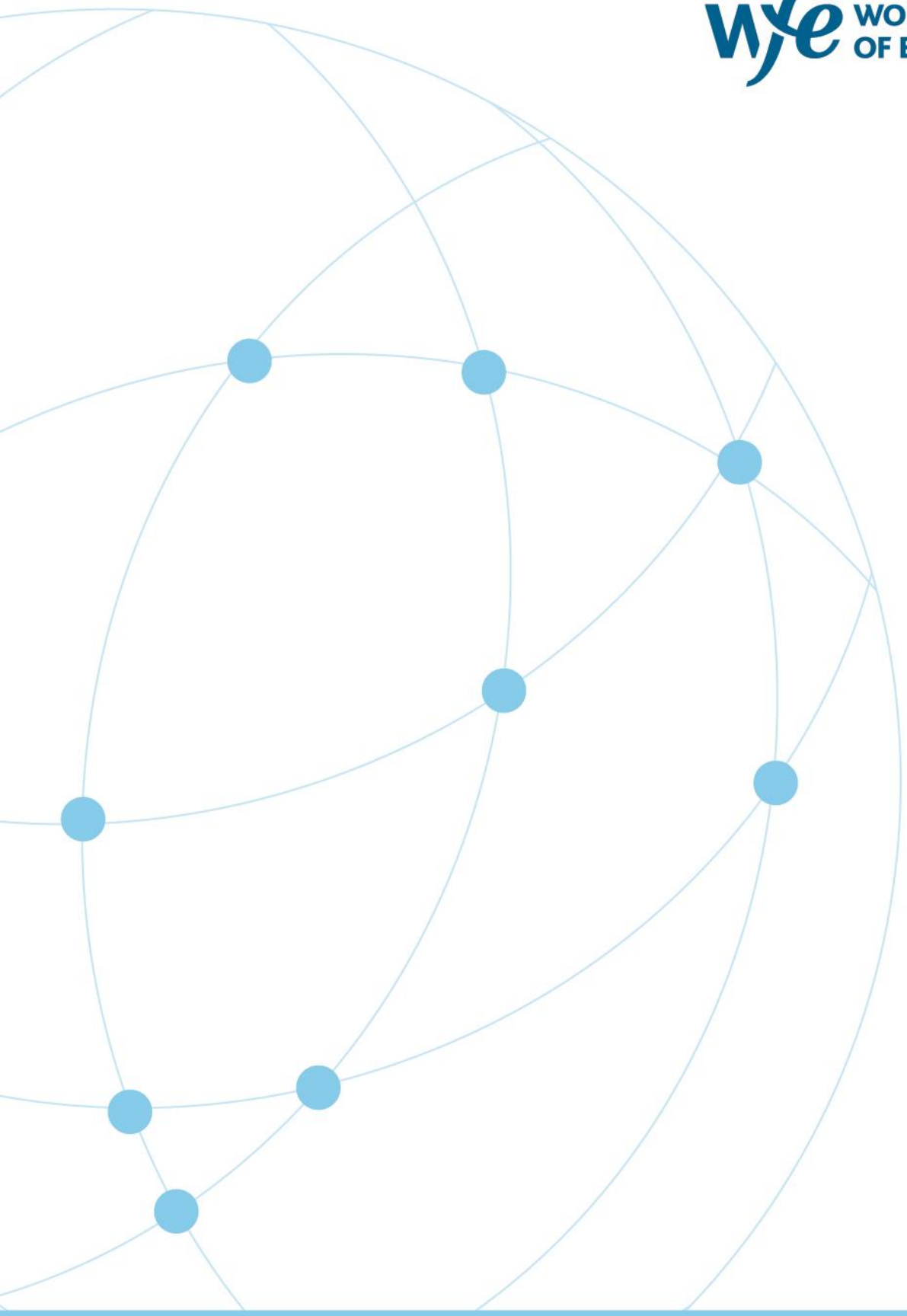

Key Attributes of Exchanges: Harnessing Network Effects

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Need financial markets? Try Exchanges!

Not for the first time, the end of exchanges is being predicted. Not for the first time, exchanges are about to prove the critics wrong. And they will do so because of the unique mix of attributes that they embody: innovation, scalability and resilience, all combined with the hugely powerful and valuable network effect that is perhaps their most distinctive characteristic. This is what makes them more credible than other forms of financial market, which instils public confidence in exchanges themselves but also in all financial markets. Public policy choices should adapt to reflect this.

