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Research Department  
31.12.1999

## Strategic Challenges for Exchanges and Securities Settlement

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The views expressed are those of the authors and do not necessarily correspond to the views of the Bank of Finland

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# Strategic Challenges for Exchanges and Securities Settlement

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## Abstract

A common feature of major trends in securities and derivative markets is that they facilitate cross-border competition between financial institutions and markets. These trends include financial deregulation, technological developments that increase network externalities and the introduction of the single currency in Europe. This paper discusses future prospects for stock and derivative exchanges and securities settlement systems globally in the light of this analytical framework.

The increased contestability of the financial markets opens the way for a completely new situation where economies of scale and network effects enable new systems to challenge existing exchanges and settlement systems. This has already led towards more integrated trading and settlement infrastructure via mergers, alliances, links, agreements and other forms of cooperation between existing infrastructure companies. At the same time new electronic communication networks and electronic exchanges operated by members of exchanges or off-exchange companies and Internet brokers have emerged.

We expect that economies of scale and scope and network effects will foster global competition. The business conducted by brokers and exchanges will tend to converge, thus posing a major challenge for the management of these businesses. Trading and settlement services for the most liquid global trading products will, we believe, be provided by limited liability companies that employ efficient governance practices. We anticipate that US stock and derivative exchanges will have to adopt fully electronic trading systems. This might lead to intense competition between exchanges in the US and globally. We also anticipate that European alliances will be based on a more efficient operational model than the models proposed so far. An increase in Internet-routed equity and derivative trades will lead to partial fragmentation of liquidity. As technology advances, we expect pooling of liquidity in one of the networks.

Key words: exchanges, settlement systems, technology, network externalities and economies of scale

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# Pörssien ja selvitysjärjestelmien strategiset haasteet

## Suomen Pankin keskustelualoitteita 21/99

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### Tiivistelmä

Arvopaperi- ja johdannaismarkkinoiden kehitykselle on ollut leimallista sijoitus-toiminnan laajeneminen yli kansallisten rajojen ja markkinapaikkojen sekä rahoituspalveluiden tarjoajien välisen kilpailun kiristymisen. Näitä trendejä ovat mm. rahoitusmarkkinoiden sääntelyn purkaminen, kasvavat verkottumisedut mahdollistava tekninen kehitys ja yhteisen rahan käyttöönotto Euroopassa. Tässä tutkimuksessa analysoidaan, miten nämä trendit vaikuttavat arvopaperi- ja johdannaispörssien ja arvopapereiden selvitysjärjestelmien tulevaisuudennäkymiin.

Rahoitusmarkkinoiden lisääntynyt kilpailullisuus antaa uusille instituutioille ja järjestelmille mahdollisuuden hyödyntää skaala-, toiminta-ala- ja verkottumiseduja, mikä taas mahdollistaa aikaisempaa paremmin kilpailun jo olemassa olevien järjestelmien kanssa. Tämä kehitys on jo johtanut entistä yhtenäisempiin kaupankäynti- ja selvitysjärjestelmiin nykyisten osapuolten välisten fuusioiden, allianssien ja erilaisten yhteistyömuotojen kautta. Samanaikaisesti ovat yleistyneet uudet elektroniset verkot ja pörssit, joita ylläpitävät perinteisten pörssien jäsenet tai pörssien ulkopuoliset yhtiöt.

Oletamme, että lisääntyneet skaala-, toiminta-ala- ja verkottumisedut edistävät globaalia kilpailua jatkossakin. Välittäjien ja pörssien liiketoiminnat lähestyvät toisiaan, mikä aiheuttaa näiden toimintojen johdolle merkittävän haasteen. Uskomme, että likvideimpien kaupankäynti- ja selvitystuotteiden tarjonnassa menestyvät parhaiten osakeyhtiöt, joiden hallinto on tehokasta. Käsityksemme mukaan yhdysvaltalaiset osake- ja johdannaispörssit joutuvat siirtymään täysin elektronisiin kaupankäyntijärjestelmiin, mikä saattaa johtaa pörssikilpailun kiristymiseen sekä Yhdysvalloissa että globaalistikin. Oletamme myös, että eurooppalaiset allianssit tulevat perustumaan nyt ilmoitettuja suunnitelmia tehokkaampiin toiminnallisiin ratkaisuihin. Internet-pohjaisen osake- ja kaupankäynnin lisääntyminen johtaa likviditeetin osittaiseen jakautumiseen. Oletamme kuitenkin tekniikan kehittymisen luovan mahdollisuuksia, joiden avulla likviditeetti keskittyy johonkin olemassa olevista verkoista.

Asiasanat: pörssit, selvitysjärjestelmät, tekninen kehitys, verkottumisedut, skaala-edut

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# 1 Introduction

This paper discusses the forces driving the development of securities and derivative markets and provides analysis regarding the future of global securities market infrastructure in the years ahead. The analysis covers the markets and trading and settlement environment for equities, interest-bearing instruments and derivatives. These issues have been discussed in numerous articles in e.g. books edited by Lo (1996), Steil (1996), Ferrarini (1998) and Dermine and Hillion (1999). In his book Lee (1998) focuses on the challenges facing stock exchanges while O'Hara (1995) provides us with a theoretical framework for securities market microstructure.

Our aim is to contribute to the literature by focusing on the key issues that are driving the European securities markets towards a single and fully contestable market and providing analysis of how current and possibly also new institutions will compete with each other. Motivation for this kind of analysis is provided in some recent research papers. Pirrong (1999) presents a theoretical model that predicts that economies of scale will encourage consolidation among stock exchanges until profitable entry into liquidity provision is eliminated. Malkamäki (1999a) finds clear evidence for the presence of economies of scale in stock exchange trading systems. Both authors argue that the rapid advances in communications technology have helped to minimise the fragmenting effect of physical distance on exchange formation.

Shapiro and Varian (1999) argue that computer hardware and network technology are already powerful and inexpensive. Recent developments in equity and derivatives markets provide evidence that technology is already sufficiently advanced and cheap enough to enable investors to trade via networks, as witnessed on a global scale in currency and bond markets. Thus infrastructure users are now better able to choose between markets on the basis of their preferences regarding infrastructure; in other words, they can choose service networks that offer the highest liquidity, adequate transparency and low transaction costs. The recent success of Eurex is a good European example of how networks can replace a trading floor in another country. Domovitz and Steil (1998) show that Instinet has gained increasing and significant trading volumes in the US equity markets, implying that it is competitive with respect to the NYSE and Nasdaq. Based on their empirical analysis, they also suggest that consideration of trading technology adoption and subsequent market structure development needs to move from issues of market quality to cost of trading. At the end of this paper we discuss how, in our view, network externalities, economies of scale and alternative trading, clearing and settlement structures could reduce costs of trading, i.e. costs associated with marketplaces and intermediaries, bid-ask spreads and market impact costs.

From the regulatory standpoint, current European financial market legislation provides for a good, albeit imperfect, environment for competition between stock exchange, derivative exchanges and investment services providers in Europe. Barriers between European securities markets have been largely removed or overcome with the implementation of the OECD codes on free movement of capital by the end of 1980s and the Investment Services Directive by the mid-1990s. In this kind of competitive regulatory environment, elimination of

economic barriers between markets reduces the importance of physical location as services can be provided and accessed via electronic networks.

The introduction of the euro was a major source of change in the short run since it involved the creation of a new and wide currency area. Investors are now able to diversify their portfolios on a euro area-wide basis without incurring currency risk. At the same time, large institutional investors have taken a dominant role in securities markets. Institutional investors and financial institutions have to adapt to increased competition, and therefore their demands regarding market infrastructure have also increased. As they pay increasing attention to the efficiency and quality of the services they are offered and the costs of such services, this places growing demands on institutions that run marketplaces.

Rapidly expanding cross-border portfolio investment in equities and bonds is increasing demand for efficient pan-European trading and settlement infrastructure. Thus, the adoption of the euro posed a challenge to existing securities markets and the competitive position of each financial institution, and even raised a question mark about the future of current financial centres. A further spur to development was provided by the introduction of the ECB's TARGET system at the beginning of 1999, as a result of which funds can now be transferred across EU countries within a few minutes. This enhances both the cross-border settlement of cash instruments and cross-border flows of liquidity.