But first, let's look at the bigger picture. Why do we care about how financial markets in general work in the first place? Starting from this point is useful, because it forces us to go back to first principles. That means we end up with the right market architecture: an outcome that is not a given and which requires constant attention.

That market architecture must not only be sound but serve a clearly identified purpose.[1]
At a very basic level, without financial markets, we are back in the dark ages of barter and middlemen. With them, we can embrace advancement – both social and industrial. Markets can make an economy not just bigger but more adaptable and flexible. It becomes possible to fund not just growth but also transitions, not to mention risk management.

So far, so good. But then why do we care about the details of how it is done? And why not embrace new, alternative, and perhaps 'disruptive' approaches?

The answer is simple: exchanges are not just a superior form of trading but the foundation of good markets. To put it another way, they are a necessity – not a luxury. The would-be alternatives have not proved themselves in direct competition with exchanges, because they cannot. And this is why they rely on special treatment, exemptions and so on.

Specifically, much is made of various phenomena: private funding, 'alt coins', crowdfunding, bilateral trading and so on. All are fine in their place but are ultimately pale imitations of a construct that has proved itself over 500 years and through revolutions – social, industrial and technological.

In all this, the critical mass that exchanges bring to trading is critical. And, as we will explore in this paper, that has profound implications for public policy, which should now reconsider:

1) the balance between bilateral and central markets;
2) the importance of pricing market price data according to its market value, given that it would not exist (let alone be hugely valuable) without central markets.

Network effects will tend to lead to some concentration. The reality in the exchange world is that this is naturally – and healthily – limited by competition: competition for listings and for trading volume. Put simply, an exchange does not need to be the only venue of its type. It is just the best type of venue, because of the mix of network effects and other attributes.

[1] To be precise, a set of purposes, both societal and national. See the Stock Exchange Manifesto, WFE, August 2025

Unfortunately, the pursuit of competition in public policy, understandable though the motivation is, has been handled in way that undermines the ability of exchanges to function, because of the unlevel playing field, especially between multilateral venues and bilateral.

One final but important point by way of introduction. Network effects have important policy significance for how we should think about central counterparties, which bring massive positive externalities precisely because they hold market participants to account and police how those participants back the market – and related counterparty credit – risks they themselves choose to take.

The key attributes of exchanges

Before we talk more about the mechanics and implications of network effects, let's revisit the other characteristics of exchanges that combine with them so significantly.

Exchanges must and do innovate. They have an unparalleled record for adding the right product at the right time. (Think, for example, of the growth of ETFs, mainly in classic long-only, index form but increasingly in many variants.) Importantly, this is not innovation for the sake of it, but because the products address a clearly identified need. It is structured innovation.

Innovation in other fields operates on the same basis. For example, biotech is not just about the tech but about the outcomes. The extent to which that is true for crypto remains to be seen – whether the tech is about faster or more convenient processes or a more radical development.

Exchanges also experiment with microstructure, especially the balance between market making and those who bring the most important form of liquidity: order flow. Exchanges constantly revisit order types and access models. They bring new ways of consuming and analysing data and, wherever possible, ensuring that there is enough research to help market participants trade effectively. And they are constantly looking at new ways to deploy IT, including AI for surveillance and for more creative processes, such as product development.

This leads us onto an area where exchanges resemble the biggest of big tech: scalability. The volumes that exchanges have to be able to handle and the speed at which they do so is hard for the non-specialist to grasp. Fractions of a second are not intuitively easy to think about but exchanges have to. This is not just about orders but all the messaging that goes on in the run-up to an order being place. The judicious use of software as a service and third-party providers of secure computing capacity are integral here.

All of this innovation and capacity must be backed up by resilience. Modern supply chains and manufacturing are a possible analogy here. Exchanges are important to the financial markets and to the economy. At the same time, they are targets for bad actors. Because they are mission-critical to financial market participants, they know they have to minimise the risk of downtime, whatever the cause. They also know that they have to get back up safely (though not prematurely), when something bad does happen.

They also have to keep an eye on whether their ecosystem of participants is or is not functional at any given moment. Operational outages can and do take out whole swathes of brokers or post-trade

agents at a time, which means that the exchange or clearing system needs to check when it is safe to let them back in.

Must mingle! Exchanges, CCPs and network effects

So, what is the deal with network effects?