Within this competitive regulatory framework, technological advances will enable network externalities to be utilised in European trading and settlement systems. This will further increase economies of scale in these operations and intensify competition between trading and settlement systems. Development towards a single and fully contestable European market for financial services seems obvious. It also implies that location will gradually lose some of its importance for marketplaces and that competition between financial centres, marketplaces and securities firms will intensify. This is an enormous challenge for markets, market participants, marketplaces and settlement systems. The trend seems likely to be towards larger unit size and more integrated infrastructure.

Extensive system developments will be needed in infrastructure in the near future because every institution should be able to have either its own network or a network based on an alliance or some other form of co-operation between service providers. Some marketplaces may find it difficult to create their own networks because at the same time earnings expectations are likely to decrease as a result of tightening competition. It is possible that some consolidation in European securities market infrastructure is already taking place, at least for current benchmark products that are traded in large volumes. Not all marketplaces will be either willing or able to renew their systems, thus providing room for alliances and mergers that imply a thorough reorganisation of existing infrastructure.

This paper is organised as follows: Section 2 identifies the major economic forces driving development and the forces inhibiting development and analyses their impact on markets and infrastructure. Section 3 reviews recent developments in trading and settlement systems. Section 4 discusses likely outcomes of the development process, presenting some scenarios for market structures and institutions in North America and Europe.

## 2 Driving forces of development

A common feature of major trends in securities markets is that they facilitate cross-border competition between financial institutions and markets. These trends include financial deregulation, technological developments that increase network externalities and the introduction of the single currency in Europe. The single currency has been the major factor influencing short-term developments in Europe. All these fundamental changes allow financial institutions to take advantage of economies of scale in their operations. These developments imply that location will gradually lose some of its importance for marketplaces and that competition between financial centres, exchanges and settlement systems will intensify. New structures will emerge and financial centres may even become less important.

### 2.1 Regulatory framework

From the regulatory standpoint, current European financial market legislation provides a good, albeit imperfect environment for competition between stock and derivative exchanges and investment services providers in Europe. Barriers between European securities markets have been largely removed or overcome with the implementation of the OECD codes on free movement of capital by the end of 1980s and the Investment Services Directive by the mid-1990s.

The Investment Services Directive (ISD) has led to a marked increase in competition between stock exchanges. First, the ISD allowed securities market participants to establish remote access to foreign stock exchanges. In addition, stock exchanges were allowed to set up terminals abroad enabling free entry by local participants. The primary effects of the ISD on market infrastructure can be seen in equity and derivative markets, where the role of exchanges has been dominant or significant. In the money and bond markets, trades have executed primarily on an OTC basis. Thus the secondary market now functions within a reasonably competitive regulatory structure that has reduced the importance of physical location for markets and enables provision of services via electronic networks.

Regulation of securities settlement systems is based on international initiatives and user requirements. The Bank for International Settlements (BIS) has published various reports on securities settlement systems. The Lamfalussy criteria, for example, offer guidance for the operation and supervision of netting systems. At the beginning of 1997 the BIS and International Organisation of Securities Commissions published results of a study on securities settlement systems entitled “Disclosure framework for securities settlement systems”. Its purpose was to increase market participants’ awareness of their risk exposures. These initiatives have been used to unify procedures applied in different settlement systems.

The ECB’s predecessor, European Monetary Institute (EMI), published nine standards for the use of securities settlement systems in ESCB credit operations. These standards provide guidance for settlement systems on legal, custodial, operational, risk management and disclosure issues. The standards also deal with finality of settlement, operating times, regulation and use of central bank money

in settlement. In the longer run, the standards may support the convergence of settlement system operations (EMI, 1997).

The ECB has endorsed the plan of the European Central Securities Depository Association (ECSDA) to construct a pan-European network integrating national securities settlement systems. The ECB seeks to ensure efficient cross-border use of collateral in its credit operations. According to the ECSDA plans, direct two-way links will be established between national central securities depositories in Europe so as to allow cross-border transfers and settlement of securities. Initially, the links will operate mainly on a free-of-payment basis. Ultimately, however, it is planned to operate the ECSDA links on a DVP basis, thus allowing efficient cross-border settlement of private transactions in securities markets.

The ECB has also implemented a genuine pan-European payment system, TARGET, which enables rapid real-time transfers of large-value euro payments across EU countries. Along with the development of TARGET, the evolution of other Europe-wide payment systems has accelerated (e.g. EBA Clearing and EAF). Developments in the field of payment systems are supporting cross-border trading and settlement in securities markets, as payments can now be executed more efficiently and reliably.

## 2.2 Network externalities and economies of scale

Technological developments have provided a major impetus to structural change in securities markets in recent decades. They have created a foundation for the modern electronic trading, clearing and settlement systems used in securities markets.

Economic analysis suggests that a single market will come into being if there are no regulatory barriers to prevent its formation and the requisite advanced telecommunication technologies exist, i.e. if the market is not dependent on physical location. This may imply a single stock exchange if there are significant economies of scale in stock exchange operations, as noted by Pirrong (1999). Malkamäki (1999a) finds clear evidence for the presence of economies of scale in stock exchange trading systems. The existence of multiple exchanges may, however, be motivated in the future if there are frictions in the trading process (see section 2.4).

In another study, Malkamäki (1999b) shows that economies of scale have increased in the 1990s within the quartile consisting of the biggest stock exchanges. The author argues that this finding provides evidence that technological advances and lower telecommunications costs have benefited the operations of large exchanges the most.

Both Pirrong and Malkamäki argue that the rapid advances in communications technology have served to minimise the fragmenting effect of physical distance on exchange formation. Domowitz and Steil (1998) and Domowitz (1995) state that an exchange or trading system is analogous to a communication network, as the benefit to one trader transacting on a given trading system increases when another trader chooses to transact there as well. These effects are called network effects or network externalities.

Network externalities imply clear scale economies in electronic trading systems, as these systems may be accessed from number of locations. Shapiro and Varian (1999) argue that this is now possible because computer hardware and

network technology are powerful and inexpensive. Under these circumstances growth is imperative, not just to achieve the usual production-side economies of scale but to achieve the demand-side economies of scale generated by network externalities. The key challenge is to gain critical mass in terms of customer base. Thereafter, the market will grow under its own momentum because of network effects. Penetration pricing may be necessary to gain critical mass, i.e. pricing below production costs in order to kick-start the positive feedback mechanism.

There are several articles on networks and externalities of trading systems. Economides and Siow (1988) showed that liquidity considerations limit the number of markets in a competitive economy. In their spatial competition model with liquidity as a positive externality, there may be too few markets because nobody wants to use a new market with low liquidity. Later, Economides (1993) showed that networks (such as electronic trading systems) are by their nature self-reinforcing. As a consequence, networks exhibit positive critical mass. A second consequence is that optimality will not result from perfect competition. According to Economides, this allows for the possibility that some market structures (such as monopoly) can coordinate expectations, leading to larger networks and higher welfare than under perfect competition.

A third observation is that network providers wield market power through the setting of network standards. Stock exchanges usually set rules and regulations governing their trading systems. According to Economides (1993), this impedes technological innovation. He also discusses another issue that is relevant for the interpretation of the analysis provided in this paper and for policy discussion. He argues that equilibrium price information generated by a financial exchange network is another externality, in addition to market liquidity discussed above. As the validity of the market price established in network X is an increasing function of the size of the network, it may be better for small network Y to use the price information provided by network X instead of engaging at all in price discovery itself. As more customers switch to network Y, the validity of the market price in network X is reduced.

This question was analysed empirically by Bessembinder and Kaufman (1998). They examined execution costs for trades in stocks listed on the NYSE and trades executed on the NYSE, the NASD dealer market and the regional stock exchanges during 1994. Under SEC rule 19c-3, NYSE members are allowed to compete with NYSE specialists by executing trades in NYSE-listed firms in off-exchange systems. They found that some off-NYSE exchanges and trading systems have specialised in attracting small trades in the shares of large NYSE-listed companies.