A piece of wisdom known as Metcalfe's law tells us two things about networks, one of them frankly pretty obvious and one of them truly profound, especially when you are thinking about how the most effective financial markets work. The very basic bit says that the value (or usefulness) of a network increases as you add participants. The more interesting rider is that this value appears to increase by an ever greater amount, for each participant that joins. (We'll get to the question of whether this is infinitely true further on.)

To make this more concrete, consider the logical extreme of a share-trading network made up of just two: Katy and Taylor. They might very happily trade shares back and forth all day, based on differing or evolving views as to the value of those shares. But the point is that it's not the most likely formula for a successful market-place.

The minute, however, you add a third participant (let's call her Lola), things get more interesting, because the number of possible inter-relationships immediately jumps from one to three, making the market-place significantly richer. And when Lola tells her friend Bertie about this network and he joins, the number of possible connections leaps by a bigger amount, to six. And so on. Exchanges refer to the 'order book mix' and typically strive to mix different types of participant, notably retail and institutional. [2]

More participants equals more chances of finding a counterparty to trade with and that means more liquidity and more information about where the prices of assets are at any given moment. Note that this is different from economies of scale and note that, unlike industrial situations where greater volume of production may translate into lower quality, the network effect enhances the quality of the 'product' – in our case the data and trade execution.

This network concept is central to the benefits that exchanges and central counterparties bring to financial markets, especially as compared with other forms of trading and clearing or settlement. Those 'other forms' include trading platforms that are 'incomplete' or quasi-exchanges. They capture some of the trading flows that exchanges provide the price discovery for but stop short of being true exchanges.

And that is a quantum leap: a change that is small in size but fundamental in impact. Anything that falls short of being a true exchange is in effect doing the opposite of an exchange, because its effect

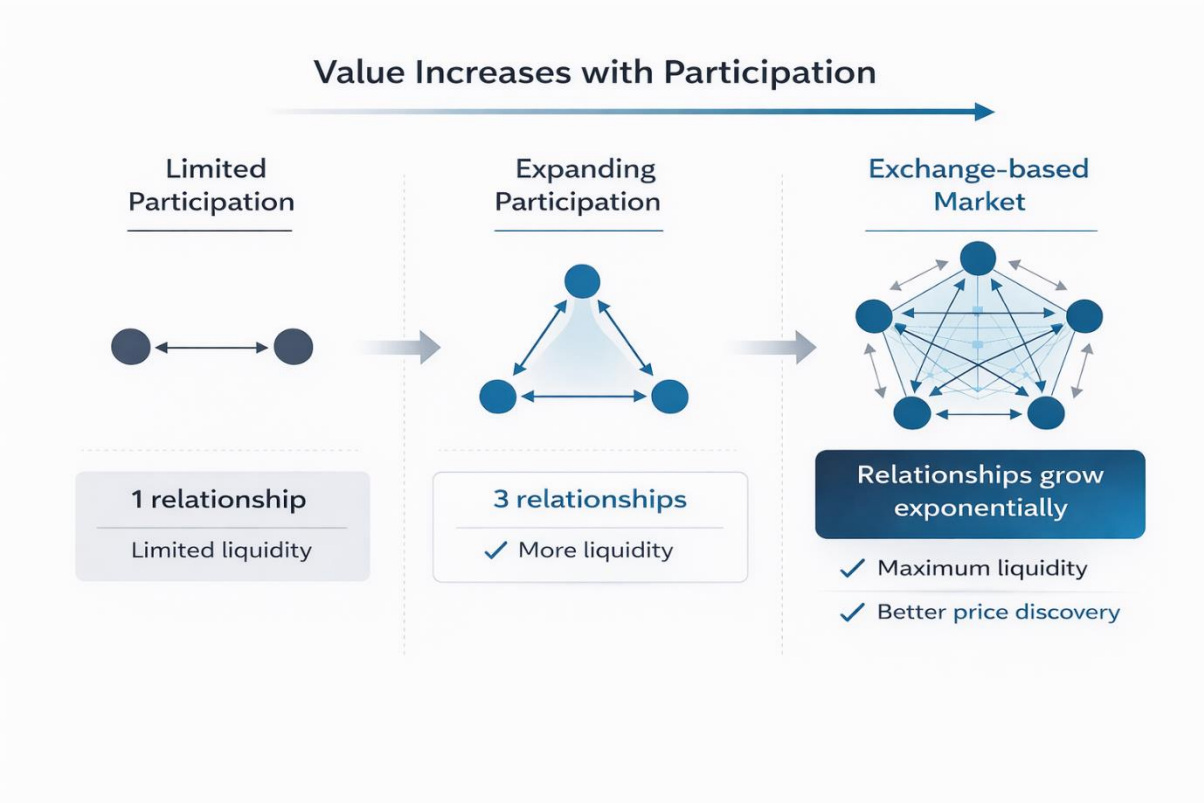
[2] The value (utility) of a network multiplies by an ever greater amount with the number of participants – 'n'. The formula – with * meaning 'multiply' – reads **n * (n-1) / 2**. This means the network value is nearly the square of the number of participants. (n squared would be n times n. n times 1-less-than-n, all divided by 2, is a bit less.) In concrete terms, from zero value (a sole participant), the network value goes to 1 (ie, 1 relationship, when there are 2 participants); which increases to 3, then to 6, to 10. To see it more intuitively, draw a diagram, with dots for every participant and lines between them, to represent the burgeoning relationships.

is to fragment, which in practice results in less liquidity, not only on that 'alternative venue' but in venues including exchanges. When exchanges have to operate in markets where order flow is segmented, the flows that do make to the exchange can end up being 'toxic' (hard for market makers in the lit environment to process) resulting in wider bid offer spreads and reduced capacity.

Metcalfe's law[3] captures the value of an exchange or CCP in a profound manner. Exchanges and CCPs are mechanisms for maximising participation, with benefits not just in terms of technical efficiency but social welfare.

Ironically, this common-interest mission requires exchanges and CCPs to run a highly rules-based system which (in apparent contradiction to the network-maximisation process) includes criteria as to who may participate. At the same time, the primary participants themselves bring in customer orders, which indirectly expands the network.

A network is a system or structure that allows each participant to interact with every other one. As this particular 'Law' of Mr Metcalfe is in reality an observation, we can acknowledge the spoilsports[4] who say that any given network's increase in value may have some sort of natural aggregate limit. (In a world of finite participants, the strange thing would be if it did not have a limit. The basic point remains: a network of 20 participants will be disproportionally more useful than one consisting of just 2.)



[3] The insight dates from 1980, when Robert Metcalfe addressed an efficiency threshold in a computer network, ie, the number of machines connected to it. (Metcalfe invented ethernet.)

[4] https://www-users.cse.umn.edu/~odlyzko/doc/metcalfe2.pdf. The authors propose a (lower) logarithmic increase (n[log]n), citing some passing froth in telco valuations. We, however, focus on enduring effects.

In any case, there is a counter to that 'natural limit' argument. "Nothing succeeds like success", especially in the world of exchanges and CCPs, in the form of permissioned participation. In plain terms, the success of these networks lies in two things. The first is that it is a structured network, with clear and transparent rules as to how buyers and sellers are matched, with policing of the integrity of the market. The second factor is that there are rules as to who is allowed to participate. This brings confidence to all potential participants – characteristics which are hard to trust in over-the-counter trading and other partial (non-impartial) solutions.

On the trading side, the benefit of creating a network includes the reliable and authoritative market data that draws in that liquidity in the first place. (Try creating credible market data otherwise!) Network effects also quantifiably underpin the value of central counterparties, who take on post-trade exposures in a way that reduces the amounts at risk. The more firms clear through a given CCP, the greater the scope for multilateral netting to have that effect. And that has a knock-on benefit in terms of systemic stability.

Metcalfe formulated his Law for computer networks, where 'backwards compatibility' of products ensured that newer versions of a bit of kit would not disrupt the network effect. In the exchange / CCP world this translates: exchanges and CCPs deal with standardised products. Compatibility, in other words, is a feature that is – or, if you value can be – baked in. It's certainly not a bug.

A distinctive feature

By way of contrast with financial markets, social media almost qualifies for Metcalfe's Law but not quite. In such systems, where exclusivity is sometimes attractive, individuals may and typically do retain some control as to whom they accept or not as a contact. Just like telephone networks, just because you could in principle reach anyone else on the network does not mean that you will actually want to. It is true (axiomatically) that at least some of the value in exchange-as-network derives from the fact that everyone else has been vetted (and that business proceeds via entities that are themselves subject to direct regulation). It is a well ordered and 'permissioned' world.