This raises the concern that exchanges other than the NYSE are actually cream skimming as some of them concentrate on trades that take advantage of price discovery on the NYSE. They also found that realised bid-ask spreads are higher for shares that are subject to cream skimming. Thus the validity of the NYSE market price seems to be reduced as customers (brokers) switch to alternative networks. The problem, of course, is that this is not necessarily in the interest of end investors, as the spreads are wider and quality of the market price worse. A solution suggested by Economides (1993) is to price market equilibrium information appropriately. This question relates to legislation and interim rules and regulations as well as to microstructure of stock exchange trading systems, and specifically those of alliances.

Theoretical and empirical analysis both suggest that economies of scale are a major source of competitive pressure in an exchange environment if the necessary conditions for a contestable market are satisfied. Moreover, new technology offers additional ways in which the infrastructure may develop. In particular, trading platforms of stock exchanges are having to face increasing competition from less organised marketplaces. In the United States, the appearance of off-exchange trading institutions using Internet as an essential transmission channel (e.g. Arizona Exchange, Instinet and Posit) already poses a formidable challenge to existing stock exchanges and traditional brokers. The value of the Internet lies in its capacity to provide immediate access to information at very modest costs.

However, the loss of market share by stock exchanges is not an unexpected development. Pagano and Röell offered a gloomy picture of the outlook for national platforms as early as 1990: “Thus, rather than in the City, in Börsenplatz or in Place de la Bourse, the heart of the future European stock exchange may end up being located in a bunch of trivial silicon wafers” (Pagano and Röell, 1990). We will return to this discussion in section 4.

Registration of holdings and clearance and settlement of securities have also developed dramatically as a result of technological progress. Use of electronic book-entry systems embodying advanced technology has become increasingly widespread and this is helping to further shorten settlement lags. These systems also facilitate cross-border transfers and cross-border settlement of securities. In an ongoing empirical study, Malkamäki (1999c) has recently shown that securities settlement systems and depository functions are subject to economies of scale effects in a similar manner as equity trading systems.

### 2.3 The euro has changed the global landscape

With the introduction of the single currency in Europe, the structure of the world securities markets has changed fundamentally. The introduction of euro is perhaps the most significant reform in the international monetary system since the breakdown of the Bretton Woods system in the early 1970s. No segment of the financial markets has been untouched by the onset of economic and monetary union in Europe. In particular, the single currency has had a direct impact on some market segments, as currency risks have been eliminated within the euro area. This section describes how the global structure of securities markets has been thoroughly revamped as a result of the single currency.

At the heart of economic and monetary union in Europe is the European Central Bank (ECB). In addition to launching the single currency, the ECB influences securities markets by setting rules for its monetary policy operations, standards for the settlement systems in its capacity as a user of market infrastructure and eligibility criteria for both counterparties and collateral. Moreover, the ECB also intends to contribute to the development of pan-European payment systems.

With the onset of economic and monetary union, the euro securities market became the second largest in the world, surpassing the Japanese market to rank second after the US market. However, relative to the euro area economy, the size of the market for euro-denominated securities is much smaller than the US securities market. Securitization is likely to advance further in Europe because of the increased size and liquidity of the euro securities market compared with the

former national securities markets. (For more details, see McCauley and White (1997), Prati and Schinasi (1997) and Duisenberg (1999))

The euro money market has likewise become the second largest in the world (Figure 1). The structure and functioning of money markets began to change rapidly already in the second half of 1998. The restructuring was completed in January 1999 when national currencies disappeared and short-term interest rates and volatility converged as a result of the introduction of the single monetary policy and ESCB's cross-border payment system TARGET, which enables large-value payments to be executed throughout Europe within a few minutes.

The benefits from economies of scale in money markets are large, and this has resulted in rapid concentration in money market trading in the euro area. The bulk of liquidity management now takes place in the cross-border Euribor-based money market of the euro area. The volumes of local money market trading are modest in the peripheral markets, and trading in national FRAs has been discontinued in most of the countries. Deposit-based instruments, repo agreements and swaps have increased in importance in the European interbank market. The disintermediation process is expected to accelerate, as a result of which the Treasury Bills and commercial papers are likely to assume increased importance throughout the single currency area.

Figure 1.

**Stock of money market instruments, end-1997**

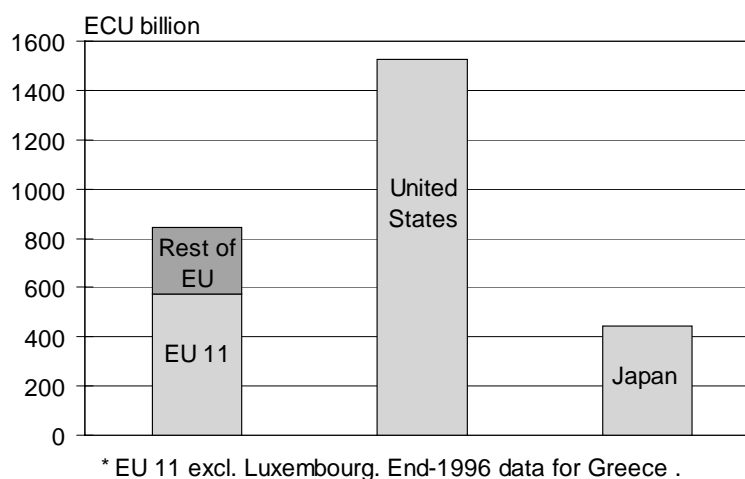
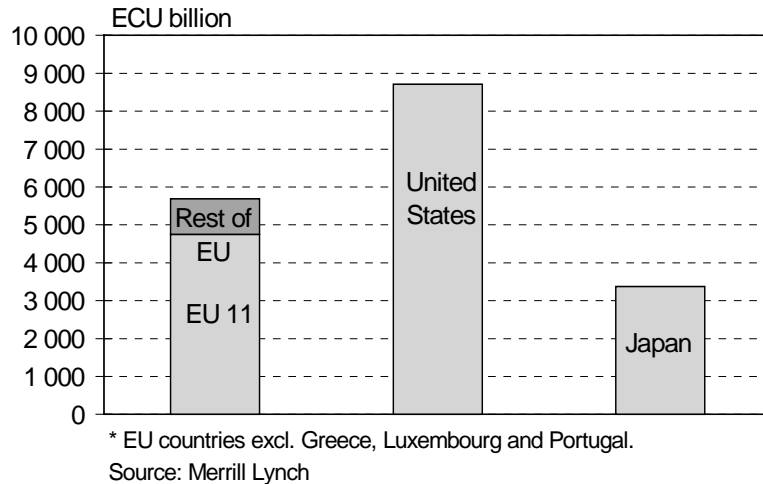


Figure 2.

**Stock of domestic bonds, nominal value, end-1997**

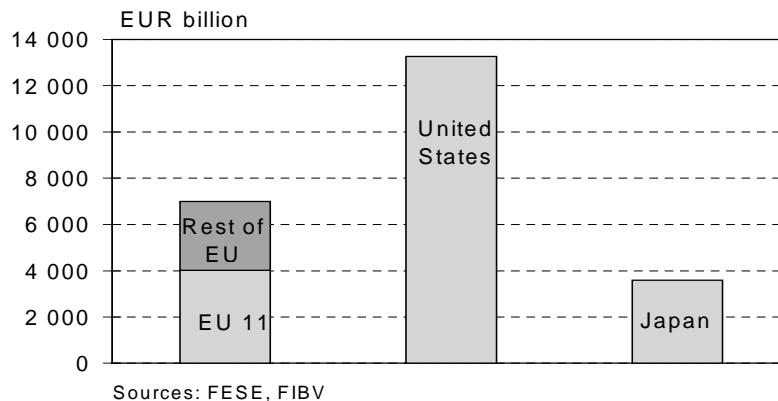


The structure of the money markets is, however, still quite fragmented, from the viewpoint of securities settlement infrastructure for example, and it is possible that money market activity is not highly correlated with the outstanding stock of money market instruments. A substantial share of the European money market trading also takes place in “outs” countries, mainly in London.

The market for domestic bonds issued in the euro area is notably larger than its Japanese counterpart but still lags behind the US market (Figure 2). In terms of market capitalisation, the bulk of domestic bonds are issued by euro area countries. Market liquidity has increased markedly, as indicated by the increased volumes in exchanged-traded bond futures. Enhanced liquidity enhances the operation of mechanisms for pricing credit and liquidity risks in European bond markets. These developments have paved the way for an increase in the size of corporate and municipal bond markets, thereby making for greater diversity in bond markets throughout Europe. The European corporate bond markets have also been boosted by the ESCB decision to treat securities issued by the private sector as eligible as collateral for central bank operations.

Figure 3.

**Market capitalization of domestic companies, end-September 1999**





The weight of the US stock market in the MSCI world index is currently over 50 per cent. The US market is thus by far the largest stock market in the world (Figure 3). The European market is clearly number two. In Europe the non-euro equity market is about the same size as the euro-denominated equity market. Investors are increasingly diversifying their portfolios within the euro area. With the adoption of the single currency in Europe, most of the prevailing restrictions on currency positions of certain institutional investors were lifted. Rapidly expanding cross-border portfolio investment is increasing the need for an efficient euro area or even pan-European trading and settlement infrastructure. According to a recent press release by a group of eight European stock exchanges, these exchanges intend to establish an integrated and electronic cross-border market for European blue chip stocks. This will reduce the need for companies to list their shares in several marketplaces in Europe and will further increase the volume of cross-border transactions.

Some of the leading derivative exchange markets (Table) are located in Europe. The significance of derivative products in European money markets has increased substantially over the past few years. With the introduction of the single currency, the volatility of short-term interest rate has converged across money markets in the euro area. This has propted a process of rapid concentration in trading in Euribor-based money market derivatives, which hither to have been traded predominantly on LIFFE in London.

In the bond derivative markets, the trend seems to be parallel to money market developments. The dominant instruments in the euro area are based on the most liquid government bonds, i.e. German Bunds. The Eurex in Frankfurt was able to divert the bulk of trade in Bund futures from LIFFE within year 1998. Other derivative exchanges lost most of their turnover in long-term interest rate futures and options. The remaining liquidity premia on government bonds issued by different governments may, however, sustain the need for derivative instruments in these government bonds as well. Trading in these instruments is likely to be modest.

Table 1. **Top derivative contracts ranked by volume and value**

Rank by volume	Rank by value	Contract	Exchange	Jan-June 99 volumes	Jan-June 99 values in USDm	Jan-June 98 volumes
1	4	Euro Bund (f)	Eurex	72,940,574	7,500,000	37,780,613
2	5	US T-bond (f)	CBoT	51,598,829	5,200,000	56,506,813
3	1	Eurodollar (f)	CME	49,817,275	49,817,275	52,651,798
4	8	Kospi 200 (o)	KSE	36,066,415	2,150,000	6,062,336
5	15	CAC40 long term (o)	Monep	32,404,070	150,000	1,197,237
6	7	Euro Bobl (f)	Eurex	22,090,252	2,400,000	14,914,776
7	9	US T-bond (o)	CBoT	20,781,589	2,100,000	19,089,114
8	14	Crude oil (f)	Nymex	18,138,905	300,000	15,713,593
9	10	10-yr T-notes (f)	CBoT	17,642,607	1,800,000	15,679,582
10	3	Sterling (f)	Liffe	16,768,925	13,300,000	15,740,152
11	2	Euro Euribor (f)	Liffe	16,370,037	21,500,000	n/a
12	13	Dax (o)	Eurex	14,841,733	410,000	13,662,374
13	6	S&P 500 (f)	CME	13,879,796	4,600,000	15,191,451
14	12	S&P 100 (o)	CBOE	13,616,149	900,000	16,386,169
15	11	Euro Bund (o)	Eurex	11,632,834	1,300,000	1,122,020

Source: Futures & Options World, 8/99.

Trading in equity derivative instruments is also concentrating on Eurex and LIFFE, but only gradually. National derivative exchanges are doing better in this regard because they can provide for possible delivery of national contracts. The introduction of the Dow Jones Euro-Stoxx 50 at Eurex and the FTSE Eurotop at LIFFE will lead to a gradual shift in part of equity derivative volumes to these market places.

With the introduction of euro and other measures furthering European integration, European securities and derivatives markets are assuming global importance. Demand for cross-border financial services has increased rapidly. Asset managers and brokers are now able to operate on many markets. This has prompted the largest banks and securities houses to look for scale advantages through acquisitions and mergers. Within Europe, competition among marketplaces and institutions that operate trading and settlement systems is intensifying rapidly. Several intercontinental mergers of listed companies raise the question as to where trading in these companies' shares will take place in the future. Global competition for liquidity is obviously about to begin.

## 2.4 Offsets to economies of scale

While the driving forces of global integration and growing cross-border activities in the securities industry are evident, there are also factors at work that will inevitably slow these developments.

Theoretical arguments have been put forward as to why the complete concentration of securities markets should not be taken for granted. Gehrig (1998a) provides a recent survey of the literature on the geography of financial activities. He argues that the geographical dispersion of financial activities exists because financial markets are not frictionless, in contrast to the usual assumption in the finance literature. He divides factors underlying the development of financial centres into centripetal and centrifugal forces, as suggested earlier by Kindleberger (1974). Economies of scale are the major centripetal force, according to these authors. They argue that scale economies are found in payment and settlement systems as well as in currency trading systems.<sup>1</sup> Other centripetal forces identified by Gehrig (1998a) are informational spillovers, market liquidity and thick market externalities, such as liquid labour markets. The centrifugal forces arise from market access costs and localisation of information. Market access costs include transportation costs, as discussed in Gehrig (1998b), and transaction costs that do not depend on distance as discussed in Pagano (1989).

Gaspar and Glaeser (1996) model cities as a means of reducing the fixed cost involved in face-to-face interactions. They argue that straightforward information can easily be transferred through electronic networks. However, given complex information, instructions may easily be misunderstood, so that face-to-face communication may be necessary. Their empirical work shows that telecommunications may in fact be a complement to, or at least not a strong

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<sup>1</sup> Bauer and Hancock (1995) actually found that there are significant scale economies in providing payment services via the Federal Reserve automated clearing house. Malkamäki (1999c) found that securities settlement is subject to even bigger economies of scale than was shown to be the case in payment systems.

substitute for, financial centres. Their analysis directly contradicts a widely raised argument that telecommunications will eliminate the significance of location.<sup>2</sup>

Gehrig (1998a) argues further that centrifugal forces should be particularly relevant in markets for instruments that are priced on the basis of complex local information, i.e. stocks and stock derivatives. Trading in these instruments is also likely to be concentrated in local financial centres rather than in global financial centres or global electronic trading systems.

Gehrig (1998b) models competition between marketplaces. According to his two-dimensional spatial model, despite strong forces towards agglomeration, multiple markets will arise under free entry of firms when markets are large enough. Another interesting outcome of the model is that deregulation of transaction taxes can be understood as an equilibrium reaction to a significant decline in transportation costs.

Interestingly, trading in short-term FRAs and bond derivatives has already shifted from national derivatives exchanges to LIFFE and Eurex, which is the centre for trading in German bund derivatives. This development is consistent with Gehrig (1998a), as corresponding concentration has not yet taken place with regard to trading in stock derivatives.

The success of Eurex relative to LIFFE may, on the other hand, be partly explained by differences in the governance of these two exchanges. Hart and Moore (1996) argue that in co-operative exchanges members may be reluctant to accept changes that would affect their own business, even if this is not in their own interest in the longer run.

Brennan and Cao (1997) develop a model of international equity portfolio investment flows based on differences in informational endowments between foreign and domestic investors.<sup>3</sup> They show that when domestic investors possess a cumulative information advantage over foreign investors about their domestic market, investors tend to purchase foreign assets in periods when the return on foreign assets is high and sell when the return is low. The empirical part of their paper finds support for the model.

Consistent with the asymmetric information hypothesis, Shucla and Inwegen (1995) report that foreign-managed mutual funds in the United States are outperformed by domestic funds, and that at least part of this performance shortfall is attributable to inferior market timing by foreign funds. Brennan and Cao note that even portfolios of US domestic mutual funds are geographically biased towards the home of the fund. These findings imply that problems of distance are dwarfed by problems of languages and cultural differences between countries and complicate cross-border activities.

Apart from theoretical models, we should perhaps note that nationalism is a powerful factor having a distinctive impact at least on political decisions. National stock exchanges, in particular, are seen as symbols of national identity, thereby providing strong support for the existence of national infrastructure. National marketplaces and other market infrastructure can also be regarded as an issue of national industrial policy.