Reed's Law (1999) is also worth thinking about. That argues for an even greater effect than Metcalfe's in assessing the value of adding participants to networks. In that paradigm, sub-groups count as well as peer-to-peer links. Such analysis would very clearly apply in a market where direct institutional participation in markets links to indirect participations by customers of those institutions, including for example, retail traders. But we should be careful here. Reed's Law could also apply to the OTC / dealer book-crossing world. And, as regulation generally recognises, sub-groups can work against the benefits of properly centralised trading, if in practice they cause problematic fragmentation.

Network value may be even more important to exchanges and CCPs than that old business-school favourite, economies of scale. Scale effects are axiomatically relevant to trading and clearing, as they are to many business models. But the crucial point is that network effects are a distinctive and distinguishing feature of exchanges and CCPs (and all who imitate them).

It may be true that not every participant will bring the same volume of transaction to a piece of market infrastructure (ie, exchange or CCP). So, a really hard-nosed assessment of the value of the network might require acknowledgement that some participants may bring rather more to the table

than others, and not every addition will bring the same quality or quantity of business to the table. But the underlying principle remains the same: exchanges maximise participation from the pool of available actors and this is good for the exchange, for intermediaries and for end-customers; good, in fact, ultimately for the confidence of regulators and the public they ultimately answer to.

It is also true that, when it comes to dealers, they tend to prefer a bilateral world. Where information is power and one can act as a selective, mini-hub, this preference boils down to perfectly logical self-interest. But it is no guarantee of the interests of the end-customers (hence rules on best execution) or of market integrity (hence rules on trade publication and transaction reporting).

What is really striking is that dealers will simultaneously exploit network effects in other areas, when it suits them. The best example is the case of centrally clearing OTC-traded swaps, where the benefits of multilateral netting were sought, even while trading remained strictly bilateral. Dealers – at their own initiative – explored this[5] solution because it would reduce their risk exposures and so the amounts of collateral that would need to be posted and the capital requirements associated with any residual risk vis-à-vis the CCP. And, because it was in their own interests, dealers did this long before any regulator thought to advocate it (which they did mainly as a way of making up for their approach in the run-up to the crisis of 2008).

In the case of CCPs, because theirs is a risk-management mandate, an interesting issue arises. While part of a CCP's value is that it can form a neutral (impartial, non-participant) overview of the distribution and possible concentration of risk in the products for which it offers a clearing service, its information is incomplete, in that it will not typically be able to form a view as to what is happening, even in closely related OTC markets. In other words, the network benefits it brings are potentially at jeopardy from developments outside its control and even outside its field of vision.

Who owns the network?

The beauty of an exchange – as distinct from dealers operating their own exclusive hubs – is that the exchange acts as a neutral and trustworthy third-party. A rough analogy might be the operator of a sports stadium. It wants to maximise that franchise and bring in as many participants as possible but does not have a stake in who wins the events that are staged in the arena.

The exchange's interest lies in ensuring that the network operates to best effect and, while they may compete with other venues this is a non-rivalrous job vis-à-vis the participants in that network. To be absolutely clear, a regulated financial exchange (in the WFE-member sense of that term) could never act as a counterparty as well as deal-matcher. The same has not always been true in the world of crypto.

The complication arises when they have to compete with other types of platform (that may enjoy relatively light regulatory treatment). In the *realpolitik* of market structure, dealers are allowed to

[5] There was some notorious holding-out. Banks with relatively high credit ratings were reported to be resistant to central clearing, as they realised they would lose a comparative advantage versus other banks, in terms of attracting business. But longer-term dynamics in the banking world, where the cost of maintaining those higher credit ratings became a competitive issue, finally forced the Houses to the table.

run entities that erode exchanges' business while retaining the benefit of being in the underlying network. They have it both ways.

Metcalfe's Law is not a law of nature or of physics. It is a rule of thumb, a bit like Moore's Law regarding computer chip capacity, which was later revised. It comes with caveats and may not hold perfectly or to the n^{th} degree. But it tells you something that the effect has been embraced by the crypto crowd to encourage participation in coins. And the Law explains an awful lot about the sort of networks that make financial markets work, which brings welfare to many, in many, many ways.

Less is not more – let a thousand exchanges bloom!