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<sup>2</sup> For a discussion of this issue, see Gaspar and Glaesser (1996), Gehrig (1998a) and O'Brien (1992).

<sup>3</sup> The basic assumption of their model is similar to that of Gehrig (1993) and Kang and Stultz (1994) in that domestic investors are assumed to be better informed about the payoffs on the domestic market than are foreign investors.

Changes in the structure of European securities markets are also being delayed by the lack of obvious alternatives for current marketplaces. At the moment, even blue chip companies still lack a common pan-European stock exchange or common trading platform. The slow progress made to date by the alliance of eight European stock exchanges in establishing an electronic market for European blue chip companies does not bode well in this regard. For small and medium-sized enterprises, in particular, it seems that the only possibility for equities listing and trading is via national stock exchanges. In this respect, there seems to be no clear solution available in the offing, notwithstanding the introduction of Easdaq, the marketplace for growth enterprises, and the EURO.NM, the alliance of several national markets for growth companies.

### 3 Developments in trading and settlement systems

Stock and derivative exchanges have existed for a long time and there is a wide understanding that stock exchange operations are subject to economies of scale and network effects. Therefore, a wave of mergers between exchanges has been expected, especially in EU member states. This process has been going on in the United States over the past few decades, as described in Arnold et al. (1999).<sup>4</sup>

In the early part of this century, there were about one hundred local stock exchanges in the United States. The amalgamation of stock exchanges started as telecommunications started to develop in the 1920s and 1930s. Additional competitive pressure was created by legislative changes in 1940s. The merging stock exchanges usually increased their trading volumes. By contrast, local stock exchanges, as a group, constantly lost trading volumes to the pan-continental New York Stock Exchange. Viewed against this historical background, one would expect to see mergers taking place in Europe as well, especially since EU legislation favours competition between stock exchanges, as described in section 2.1.

But instead of mergers of stock exchanges, just the opposite has taken place globally. Clayton et al. (1999) show that more derivative and stock exchanges than ever have been established since 1950, the most active decade in this regard being the 1990s. Most of the new stock and derivative exchanges have been set up in emerging markets in, for example, the Asia-Pacific rim and in Central and Eastern Europe. These new exchanges function in national markets and are local by nature. The formation of these exchanges can therefore be seen as part of the development of capital markets in emerging countries.

By taking a closer look at the recent evolution of equity trading systems, it can be seen that a huge invasion of new equity routing/matching/trading systems such as Instinet, POSIT and Attain is taking place in the United States. These systems have gained increasing volumes, especially in stocks listed on Nasdaq but also in many NYSE-listed stocks; for details, see Bessembinder and Kaufmann (1997), Domowitz and Steil (1998), Clay (1999) and Wicker-Miurin and Hart (1999). This opens up the possibility of a new scenario in which economies of

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<sup>4</sup> Developments in securities settlement systems is discussed separately in section 3.2, as these systems are of recent origin as compared with exchanges.

scale lead to further consolidation of traditional stock exchange volumes at the same time as new alternative electronic trading systems create new competition that may lead to new fragmentation of liquidity and cream skimming. We discuss this and other recent developments in stock and derivative exchanges and securities settlement systems in the following two subsections.

### 3.1 Recent developments in exchange-traded markets

Economic developments foster structural changes, as already discussed above. Several recent papers discuss structural changes in stock and derivative exchanges and new trading services competing with traditional exchanges and brokers. We cite these papers below and consider their findings with regard to recent structural changes in the markets.

#### **Governance structure, economies of scale and network effects**

Hart and Moore (1996) argued some years ago that in co-operative exchanges members may be reluctant to accept changes that could affect their own business, even if this is not in their own interest in the longer run. Since then many co-operative exchanges have separated ownership from membership and now operate as limited liability companies. Stock exchanges in Stockholm (1993), Helsinki (1995), Copenhagen (1996), Amsterdam (1997), Italy (1997) and Australia (1998) were the first to start operating as for-profit companies. In the course of 1999, several other stock and derivative exchanges have followed in their footsteps. Hong Kong and Singapore are two cases in point in Asia. The London International Financial Futures and Options Exchange (LIFFE), the Chicago Board of Trade (CBoT) and the Toronto Stock Exchange (TSE) have made the same move in the course of 1999. The New York Stock Exchange (NYSE) and the London Stock Exchange (LSE) are currently considering this possibility and may soon follow suit.

The big US exchanges are still more or less floor-based exchanges. In contrast, Nasdaq is electronic but based on market making. Both LIFFE and the LSE were floor-based exchanges until 1998 when the LSE introduced its SETS electronic trading system, which is based on a limit order book. LIFFE introduced its Connect trading system last year. The London exchanges were the last to go electronic in Europe. LIFFE seat owners accepted the change only after the success of the Frankfurt-based Eurex relative to LIFFE, which saw Eurex increase its share of Bund futures volume at the expense of LIFFE in 1998. LIFFE's owners acted as stated by Hart and Moore and paid a high price for developing its electronic trading system as late as they did. The performance of the LSE has also been modest. Liquidity has flowed back from London to the home countries of listed companies over the past few years.

Derivative and stock exchanges in the United States are now in the same position as their London-based counterparties were just a few years ago. The structure of their trading systems is not the best possible and owners are reluctant to accept fully electronic trading systems as these would challenge their own businesses. Domowitz and Steil (1998) show that trading on the Nasdaq market, in particular, is considerably more expensive than on the new electronic

communication and alternative trading systems (ECNs and ATs) such as Instinet, POSIT and the Arizona stock exchange. Although the Nasdaq market is screen-based, it still lacks a central limit order book. ECNs and ATs now account for about 30 per cent of all business on Nasdaq.

Bessembinder and Kaufman (1997) examined execution costs for trades in stocks listed on the NYSE and trades executed on the NYSE, the NASD dealer market, and the regional stock exchanges during 1994. Under SEC rule 19c-3, NYSE members are allowed to compete with NYSE specialists by executing trades in NYSE-listed firms in off-exchange systems. They found that some off NYSE exchanges have specialised in attracting small trades in the shares of large NYSE-listed companies and have in fact made significant volumes gains in their operations. Domowitz and Steil argue that this has been possible because automated electronic systems have been commoditised and can now be tailored quickly and inexpensively to accommodate trading in a growing number of different securities and other commodities.

The US derivative exchanges are forming alliances with their European counterparts. The CBoT has agreed to form a strategic alliance with Eurex and Chicago Mercantile Exchange (CME) with LIFFE. Both of them will adopt the electronic trading systems of their European partners. This implies that the Chicago Board of Options Exchange will continue alone, at least for a while. LIFFE and Eurex are now free to install their screens all over the United States as the Commodity Futures Trading Commission abolished regulatory barriers for entry in August 1999.

Pirrong (1999) shows, interestingly, that under specified conditions a member-owned exchange has a monopoly over the trade of a particular financial contract and its close substitutes. These exchanges may not merge to exploit all economies of scope because maintaining separate exchanges reduces competition between suppliers of financial services. He also argues that the evidence from the markets is broadly consistent with his model's predictions. We expect that all this may change given the obvious advantages of network externalities. The trading systems of LIFFE and Eurex offer a full range of European derivative products and the same wide range of US products could be offered in these systems in US markets as well. This would imply huge advantages in economies of scale, as well as in economies of scope.

### **Conglomerations, economies of scope and straight-through-processing**

Stock and derivative exchanges are merging in many countries, as described in Williamson (1999). Mergers of this kind have taken place in Switzerland (1993), Germany (1994), the Netherlands, Finland, France and Austria (1997), Sweden (1998) and Hong Kong, Singapore and Australia (1999). By enlarging the scope of trading operations, it is possible to better exploit the knowledge needed in developing and maintaining electronic trading systems.

In some countries, securities settlement systems have also been merged with exchanges; Germany (1994), the Netherlands (1997) and Finland (1999) are cases in point. In emerging markets, where stock exchanges and settlement systems are of recent origin, these operations are located within the same company almost without exception. Clearly, centralising the securities infrastructure enhances the opportunities for integrating and increasing automation throughout the entire

service chain, i.e. validating straight-through-processing. On the other hand, the DTCC clears and settles trades on all major US stock exchanges. This kind of solution enables consolidation of positions in different markets. We discuss this further in the next section.

### **Mergers, alliances and economies of scale**

In most European and Asian countries, stock exchanges have historically been local monopolies. This is in sharp contrast with the North American exchanges, which compete with each other throughout the United States and Canada. Because of this competition, the number of exchanges has declined over the years in the United States. The latest mergers of AMEX and the Philadelphia Stock Exchange with Nasdaq were announced in 1998.

With the introduction of the euro, competition between the European stock exchanges is intensifying. Globalisation of industrial and financial companies increases the need for intercontinental gross-listings, which will foster competition between stock exchanges across continents. It is therefore instructive to compare the activities and relative performance of the European stock exchanges in 1996. It can be seen from Table 2 that European exchanges handled about 50 per cent less in terms of transactions and other output than the North American exchanges, generated almost as much in terms of costs as the North American exchanges and generated as much profit as the stock exchanges in the rest of the world. It is also important to note that the average cost per transaction at end-1996 was about three times higher in Europe than in North America (FIBV, 1997).

Table 2. **Exchange statistics by region in 1996,  
% of total**

1996 %	Capitalization	Transactions	Value of share trading	Revenues	Costs	Profits
Asia	26	39	16	29	28	32
Europe	26	20	32	36	32	49
North America	46	40	51	29	35	7
South America	2	1	1	6	5	12
	100	100	100	100	100	100

Source: FIBV 1997, Annual Report

Measures are obviously needed to cut costs and improve the quality of services in order to create more liquidity for share trading, if the European stock market is to remain globally competitive. It is clear that international securities houses will want to keep their own costs down and their efficiency up. They will not want to pay membership fees to many European stock exchanges and to have dozens of different terminals for trading and settlement of trades. Rather, they and institutional investors look forward to having liquid European instruments and an efficient trading infrastructure. If these are not available in Europe, securities houses and investors will be able to trade in the shares of the biggest European listed companies on the NYSE and Nasdaq, as well as in systems such as Instinet, Posit and Tradepoint. This is because customer demand for cross-border

transactions has already increased, as portfolios become increasingly diversified on a global scale. The value of cross-border transactions are already increased manifold with the advent of the euro.

To meet this challenge European stock exchanges are reorganising their operations in order to become more competitive. They are endeavouring to gain scale advantages by forming bilateral or multilateral alliances among themselves. Alliances already exist for example between 1) nine exchanges in Germany; 2) four exchanges in Spain; 3) three exchanges in the Benelux countries; 4) three exchanges in the Scandinavian countries; 5) the Vienna Stock Exchange and Deutsche Börse; and HEX in Helsinki and Eurex. All these alliances utilise economies of scale in the trading system, because they use common platforms and/or even the system operated by one of the participants in the alliance. This increases operative efficiency, according to the empirical results in Malkamäki (1999a). Chan et al. (1997) find that, in horizontal strategic alliances, more value accrues when the alliance involves the transfer or pooling of technical knowledge.

In September 1999, eight European exchanges (Amsterdam, Brussels, Frankfurt, London, Madrid, Milan, Paris and the Swiss Exchange) agreed to form an electronic market for trading of European blue chips by November 2000. The alliance will be based on a common market model with common functionality, supported by a harmonised rulebook. The agreed system will aim to: increase liquidity; enhance market transparency; simplify transaction procedures; minimise systems complexities for users; attract new capital flows; serve investor protection; and enhance the integrity of the markets (press release).

The agreed market model is based on the following seven features:

- 1) continuous electronic order driven trading, with an opening and closing auction and optional intra-day auctions;
- 2) a harmonised approach to access arrangements to each market/order book for each exchange's customers;
- 3) pre and post-trade anonymity and trading supported by central counterparty arrangements or the equivalent;
- 4) harmonised functionality for continuous trading, e.g. order types, size, use of auctions, dealing capacities, tick sizes;
- 5) functional support for hidden or "iceberg" orders, thereby facilitating block trades;
- 6) a common approach to preventing market or index manipulation, with each exchange supervising trading of its own alliance market securities;
- 7) market access will be fair and equal regardless of the member firms' geographic location.

It seems obvious that co-operation between European stock exchanges will continue to be based on alliances in the short run rather than mergers. This could also be rational given the fact that Europe is heterogeneous with respect to language, culture accounting principles and bankruptcy legislation, for example.

The economic literature suggests that activities that are based on very simple information are likely to be centralised. Limit orders and market orders can actually be considered standardised information, and the processing of this information is technical and not issuer-specific, i.e. all the transactions are treated in more or less the same way in the trading system. Thus execution of trades can realistically be based on technology that is standardised throughout each country



or even throughout Europe. However, the solution agreed by the eight European exchanges does not exploit the economies of scale in trading systems found in Malkamäki (1999a and 1999b). The model could have been developed further by agreeing on the use of one set of software and centralising the operation of the system.

The literature also suggests that complex information, by contrast, may require face-to-face contacts to be properly understood. Centralisation in this area may cause congestion problems and may also introduce a “transportation cost” that is unduly high. The optimal solution might therefore be for listing procedures and communication with companies and other related matters to continue to be handled by national exchanges.

### **Electronic systems, internet, network effects and cost of trading**

Clay (1999) and Wicker-Miurin and Hart (1999) discuss potential effects of electronic communication systems (ECNs), alternative trading systems (ATMs), electronic trading systems that include a limit order book, and Internet as an order routing vehicle.

Between 30 and 40 per cent of all US securities transactions are now channelled through the Internet and about 15 per cent of all the US equity trades are done on-line. The average cost of an Internet transaction is only about USD 15, which is just a small fraction of the level that used be common in US markets. The internet has speeded up the flow of orders and reports to and from trading destinations. From the investor’s point of view, it does not matter at all where the trading destination is. Traditional US exchanges and brokers have lost part of their market share to lower-cost competitors, ECNs and ATMs and electronic brokers.

There are about 20–30 systems of this kind in the United States and the number is increasing all the time. These systems include e.g. Archipelago, Islands, Instinet, Posit and E-Crossnet, to name only a few. They have been able to expand mainly because the biggest US exchanges do not provide fully electronic trading with a limit order book. Investors find it cheaper to use the alternative systems, which also allow anonymous trading, thus reducing the market impact cost. They account for about one-third of Nasdaq and about 5 per cent of NYSE volumes. Clearing and settlement is not a problem as almost all settlements in the United States take place in the DTCC settlement system.

Electronic brokers have the potential to link global markets together rather than exchanges. Charles Schwab, for example, plans to provide a link between US, European and Japanese markets. Island has announced that it will bypass Nasdaq totally. That would further intensify competition between electronic brokers and stock exchanges. On the other hand, electronic trading systems could be opened for investors, which would bypass the whole broking industry.

So far, the alternative electronic systems have not been successful in Europe. It has been argued that this is because they do not really have anything new to offer over and above what the European trading systems already offer. However, many investment banks have acquired stakes in Tradepoint and have started to compete with the LSE. In addition, Nasdaq has announced that it will start to operate in Europe and ITG Europe has started to operate its Posit system in London and has acquired a significant market share in the course of 1999. These new marketplaces have also announced that they aim to list all the European listed

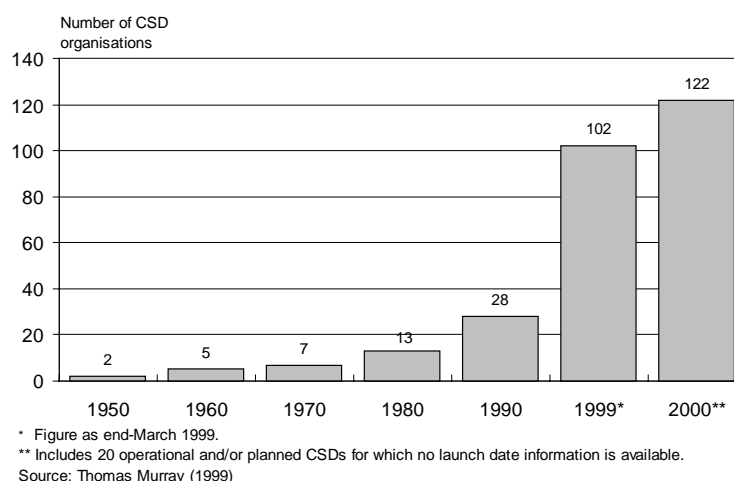
companies on their systems. It remains to be seen whether they are able to solve the problem of settlement of trades; settlement is fragmented in Europe, as is discussed in the next section.