It (almost) goes without saying that the more products an exchange can offer, the more likely participants may be to flock to that 'one-stop shop'. But it is also true that exchanges can and do specialise. Some of this happens in relatively obvious ways, such as geographical focus – a focus that often mirrors a 'home bias' among investors, making it effective to concentrate Ruritanian company listings in Ruritania.

Less obvious but at least as important is strength in a particular industry sector (for instance tech, pharma, mining or carbon removal). And then there is the array of instrument types an exchange can offer, including products that help to complete a market built on share ownership: bonds, derivatives, ETFs and indices. Tools to help market participants parse and analyse data are also an area in which it is possible to deliver value, in addition to the trading profits that those participants can make from low-latency data created by exchanges.[6] Last but not least, exchanges compete with all-comers on the best mix of order types and liquidity provision.

In short, exchanges compete with each for listings – and to some extent, for the available liquidity in the market (which is not limitless or costless). But they also play to strengths, while exploring collaboration wherever it may be mutually beneficial and serve respective customer bases better, for instance through cross listings or depository receipts.

Regional hubs that try to bridge various jurisdictions face many challenges: different currencies is an obvious one but, even when this can be overcome, differences in bankruptcy regimes and other legal issues, including the structure of securities holdings, can all combine to confound attempts to create an economic bridge. Clearing can be offered across borders and, in securities at least, interoperability may be within reach. In practice, however, it proves hard to achieve.

Conclusion: The Real (Finance) Thing

Many want to be thought of as an 'exchange' without necessarily adhering to the same, high standards. (In various branches of finance, the term is adopted, without offering the same rules-based environment.)

[6] Exchanges are creators of data as much if not more than anything else. See Not What but Who – Market Data Use Cases, WFE Regulatory Affairs, 2023

The WFE and its members know that the details of running such operations are crucial. This starts with membership criteria and goes all the way to post-trade transparency, via rules for matching buyers and sellers in a fair and orderly manner. Take that combination of things for granted at your peril!

Why exchanges? A simple answer is that there is no need to reinvent the wheel. In fact, there are big dangers in doing so; especially when what you actually need is a fully functioning vehicle. And, while network effects may not be new, they are a useful way to frame the important policy decisions associated with how exchanges are treated, especially as compared with bilateral markets. The latter may be useful for some products at some times but should never be favoured at the expense of the robust and socially useful trading venue that optimises participation in the financial markets on which we all depend to some extent.

Exchanges and their operators face challenges from all sides (including from other exchanges). But, because they combine age-old virtues with the attributes of the best of modern businesses, backed the best and often the most cutting-edge technology, they have the staying power and structure to deliver true value. Allowing others to take short cuts is counterproductive and dangerous.

Great headlines don't always capture the truth as much as they capture the attention. As American author Mark Twain famously said, 'The report of my death was an exaggeration.' The same goes for exchanges – and will do, in the right public policy framework.

Background

Established in 1961, the WFE is the global industry association for exchanges and clearing houses.

Headquartered in London, it represents the providers of over 250 pieces of market infrastructure, including standalone CCPs that are not part of exchange groups. Of our members, 36% are in Asia Pacific, 43% in EMEA and 21% in the Americas. The WFE's 87 member CCPs and clearing services collectively ensure that risk takers post some $1.3 trillion (equivalent) of resources to back their positions, in the form of initial margin and default fund requirements. The exchanges covered by WFE data are home to over 55,000 listed companies, and the market capitalization of these entities is over $111tr; around $124tr in trading annually passes through WFE members (at end-2023).

The WFE is the definitive source for exchange-traded statistics and publishes over 350 market data indicators. Its free statistics database stretches back more than 40 years and provides information and insight into developments on global exchanges. The WFE works with standard-setters, policy makers, regulators and government organisations around the world to support and promote the development of fair, transparent, stable and efficient markets. The WFE shares regulatory authorities' goals of ensuring the safety and soundness of the global financial system.

With extensive experience of developing and enforcing high standards of conduct, the WFE and its members support an orderly, secure, fair and transparent environment for investors; for companies that raise capital; and for all who deal with financial risk. We seek outcomes that maximise the common good, consumer confidence and economic growth. And we engage with policy makers and regulators in an open, collaborative way, reflecting the central, public role that exchanges and CCPs play in a globally integrated financial system.

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If you have any further questions, or wish to follow-up on our contribution, the WFE remains at your disposal. Please contact:

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