### 3.2 Recent developments in securities settlement systems

The number of central securities depositories (CSDs) has been growing at an increasingly faster pace throughout the latter part of this century (see figure 4). The growing number of CSDs reflects the common trend towards concentration of settlement and depository functions in one or a few institutions at national level. Growth has been particularly rapid following the Group of Thirty's recommendation in 1989 to establish a CSD in each country. One of the aims of establishing CSDs has been to enhance efficiency in national securities markets, e.g. by facilitating transaction processing via book-entry mechanisms. The use of electronic mechanisms for processing securities in CSDs has also provided a basis for feasible cross-border settlement of securities.

Figure 4.

**Growth in the number of CSDs**



CSDs are most common in mature securities markets, especially in the United States and Western Europe (Table 3). The coverage of operational CSDs is more extensive in equities than in debt instruments, which mirrors the more organised nature of the stock market infrastructure. The current structure in the CSD field is likely to guide future developments. In the developed markets, any future changes in the structure of the infrastructure are likely to be based on some kind of collaboration or consolidation of existing CSDs, while totally new infrastructure solutions could be more feasible in other markets.

The settlement infrastructure has traditionally been most integrated in US securities markets. The latest step in the consolidation process in the United States was the integration of the operations of the Depository Trust Company (DTC) and the National Securities Clearing Corporation (NSCC) under a common holding company, the Depository Trust & Clearing Corporation (DTCC). Together, the companies with their affiliates clear and settle virtually all securities transactions

in the US market, while the DTC remains the world's largest securities depository.

In contrast with the United States, the securities settlement and depository infrastructure in the euro area is still quite fragmented, although efforts towards a more integrated infrastructure can now be discerned. More specifically, there are currently 28 securities settlement systems in the EU approved for the settlement of central bank operations, in comparison with just a handful of systems in the United States. At national level, the integration of CSDs and settlement houses is already quite far advanced, so that the emphasis is now on the need for reforms in the cross-border settlement of securities. The degree of fragmentation differs between debt markets, where international central securities depositories already play quite a dominant role at European level, and equity markets, where the settlement structure is scattered widely between national CSDs.

Table 3. **Percentage of markets with operational CSDs**

Number of countries Region (Sample in brackets)	Percentage of markets with operational CSDs					
	Equities		Fixed income		Money market	
	Operational	Planned	Operational	Planned	Operational	Planned
Africa (11)	36 %	45 %	45 %	18 %	9 %	27 %
Asia Pacific (19)	84 %	11 %	68 %	21 %	32 %	21 %
C & E Europe (17)	88 %	0 %	76 %	12 %	53 %	18 %
Western Europe (20)	90 %	10 %	85 %	15 %	75 %	5 %
Middle East (14)	50 %	21 %	43 %	14 %	29 %	14 %
North America (2)	100 %	0 %	100 %	0 %	100 %	0 %
South America (24)	71 %	25 %	58 %	29 %	37 %	25 %

Source: Thomas Murray

Recently, three major initiatives have been launched for the integration of the settlement and depository industry in Europe. The ECSDA has put forward a model for integrating settlement infrastructure by bilateral links between individual securities settlement systems or depositories. The main aim of the ECSDA is to create harmonised standards for links so as to facilitate a multiple link structure at a bearable cost.

So far, the links constructed between European national CSDs have been free-of-payment links, i.e. the payment leg of the security transaction has not been processed through the link. In practice, the use of free-of-payment links is mainly limited to transfers of collateral and physical deliveries of underlying instruments of derivatives, excluding the settlement of cross-border trades of securities. The ECSDA has, however, been working on standards and mechanisms for delivery-versus-payment links that could serve as a useful settlement solution for cross-border transactions.

The number of the links between European CSDs has been growing continually, and most links have been approved for cross-border use of collateral in ESCB credit operations. Up till now, views among practitioners on the appropriate density of links have ranged from a pure "spaghetti" model with bilateral links between every pair of CSDs to solutions with CSDs connected through one or a few hubs.<sup>5</sup>

<sup>5</sup> See also Giddy et al. (1996) for a discussion on settlement structures in Europe.

In spring 1999, the largest international central securities depository in Europe, Euroclear, announced its support for a “hub and spokes” approach towards pan-European securities settlement. The Euroclear model calls for a European settlement infrastructure that is gathered around a single hub linking all the European CSDs (the spokes), thus providing market participants with a single point of entry to the settlement infrastructure. To date, no single CSD has yet declared its support for the hub and spokes model.

In contrast with the “spaghetti” model, the Euroclear approach would involve only a limited number of links between CSDs, as each national CSD would only establish bilateral delivery-versus-payment links with the central hub. In addition to the administration of global securities, the hub would act as cross-border settlement provider for intermediaries preferring concentration of settlement activities. The hub would also provide the global connections to non-European markets. In the model, the spokes would settle transactions made in the respective domestic markets. Moreover, the spokes would act as the primary depositories for domestic issues, as well as administer the domestic securities on behalf of the whole system. Although the Euroclear model leaves some tasks for national CSDs, there is a clear emphasis on the role of the hub, whose efficient settlement system would be at the heart of the infrastructure. In practice, both Euroclear and the other international central securities depository in Europe, Cedel International, have traditionally acted as hubs for the European settlement infrastructure as regards international bond markets.

In response to the introduction of the hub and spokes model by Euroclear, Cedel International and Deutsche Börse Clearing, the German central securities depository, announced their merger only a couple of weeks later.

The ultimate aim of the new Cedel International is to create a consolidated clearing and settlement mechanism for European markets called the European Clearing House (ECH), which could also be seen as a counterpart to the DTCC in the United States. European clearing and settlement systems were invited to join the integration process through electronic communication links, outsourcing securities processing services or merging with the ECH. Although the ECH offers a step-by-step approach for its potential partners, it clearly aims at the full consolidation of clearing and settlement infrastructure in Europe, at least from the operational point of view.

All three proposals for integrating European settlement infrastructure are based on existing infrastructure, but they clearly differ from each other in their prospective effects on the functional and institutional structure of the settlement industry. The “spaghetti” model as implemented by ECSDA links would be neutral for the CSDs involved whereas the hub and spokes approach would leave some tasks for each CSD but give central status to one of them. In contrast to the other proposals, the ECH solution aims to combine settlement services in a single institution.

The market model of the group of eight European exchanges assumes that each exchange should be able to establish and operationalise a concept in which a central counterpart provides post-trade anonymity for the investors involved. This will be another major challenge that national marketplaces and CSDs will have to cope with.

## 4 Future prospects for market design

Above we reviewed theories and empirical analysis that help us to understand the developments taking place in securities and derivatives markets. We also attempted to relate causes and effects regarding past developments and the latest announcements on future plans. Next, we discuss the future prospects of stock and derivative exchanges and securities settlement systems globally in the light of this analytical framework. First we summarise the developments to date and then go on to consider the future of trading and settlement systems.

The common features of developments so far are:

- (1) an increase in cross-border investment activities and enhanced competition between marketplaces and providers of financial services;
- (2) the growing involvement of the biggest institutional investors in direct trading, which is leading to efficient and cost-effective trading infrastructures;
- (3) a tendency towards a more integrated trading and settlement infrastructure via mergers, alliances, links, agreements or other forms of co-operation;
- (4) the emergence of new electronic exchanges and alternative trading systems operated by members of stock exchanges or off-exchange companies; and
- (5) the emergence of internet brokers.

The increase in cross-border activities and competition is based both on the global diversification needs of customers and the elimination of various barriers to competition in securities markets. Both investors and issuers prefer liquid and transparent securities markets with low transaction costs, enabling them to minimise their direct and indirect costs. Technology has advanced to the point where electronic trading systems enhance market efficiency and liquidity. This introduces a totally new scenario in which economies of scale and network effects enable new trading systems to challenge existing exchanges and settlement systems.

In our view, the increasingly important role played by the biggest institutional investors and investment banks will force trading and settlement service providers to offer low-cost services that allow investors to remain anonymous so that they can eliminate market impact while trading. Based on this scenario, we expect significant changes to take place globally. We discuss these changes below.

### **Governance of exchanges**

Hart and Moore (1996) argued that in co-operative exchanges members may be reluctant to accept changes that could affect their own business, even if such changes are in their own interests in the longer run. Many co-operative exchanges have already separated ownership from membership and operate as limited liability companies. Co-operative exchanges that rank among the largest exchanges have in many cases lagged behind in taking full advantage of the new technologies. We expect that exchanges and clearing and settlement companies will need to move quicker in the future if they want to maintain their relative importance in the sector. There is therefore a need to behave like for-profit companies in their decision making. One natural way to do this is to separate

ownership from membership, and we expect this trend to continue at an accelerating pace. Trading and settlement infrastructure for the most liquid global trading products will, we believe, be provided by limited liability companies that employ efficient governance practices. It should, however, be noted that even limited liability companies need to collaborate with brokerage firms and other customers in order to be successful.

### **Electronic trading systems and anonymous limit order books**

Pirrong (1999) and Malkamäki (1999a) argue that rapid advances in communications technology have helped to minimise the fragmenting effect of physical distance on exchange formation and operations trading services. Steil and Domowitz (1998) and Domowitz (1995) point out that an exchange or trading system is analogous to a communication network, as the benefit to one trader transacting on a given trading system increases when another trader chooses to transact in the same system. Clearly, such network externalities imply economies of scale for electronic trading systems that can be accessed from a number of locations.

Therefore, we expect that the biggest US derivative exchanges, which are still more or less floor-based, will make use of the electronic trading systems of their European alliance partners. The trading systems of LIFFE and Eurex offer a full range of European derivative products, and the same wide range of US products could be offered via these systems in US markets as well. This implies that traditional scope of business of US derivative exchanges could expand and that US exchanges will start to compete with each other.

Shapiro and Varian (1999) argue that, in these circumstances, growth is imperative, not just to achieve the usual production-side economies of scale but also demand-side economies of scale generated by network externalities. The key challenge is to gain critical mass in terms of a sufficiently large customer base. The race to be the first to achieve critical mass may lead to aggressive competition between US derivative exchanges seeking to obtain positive feedback from the markets.

The Nasdaq trading system is already electronic but is based on market making. However, it is been announced that they will soon introduce a trading system with a limit order book. We expect that Nasdaq will be able to win back trade volumes once their new system is implemented because of an increase in network externalities. The current market making arrangement may be hard put to survive, at least in its present form. It is quite likely that even the NYSE will have to consider whether an anonymous limit order book for trades that are currently matched upstairs, i.e. by specialists, might be necessary and good for liquidity. We therefore anticipate that trading networks will be more or less similar. Network externalities may lead to the total amalgamation of liquidity. Besides these systems, some exchanges may start to act as counterparties to investors.

Economides (1993) discusses another issue that is of relevant for interpreting the analysis provided above. He argues that equilibrium price information from a financial exchange network is another externality, in addition to market liquidity. As the validity of the market price established in a network X is an increasing function of the size of the network, it may be better for a small network Y to use the price information provided by network X instead of engaging itself in price

discovery. As more customers switch to network Y, the validity of the market price in network X diminishes. This raises the question of who owns market information and how it can or should be priced. We expect that cream skimming of off-exchange trading systems will force exchanges to provide first-class electronic services at competitive prices. The network externalities and economies of scale will speak for the exchanges in the United States and in Europe, regardless of the fact that off-exchange systems will be able free-ride to some extent. Therefore we expect these systems to exist side by side.

The alliances between European stock exchanges in respect of trading systems are a move in the right direction. However, even the alliance between eight European exchanges is likely to be only a temporary solution, and we expect further consolidation to take place in the area of trading system software and systems operation. The agreed model lacks economies of scale because technology is not shared, and therefore it will not last long. More cost-efficient solutions will be implemented. On the other hand, it seems clear that national exchanges will exist in Europe for the foreseeable future. They will not necessarily be nationally owned but they will continue to operate and to provide a means of fulfilling issuer-specific responsibilities. However, there is no reason why each of them should have its own trading and/or settlement technology.

Nasdaq has announced plans to establish a European stock exchange for all European listed stocks. Tradepoint has issued a statement along similar lines. Deutsche Börse has likewise announced that it will list all European blue chips if the alliance of eight stock exchanges does not proceed efficiently. We feel there is an urgent need for investors to be able to trade efficiently in Europe. We expect a solution to be found and implemented during the year 2000. In our view, the market model as it stands at present is an example of an inefficient alliance.

### **Internet and alternative trading systems**

Volume growth of Internet-routed equity and derivative trades will have a major impact on European brokers over the next few years. Many of traditional brokerage houses may find it difficult to survive these changes. We expect the US equity brokers that use off-exchange matching networks and electronic trading systems in the United States to penetrate Europe as well. However, European stock exchanges are likely to be able to compete with ATSSs, if they are able to find an efficient trading structure for European blue chips. Exchanges may find it difficult to compete with ECNs such as Posit. These systems provide the biggest investors with pre and post-trade anonymity, together with the possibility to trade at mid bid-ask prices. On the other hand, these systems will probably not be able to acquire enough market share to pose a challenge to exchanges since they employ the market prices established on exchanges. Thus the existence of transparent stock exchanges is beneficial for them as well.

Developments along these lines will, however, lead to fragmentation of liquidity. As technology advances, we expect that the liquidity will again be pooled in one way or another in one of the networks.

Nevertheless, the business conducted by brokers and exchanges will tend to converge, thus posing a major challenge for the management of exchanges. Exchanges need to collaborate with their biggest clients in a constructive way just when these clients are starting to compete with them. At the same time, the largest

institutional investors are setting up their own trading desks and are ready to start trading actively. Should they be granted access to the trading systems of exchanges? Institutional membership has actually been possible in United States for a long time and also in some Europe in some exchanges for quite some time now. The more contestable the market, the more likely one would expect to see market structures to develop freely.

### **Securities settlement**

The settlement infrastructure is the most integrated in the US securities markets. The latest step in the consolidation process in the United States was the integration of the operations of the Depository Trust Company (DTC) and the National Securities Clearing Corporation (NSCC) under a common holding company, the Depository Trust & Clearing Corporation (DTCC). Together, the companies and their affiliates clear and settle virtually all securities transactions in the US market, while the DTC remains to be the world's largest securities depository.

The number of ECSDA links between European CSDs has been increasing continuously, and most links have been approved for cross-border use of collateral in ESCB credit operations. However, it would not make economic sense to build  $N(N-1)/2$  links between European CSDs. Nor would such a solution help to bring about the economies of scale effects found in Malkamäki (1999c). Therefore we expect that a "hub and spokes" type of model will be implemented in one form or another.

The market model of the group of eight European exchanges implies application of the home market principle to trading and settlement. The existence of several systems implies manifold settlement software and hardware solutions, inevitably leading to high settlement costs in Europe. At this point of time, it seems economically advantageous that consolidation process continue. We may see even some mergers of leading companies in this business. However, it is likely that there will be several hubs in Europe, perhaps between two and five in the short run. On the other hand, no sweeping changes in system infrastructure are possible in the short run. Therefore the settlement structure will be very fragmented in Europe for the next few years, irrespective of any restructurings between settlement companies.

It is worth noting, however, that the market model implies that each trading place should start acting as a counterparty for trades. Crest of London, together with the London Clearing House, will perform this function for trades executed on the LSE. The LCH clears also trades executed via Tradepoint. Joint efforts of this kind may turn out to be very successful, and may, surprisingly, lead to partial concentration of clearing and settlement already during the year 2000.

### **Efficiency gains and supervisory concerns**

Globalisation of listed companies and the investment industry involves rapid development in trading, settlement and payment infrastructure. Global integration and innovations in infrastructure will increase efficiency in the entire investment



industry, which is in the interests of listed companies and investors alike. It is clear that the whole economy will benefit from such developments.

We expect that the authorities will welcome amalgamation of infrastructure because of the benefits with regard to economies of scale. The authorities should, however, see to it that adequate governance structures are in place in these institutions and that entry to the infrastructure is possible at reasonable terms. The infrastructure should be kept contestable.

In our view, globalisation of the entire investment industry should lead to increased and deeper co-operation between the relevant authorities. We take it for granted that the demands as regard global standards and regulations are high.

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